G06F

ELECTRIC DIGITAL DATA PROCESSING (computer systems based on specific computational models G06N)

Definition statement

This place covers:

Electrical arrangements or processing means for the performance of any automated operation using empirical data in electronic form for classifying, analyzing, monitoring, or carrying out calculations on the data to produce a result or event.

References

Limiting references

This place does not cover:

Computer systems based on specific computational models	G06N

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program-control systems	G05B 19/00
Digital computers in which all the computation is effected mechanically	G06C
Computers in which a part of the computation is effected hydraulically or pneumatically	G06D
Computers in which a part of the computation is effected optically	G06E
Self-contained input or output peripheral equipment	G06K
Computer displays	G09G
Impedance networks using digital techniques	H03H

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Handling	includes processing or transporting of data.
Data processing equipment	An association of an electric digital data processor classifiable under group G06F 7/00, with one or more arrangements classifiable under groups G06F 1/00- G06F 5/00 and G06F 9/00- G06F 13/00.

G06F 1/00

Details not covered by groups G06F 3/00 - G06F 13/00 and G06F 21/00 (architectures of general purpose stored program computers G06F 15/76)

Definition statement

This place covers:

Details not covered by groups G06F 3/00-G06F 13/00 and G06F 21/00.

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References

Limiting references

This place does not cover:

Architectures of general purpose stored program computers	G06F 15/76

G06F 1/02

Digital function generators

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Evaluating functions by calculating only	G06F 7/544, G06F 7/60
Generating sawtooth or staircase waveforms	H03K 4/00

G06F 1/025

for functions having two-valued amplitude, e.g. Walsh functions

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Generation of pulse trains in general	H03K 3/00

G06F 1/04

Generating or distributing clock signals or signals derived directly therefrom

Definition statement

This place covers:

Generation and/or distribution of clock signal(s) within a computer system.

G06F 1/10

Distribution of clock signals {, e.g. skew}

Definition statement

This place covers:

Distribution of clock signal(s) within a computer system, in a typical case the goal to be achieved is to minimize the skew.

G06F 1/105

{in which the distribution is at least partially optical}

Definition statement

This place covers:

Clock distribution wherein the clock signal(s) are distributed entirely optically or partially optically and partially electrically.

G06F 1/16

Constructional details or arrangements

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Instrument details	G12B
Constructional details common to different types of electric apparatus	H05K 7/00

G06F 1/1603

{Arrangements to protect the display from incident light, e.g. hoods}

Special rules of classification

Used also for hoods protecting displays of portable computers.

G06F 1/1607

{Arrangements to support accessories mechanically attached to the display housing (G06F 1/1603, G06F 1/1605 take precedence)}

Special rules of classification

Used also for accessories attached on displays of portable computers.

G06F 1/1613

{for portable computers (cooling arrangements therefor G06F 1/203; constructional details or arrangements for pocket calculators, electronic agendas or books G06F 15/0216; constructional details of portable telephone sets: with several bodies H04M 1/0202)}

Definition statement

This place covers:

Portable computers in the sense of computers able to be used as standalone computers with their own integrated user interface and designed to be carried by hand (e.g. hand held computers or laptop computers) or worn on the user's body (wearable computers).

Docking stations and extensions associated with the portable computers which may be mechanically attached to them.

References

Limiting references

This place does not cover:

Cooling arrangements for portable computers	G06F 1/203
Constructional details or arrangements for pocket calculators, electronic agendas or books	G06F 15/0216
Constructional details of portable telephone sets: with several bodies	H04M 1/0202

Informative references

Attention is drawn to the following places, which may be of interest for search:

Anti-theft locking devices	E05B 73/0082
Constructional details of cameras	G03B 17/00
Hand held scanners	G06K 7/10881
Personal calling arrangements, i.e. paging systems or devices, i.e. pagers	G08B 5/222
Casing of remote controls	H01H 9/0235
Telephone sets including user guidance or feature selection means facilitating their use	H04M 1/247
Cordless telephones	H04M 1/725
Cameras or camera modules comprising electronic image sensors	H04N 23/00

Special rules of classification

In this field, main mechanical aspects of the housing (single housing, foldable or sliding housings) are classified in G06F 1/1615 - G06F 1/1626, while all the other constructional details (enclosure details, display, keyboard, integrated peripherals, etc) are classified in G06F 1/1633 in complement to this main aspect.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "laptop", "palmtop" and "PDA"
- " cell phone", "mobile phone" and "smart phone"

G06F 1/1615

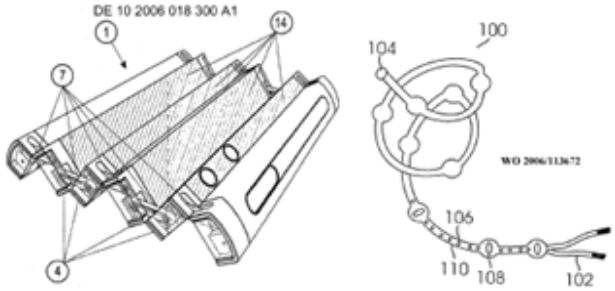
{with several enclosures having relative motions, each enclosure supporting at least one I/O or computing function (constructional details of portable telephones comprising a plurality of mechanically joined movable body parts H04M 1/0206)}

Definition statement

This place covers:

Portable computers having a plurality of enclosures which can't be classified in anyone of the subgroups, e.g. multiple enclosure with loose mechanical link (single wire, expandable or/and flexible link, rollable part), computer split in several housings with no mechanical connection and wirelessly connected, complex mechanical link with multiple degrees of freedom.

Illustrative examples:



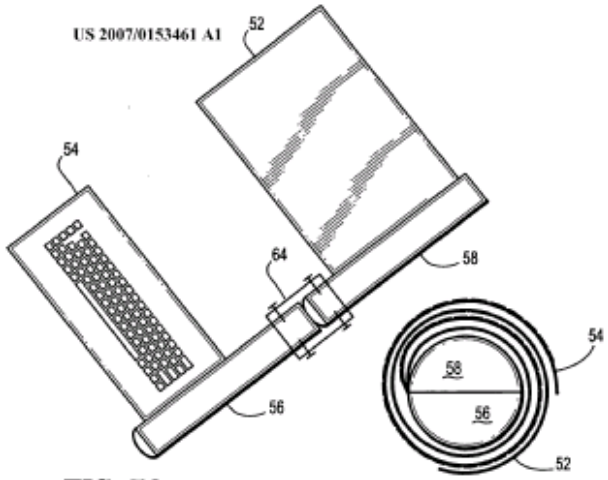
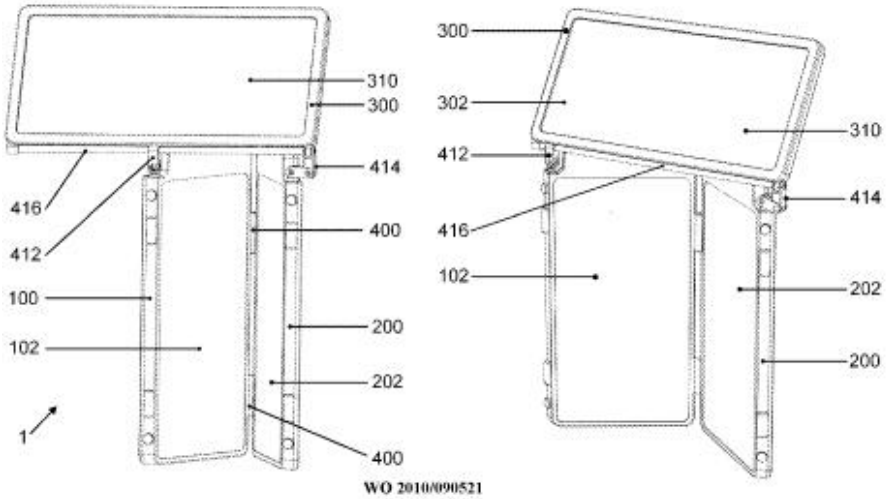


FIG. 5A FIG. 5B



References

Limiting references

This place does not cover:

Constructional details of portable telephones comprising a plurality of mechanically joined movable body parts	H04M 1/0206

G06F 1/1616

{with folding flat displays, e.g. laptop computers or notebooks having a clamshell configuration, with body parts pivoting to an open position around an axis parallel to the plane they define in closed position}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Foldable portable telephones	H04M 1/0214

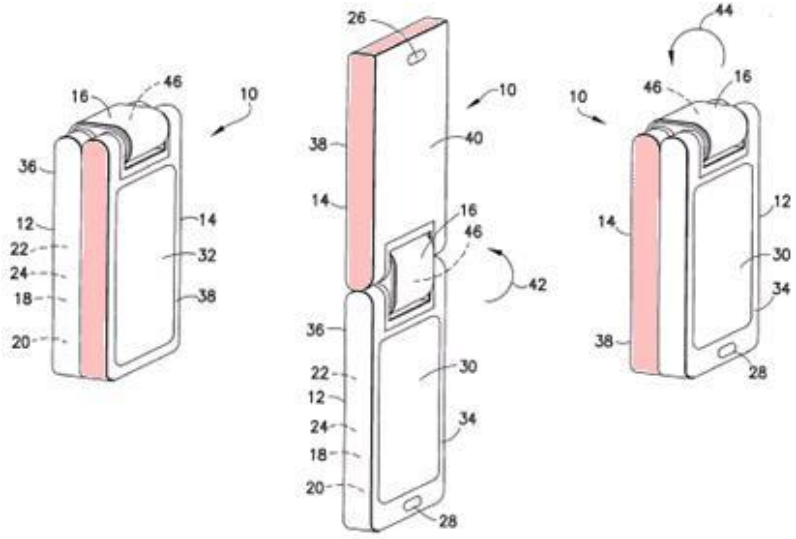
G06F 1/1618

{the display being foldable up to the back of the other housing with a single degree of freedom, e.g. by 360° rotation over the axis defined by the rear edge of the base enclosure}

Definition statement

This place covers:

Also when the hinging part is composed of two parallel rotation axes.



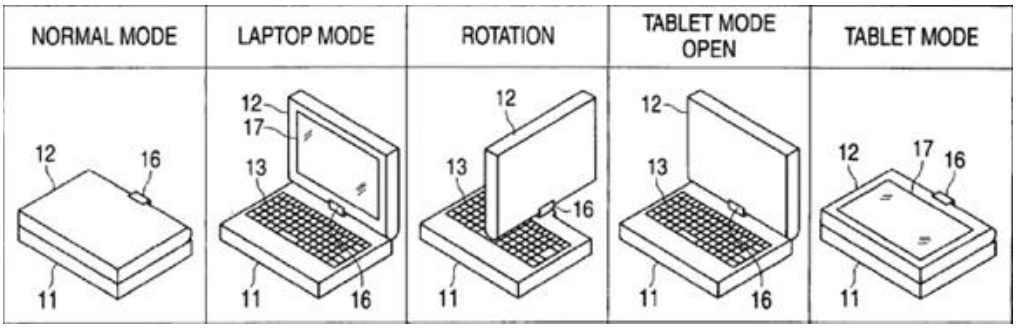
G06F 1/162

{changing, e.g. reversing, the face orientation of the screen with a two degrees of freedom mechanism, e.g. for folding into tablet PC like position or orienting towards the direction opposite to the user to show to a second user}

Definition statement

This place covers:

Reversing the orientation done either by rotating along the X or Y axis or by detaching the display and attaching it in the reverse orientation. Illustrative example:



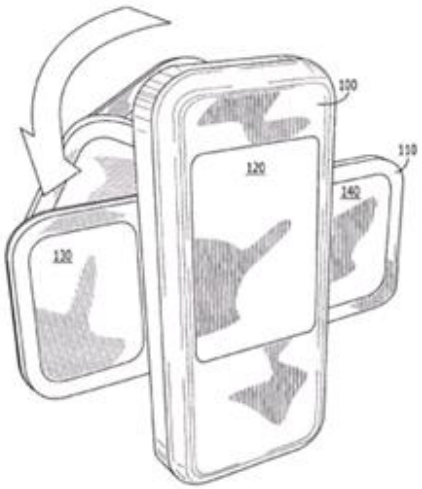
G06F 1/1622

{with enclosures rotating around an axis perpendicular to the plane they define or with ball-joint coupling, e.g. PDA with display enclosure orientation changeable between portrait and landscape by rotation with respect to a coplanar body enclosure}

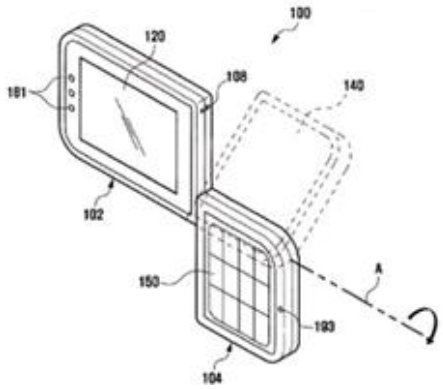
Definition statement

This place covers:

Illustrative examples of subject matter classified in this group:



Additionally rotation around an axis common to the plane they define but perpendicular to their common side, e.g. reversing the relative orientation along an axis common to both planes but not along their sides (which would be then a folding axis).



References

Limiting references

This place does not cover:

Reversing the face orientation of the screen of a folding flat display	G06F 1/162

Informative references

Attention is drawn to the following places, which may be of interest for search:

Rotatable portable telephones	H04M 1/0225

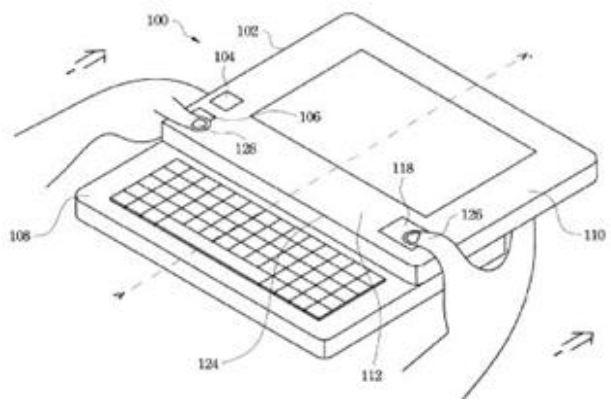
G06F 1/1624

{with sliding enclosures, e.g. sliding keyboard or display}

Definition statement

This place covers:

Portable computers linked by a mechanism allowing translation of one housing relatively to the other housing.



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Slidable portable telephones	H04M 1/0235

G06F 1/1628

{Enclosures for carrying portable computers with peripheral devices, e.g. cases for a laptop and a printer}

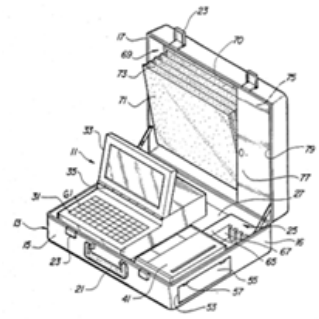
Definition statement

This place covers:

Portable enclosures allowing the transport of the portable computer together with other peripherals.

Illustrative examples of subject matter classified in this place:

1.



2.

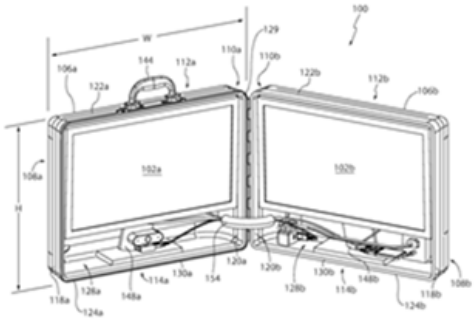


Figure 2 illustrates a portable system for carrying a monitor and a computing device in a case.

Relationships with other classification places

In the context of subclass A45C, storing is understood as to refer to putting or keeping something in a receptacle for future use.

Receptacles for storing portable audio devices, portable handheld communication devices or portable computing devices where the device must be removed for use are classified in A45C 11/001, A45C 11/002 and A45C 11/003, respectively.

Holders or carriers being worn by a user for portable audio devices, portable handheld communication devices and portable computing devices to facilitate transporting or carrying, where the device is not in use or being passively used, are classified in groups A45F 5/1508, A45F 5/1516 and A45F 5/1525, respectively.

Protective covers or auxiliary enclosures for mobile phones that are intended to hold the device during use without hampering the telephonic functions are classified in H04M 1/0203.

Constructional features, like venting or EMI shielding means, of electronic housings not characterised by the inner electronic arrangements are classified in H05K 5/00.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protective covers or auxiliary enclosures for portable computers	G06F 1/1629
Bags	A45C
Receptacles for storing portable computing devices, e.g. laptops, tablets or calculators	A45C 11/003
Holders or carriers for portable computing devices, e.g. laptops, tablets or calculators	A45F 5/1525
Stands with or without wheels as supports for apparatus	F16M 11/00
Arrangements for carrying or protecting portable transceivers in general	H04B 1/3888

Special rules of classification

Enclosures for carrying portable computers with peripheral devices, like a printer or a charger, are classified in G06F 1/1628.

G06F 1/1629 relates to protective covers or auxiliary enclosures for portable computers that are intended to hold the device during use. Details related to functional adaptations of the enclosures, e.g. to provide protection against EMI, shock or water are identified by allocating further classification in G06F 1/1656 or subgroups.

G06F 1/1629

{Protective covers or auxiliary enclosures for portable computers (for carrying with peripheral devices G06F 1/1628; for storing A45C 11/003)}

Definition statement

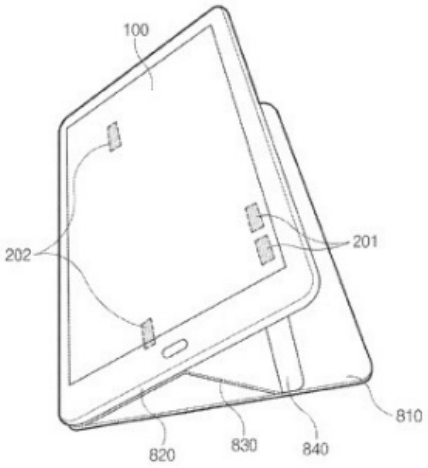
This place covers:

Protective covers or auxiliary enclosures for portable computers that are intended to hold the device during use without hampering said use. The covers or enclosures for portable computers are in principle detachable but intended to remain on the computer during use.

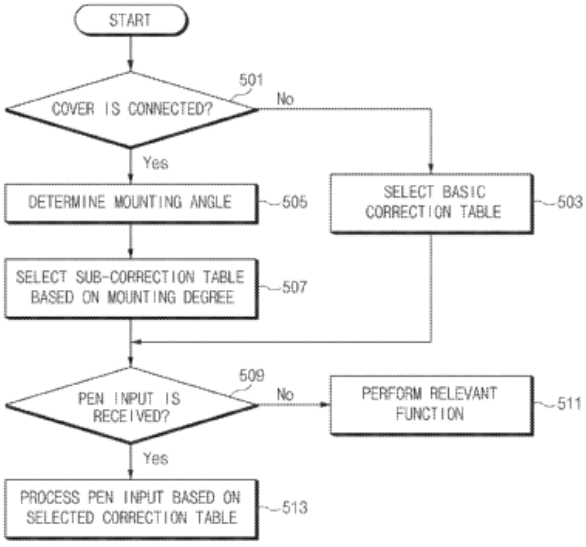
Illustrative example of subject matter classified in this place:

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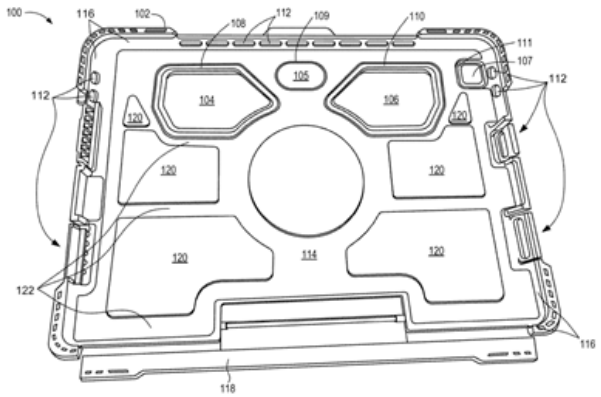
1a.



1b.



1c.



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Relationships with other classification places

Protective covers or auxiliary enclosures for portable computers that are intended to hold the device during use are classified in G06F 1/1629 while receptacles for storing portable audio devices, portable handheld communication devices or portable computing devices where the device must be removed for use are classified in A45C 11/001, A45C 11/002 and A45C 11/003, respectively.

In the context of subclass A45C, storing is understood as to refer to putting or keeping something in a receptacle for future use.

Holders or carriers being worn by a user for portable audio devices, portable handheld communication devices and portable computing devices to facilitate transporting or carrying, where the device is not in use or being passively used, are classified in groups A45F 5/1508, A45F 5/1516 and A45F 5/1525, respectively.

Protective covers or auxiliary enclosures for mobile phones that are intended to hold the device during use without hampering the telephonic functions are classified in H04M 1/0203.

Constructional features, like venting or EMI shielding means, of electronic housings not characterised by the inner electronic arrangements are classified in H05K 5/00.

Supports for positioning or steadying a device relative to a person with the intent of using the device are classified in F16M 13/04.

References

Limiting references

This place does not cover:

Enclosures for carrying portable computers with peripheral devices	G06F 1/1628
Receptacles for storing portable computing devices, e.g. laptops, tablets or calculators	A45C 11/003

Informative references

Attention is drawn to the following places, which may be of interest for search:

Receptacles for storing portable audio devices like headphones or digital music players	A45C 11/001
Receptacles for storing portable handheld communication devices, e.g. pagers or smart phones	A45C 11/002
Holders or carriers for portable audio devices	A45F 5/1508
Holders or carriers for portable handheld communication devices	A45F 5/1516
Holders or carriers for portable computing devices	A45F 5/1525
Supports for positioning or steadying a device relative to a person	F16M 13/04
Arrangements for carrying or protecting portable transceivers	H04B 1/3888
Protective covers or auxiliary enclosures for portable telephones	H04M 1/0203
Casings, cabinets or drawers for electric apparatus	H05K 5/00

Special rules of classification

Enclosures for carrying portable computers with peripheral devices, like a printer or a charger, are classified in G06F 1/1628.

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Details related to functional adaptations of the enclosures, e.g. to provide protection against EMI, shock or water are identified by allocating further classification in G06F 1/1656 or subgroups.

G06F 1/163

{Wearable computers, e.g. on a belt}

Definition statement

This place covers:

Portable computers, e.g. smart watches, whereby the portable computer itself is worn by a user.

Relationships with other classification places

Carrying devices like bands or straps worn on the user to which a computer is attached for facilitating transport or carrying when the computer is not in use or being passively used, e.g. belt clip with means for retaining a tablet, the tablet being removed from the belt clip for use, is classified in A45F 5/1525.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Garments adapted to accommodate electronic equipment	A41D 1/002
Fastening articles to garments	A45F 5/02
Holders or carriers for portable computing devices, e.g. laptops, tablets or calculators	A45F 5/1525

G06F 1/1632

{External expansion units, e.g. docking stations}

Definition statement

This place covers:

Expansions which are directly attached to portable computers, including supplementary battery packs external to the housing, port replicators and cradles for PDAs.

References

Limiting references

This place does not cover:

Standard wired or wireless peripherals such as keyboards, printers or displays which are not mechanically linked to a portable computer	B41J 1/00, G06F 3/02, G06F 1/1601

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mounting in a car	B60R 11/02
Locking against unauthorized removal	E05B 73/0082
Battery charging cradles	H02J 7/70
PCMCIA cards	H05K 5/0256

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Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "docking station", "cradle" and "port replicator"

G06F 1/1633

{Constructional details or arrangements of portable computers not specific to the type of enclosures covered by groups G06F 1/1615 - G06F 1/1626}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details or arrangements of portable computers specific to the type of enclosures	G06F 1/1615 - G06F 1/1626
Mounting of specific components of portable telephones	H04M 1/026

G06F 1/1635

{Details related to the integration of battery packs and other power supplies such as fuel cells or integrated AC adapter}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Computer power supply in general	G06F 1/26
Details of mounting batteries in general	H01M 50/20
Portable telephones battery compartments	H04M 1/0262

G06F 1/1637

{Details related to the display arrangement, including those related to the mounting of the display in the housing}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details related to the housing of computer displays in general	G06F 1/1601
Accessories mechanically attached to the display housing portion of portable computers	G06F 1/1603 - G06F 1/1611
Portable telephones display	H04M 1/0266

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G06F 1/1641

{the display being formed by a plurality of foldable display components (G06F 1/1647 takes precedence)}

References

Limiting references

This place does not cover:

Including at least an additional display	G06F 1/1647

Special rules of classification

Should be used when the displays are used in combination as a virtual single display area where the displayed image is split over the display screens.

G06F 1/1643

{the display being associated to a digitizer, e.g. laptops that can be used as penpads (details related to the relative motion of the display enclosure with respect to the body enclosure, e.g. to move between laptop and tablet PC configuration G06F 1/1615)}

References

Limiting references

This place does not cover:

Movement typologies	G06F 1/1615

Informative references

Attention is drawn to the following places, which may be of interest for search:

Touchpads integrated in a laptop or similar computer	G06F 1/169
Secondary touch screen	G06F 1/1692

G06F 1/1647

{including at least an additional display (G06F 1/1692 takes precedence)}

References

Limiting references

This place does not cover:

Constructional details or arrangements related to integrated I/O peripheral being a secondary touch screen used as control interface, e.g. virtual buttons or sliders	G06F 1/1692

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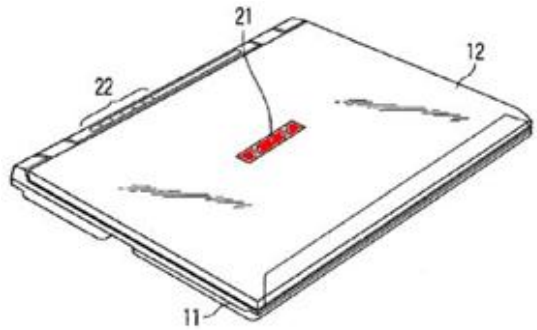
G06F 1/165

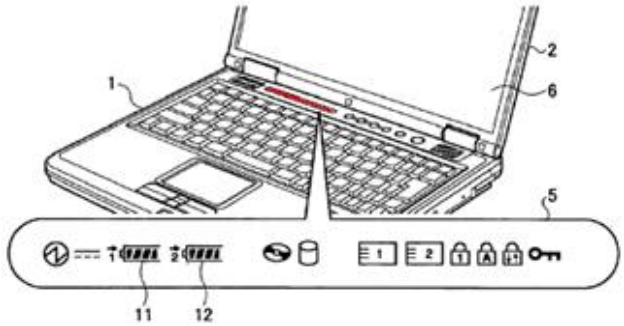
{the additional display being small, e.g. for presenting status information}

Definition statement

This place covers:

Typically very small displays disposed on the back of the main display for indicating time, alerts or battery level or small status displays near the hinge above the keyboard. Illustrative examples:





G06F 1/1652

{the display being flexible, e.g. mimicking a sheet of paper, or rollable}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Portable telephones flexible display	H04M 1/0268

G06F 1/1656

{Details related to functional adaptations of the enclosure, e.g. to provide protection against EMI, shock, water, or to host detachable peripherals like a mouse or removable expansions units like PCMCIA cards, or to provide access to internal components for maintenance or to removable storage supports like CDs or DVDs, or to mechanically mount accessories (mounting of accessories to a computer display G06F 1/1607; display hoods G06F 1/1603; cooling arrangements for portable computers G06F 1/203)}

References

Limiting references

This place does not cover:

Arrangements to protect the display from incident light, e.g. hoods	G06F 1/1603
Arrangements to support accessories mechanically attached to the display housing	G06F 1/1607
Enclosure details of non-portable computers	G06F 1/181
Cooling arrangements for portable computers	G06F 1/203

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protective covers or auxiliary enclosures for portable computers	G06F 1/1629
Protective covers or auxiliary enclosures for portable telephones	H04M 1/0203
Portable telephones with mechanically detachable modules	H04M 1/0254

G06F 1/1658

{related to the mounting of internal components, e.g. disc drive or any other functional module}

References

Limiting references

This place does not cover:

Internal mounting structures of non portable computers	G06F 1/183

G06F 1/1662

{Details related to the integrated keyboard}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of stand alone keyboards	G06F 3/0202

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Constructional details of keyboard switches	H01H 13/70
Portable telephones keypads	H04M 1/23

G06F 1/1673

{Arrangements for projecting a virtual keyboard}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digitisers	G06F 3/041
Interaction with virtual keyboards displayed on a touch sensitive surface	G06F 3/04886

G06F 1/1675

{Miscellaneous details related to the relative movement between the different enclosures or enclosure parts}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Movement typologies	G06F 1/1615
Relative motion of the body parts to change the operational status of the portable telephone	H04M 1/0241

G06F 1/1677

{for detecting open or closed state or particular intermediate positions assumed by movable parts of the enclosure, e.g. detection of display lid position with respect to main body in a laptop, detection of opening of the cover of battery compartment}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Portable telephones open/close detection	H04M 1/0245

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G06F 1/1681

{Details related solely to hinges (hinge details related to the transmission of signals or power are classified in G06F 1/1683)}

References

Limiting references

This place does not cover:

Hinge details related to the transmission of signals or power	G06F 1/1683

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hinges for doors, windows or wings	E05D 1/00 - E05D 15/00
Portable telephones hinge details	H04M 1/0216, H04M 1/0227, H04M 1/0237

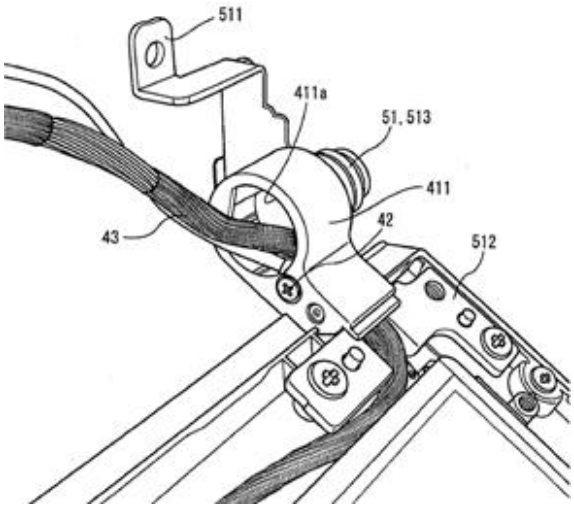
G06F 1/1683

{for the transmission of signal or power between the different housings, e.g. details of wired or wireless communication, passage of cabling}

Definition statement

This place covers:

Also optical transmission of data or inductive transmission of power between housings.



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G06F 1/1686

{the I/O peripheral being an integrated camera}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Camera details of portable telephones	H04M 1/0264

G06F 1/1688

{the I/O peripheral being integrated loudspeakers}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mounting aspects of transmitters in portable telephones	H04M 1/03
Loudspeakers	H04R 1/00

G06F 1/169

{the I/O peripheral being an integrated pointing device, e.g. trackball in the palm rest area, mini-joystick integrated between keyboard keys, touch pads or touch stripes (G06F 1/1643 takes precedence; constructional details of pointing devices G06F 3/033)}

References

Limiting references

This place does not cover:

Touchscreens	G06F 1/1643
Constructional details of pointing devices	G06F 3/033

Informative references

Attention is drawn to the following places, which may be of interest for search:

Joysticks in general	G05G 9/047
Constructional details of pointing devices in portable telephones	H04M 1/233

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G06F 1/1692

{the I/O peripheral being a secondary touch screen used as control interface, e.g. virtual buttons or sliders}

Definition statement

This place covers:

Secondary touchscreens which are used only as input device (touchpad, virtual input devices), and not for information display.

G06F 1/1694

{the I/O peripheral being a single or a set of motion sensors for pointer control or gesture input obtained by sensing movements of the portable computer}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Gestural input	G06F 3/017
Motion sensing in space for computer input	G06F 3/0346

G06F 1/1696

{the I/O peripheral being a printing or scanning device}

Definition statement

This place covers:

Scanners for e.g. A4 sheets.

References

Limiting references

This place does not cover:

Barcode readers	G06K 7/10861 , G06K 7/10821

Informative references

Attention is drawn to the following places, which may be of interest for search:

Scanners	G06K 7/10, H04N 1/00
Printers	G06K 15/00, B41J 1/00

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G06F 1/1698

{the I/O peripheral being a sending/receiving arrangement to establish a cordless communication link, e.g. radio or infrared link, integrated cellular phone (details of antennas disposed inside a computer H01Q 1/2266)}

References

Limiting references

This place does not cover:

details of antennas disposed inside a computer	H01Q 1/2266
Interaction of portable devices with video on demand or television systems	H04N 21/4126, H04N 21/41407, H04N 21/42204

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aerials	H01Q
Cordless telephones	H04M 1/725

G06F 1/18

Packaging or power distribution

Definition statement

This place covers:

Cases and housing for computers and how computer components are "packed" , i.e. mounted within the housing . It also covers arrangements, e.g. cabling, to distribute the power generated by the power supply unit to the other computer components mounted within the casing.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electric power networks; Circuit arrangements or systems for supplying or distributing electric power; Systems for storing electric energy	H02J
Casings or constructional details of electric apparatus	H05K

G06F 1/181

{Enclosures (for portable computers G06F 1/1613)}

Definition statement

This place covers:

Enclosures for computers, including constructional details of front or bezel.

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References

Limiting references

This place does not cover:

Enclosures for portable computers	G06F 1/1613

Informative references

Attention is drawn to the following places, which may be of interest for search:

Enclosures for electrical apparatuses in general	H05K 5/00

G06F 1/182

{with special features, e.g. for use in industrial environments; grounding or shielding against radio frequency interference [RFI] or electromagnetical interference [EMI]}

Definition statement

This place covers:

Enclosures for non-standard computers, e.g. industrial computers, computers specifically adapted to special environments.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Shielding against electromagnetic interference in general	H05K 9/00

G06F 1/183

Internal mounting support structures, e.g. for supporting printed circuit boards

Definition statement

This place covers:

Mounting structures for securing and/or interconnecting among them internal components within the enclosure of a computer system.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mechanical coupling between device and bus	G06F 13/409
Mounting structures for printed circuits in general	H05K 7/1422

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G06F 1/184

Mounting of motherboards

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Housings for circuits carrying a CPU and adapted to receive expansion cards	H05K 7/1429

G06F 1/185

Mounting of expansion boards

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mounting of expansion boards in general	H05K 7/1417

Special rules of classification

Used for the securing of expansion cards completely within the enclosure, and not to the connection to openings in the enclosure.

G06F 1/186

Securing of expansion boards in correspondence to slots provided at the computer enclosure

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Securing of expansion boards in general	H05K 7/1402

Special rules of classification

Used for to the connection of expansion boards to openings in the enclosure so that at least a portion, or connector, of the expansion board is accessible from outside the enclosure.

G06F 1/187

Mounting of fixed or removable disk drives

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details of disk drives housings in general	G11B 33/00

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Special rules of classification

Used for both optical drives and hard disk drives.

G06F 1/188

Mounting of power supply units

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Power supply for computers	G06F 1/26

G06F 1/20

Cooling means

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Modifications to facilitate cooling, ventilating, or heating	H05K 7/20

G06F 1/206

{comprising thermal management}

Special rules of classification

This groups refers also to documents wherein the thermal management is achieved by lowering power consumption in order to reduce heat generation..

Documents also disclosing costructional details about the managed cooling arrangement should be also classified in G06F 1/20 if describing the cooling of a desktop computer or G06F 1/203 if describing the cooling of a portable computer.

G06F 1/24

Resetting means

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Microprogramme loading	G06F 9/24
Restoration from data faults	G06F 11/00

G06F 1/26

Power supply means, e.g. regulation thereof (for memories G11C)

Definition statement

This place covers:

Power supplies for computers including:

- Power regulation;
- Power monitoring including means for acting in the event of power supply fluctuations or interruption;
- Power save.

References

Limiting references

This place does not cover:

Power supplies for memories	G11C

Informative references

Attention is drawn to the following places, which may be of interest for search:

Systems for regulating electric or magnetic variables	G05F

G06F 1/263

{Arrangements for using multiple switchable power supplies, e.g. battery and AC (G06F 1/30 takes precedence)}

Definition statement

This place covers:

Arrangements with switchable, multiple power supplies (typical example is AC and battery, but may also include multiple batteries, fuel cells or solar panels).

References

Limiting references

This place does not cover:

Means for acting in the event of power-supply failure or interruption, e.g. power-supply fluctuations	G06F 1/30

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G06F 1/266

{Arrangements to supply power to external peripherals either directly from the computer or under computer control, e.g. supply of power through the communication port, computer controlled power-strips}

Definition statement

This place covers:

Arrangements to supply power to external peripherals, either directly from the computer or under computer control (typical cases are the supply of power through a USB interface and the power strips).

G06F 1/28

Supervision thereof, e.g. detecting power-supply failure by out of limits supervision

Definition statement

This place covers:

Arrangements to monitor, and only monitoring, power supply parameters (e.g. voltage and/or current).

References

Limiting references

This place does not cover:

Means for acting in the event of power-supply failure or interruption, e.g. power-supply fluctuations	G06F 1/30, G06F 1/305

G06F 1/30

Means for acting in the event of power-supply failure or interruption, e.g. power-supply fluctuations (for resetting only G06F 1/24)

References

Limiting references

This place does not cover:

For resetting only	G06F 1/24

Informative references

Attention is drawn to the following places, which may be of interest for search:

Involving the processing of data-words	G06F 11/00

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G06F 1/32

Means for saving power

Definition statement

This place covers:

Means to save power in computers, including devices, methods and combinations of devices and method features.

G06F 1/3203

Power management, i.e. event-based initiation of a power-saving mode

Definition statement

This place covers:

Power saving obtained by switching, in relation to events of any type, between computing device operating modalities implying different power consumption levels. As opposed to power saving arrangements and/or methods of a permanent or continuous nature.

G06F 1/3206

Monitoring of events, devices or parameters that trigger a change in power modality

Definition statement

This place covers:

Power saving triggered by a certain event and/or condition detected by monitoring or supervision of e.g. hardware, communication, processing tasks.

G06F 1/3215

Monitoring of peripheral devices

Special rules of classification

Used when the peripheral monitored does not belong to any of the subgroups: G06F 1/3218, G06F 1/3221 or G06F 1/3225.

G06F 1/3228

Monitoring task completion, e.g. by use of idle timers, stop commands or wait commands

Definition statement

This place covers:

Power saving initiated when a task completion is detected (typical cases are the completion of processing tasks, e.g. programs, applications, routines).

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G06F 1/3231

Monitoring the presence, absence or movement of users

Definition statement

This place covers:

Power saving initiated when the user absence/presence is detected, e.g. through a camera and/or sensors.

Relationships with other classification places

This group is not to be used when the user absence/presence is inferred by a user inactivity period, e.g. absence of keyboard input. Subgroups referring to monitoring of peripheral devices to be used in such cases, i.e. G06F 1/3215 and subgroups.

G06F 1/3234

Power saving characterised by the action undertaken

Definition statement

This place covers:

Power saving obtained by selectively reducing power consumption of all or individual components of a computing system. Such reduction can be achieved in different ways, e.g. by lowering the clock frequency, by stopping the supply of the clock signal, by lowering the voltage, by stopping the supply of power, by task scheduling.

G06F 1/3237

by disabling clock generation or distribution

Definition statement

This place covers:

Power saving by stopping clock generation or distribution to a computer or a component.

G06F 1/3243

{Power saving in microcontroller unit}

Definition statement

This place covers:

Power saving taking place in the processing unit of the computer, intended as central processing unit (CPU), microcontroller unit (MCU), microprocessor.

G06F 1/3256

{Power saving in optical drive}

Definition statement

This place covers:

Power saving in optical (or magneto-optical) disk drives, e.g. CD, DVD, Blue-Ray, etc.

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G06F 1/3268

{Power saving in hard disk drive}

References

Limiting references

This place does not cover:

Power saving in storage systems (e.g. not in disk drives within a computer system)	G06F 3/0625

G06F 1/3287

by switching off individual functional units in the computer system

Definition statement

This place covers:

Power saving by selectively reducing power consumption of individual components of a computer system. Such reduction can be achieved in different ways, e.g. by lowering the clock frequency or stopping the clock, by lowering the voltage, by stopping the power supply (power gating).

G06F 3/00

Input arrangements for transferring data to be processed into a form capable of being handled by the computer; Output arrangements for transferring data from processing unit to output unit, e.g. interface arrangements

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Typewriters	B41J
Conversion of physical variables	F15B 5/00, G01
In regulating or control systems	G05B
Image acquisition	G06T 1/00, G06F 9/00
Coding, decoding or code conversion in general	H03M
Transmission of digital information	H04L

G06F 3/002

{Specific input/output arrangements not covered by G06F 3/01 - G06F 3/16 (other optical apparatus G02B 27/00)}

Definition statement

This place covers:

Includes inter alia arrangements in which a barcode reader is used to input data to a computer and in particular drivers for barcode or QR code readers.

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Relationships with other classification places

Recognition of data; presentation of data; record carriers; handling record carriers: G06K.

References

Limiting references

This place does not cover:

Specific input/output arrangements	G06F 3/01 - G06F 3/16
Other optical apparatus	G02B 27/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Viewers photographic printing	G03B
Electrography, magnetography	G03G
Constructional details of barcode readers	G06K 7/00
Reading of RFID record carriers	G06K 7/0008
Constructional details of RFID record carriers	G06K 19/07749
Use of barcode readers or RFIDs in data processing systems for business applications	G06Q
Wireless phone using NFC or a two-way short-range wireless interface	H04M 1/72412
Facsimile per se	H04N 1/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

TUI	a user interface in which a person interacts with digital information through a physical environment, i.e. by manipulating physical objects (e.g. in the same way as moving pieces of a game on a tablet), often using RFID or NFC.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

TUI	Tangible User Interface
RFID	Radio-Frequency Identification
NFC	Near Field Communication

G06F 3/005

{Input arrangements through a video camera}

Definition statement

This place covers:

Specific arrangements for input through a video camera, not covered by G06F 3/01 - G06F 3/16, e.g. details of the interface linking the camera to the computer.

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This group was originally meant for devices adapting analog video cameras to computer entry.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Tracking user body for computer input	G06F 3/011, G06F 3/017
Pointing device integrating a camera for tracking its own position with respect to an imaged reference surface or the surroundings	G06F 3/0304
Tracking a projected light spot generated by a light pen or a "laser pointer" indicating a position on a display surface	G06F 3/0386
Digitisers using a camera for tracking the position of objects with respect to an imaged reference surface	G06F 3/042
Recognising movements or behaviour, e.g. recognition of gestures, dynamic facial expressions; Lip-reading	G06V 40/20
Television cameras	H04N 23/00

G06F 3/007

{Digital input from or digital output to memories of the shift register type}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital input from, or digital output to, record carriers	G06F 3/06
Digital stores in which the information is moved stepwise using magnetic elements and thin films in plane structure	G11C 19/08
Digital stores in which the information is moved stepwise using semiconductor elements	G11C 19/28
Organisation of a multiplicity of shift registers	G11C 19/287

Special rules of classification

Old technology, not used anymore.

G06F 3/01

Input arrangements or combined input and output arrangements for interaction between user and computer (G06F 3/16 takes precedence)

Definition statement

This place covers:

Input arrangements, or combined input and output arrangements, for interaction between user and computer.

Particularly, said input arrangements include those based on the interaction with the human body, e.g.

- gloves for hand or finger tracking;
- eye or head trackers;

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- devices using bioelectric signals, e.g. detecting nervous activity;
- arrangements for providing computer generated force feedback in input devices.

References

Limiting references

This place does not cover:

Sound input, sound output including multimode user input, i.e. combining audio input (e.g. voice input) with other user input	G06F 3/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction techniques based on graphical user interfaces [GUI]	G06F 3/048

G06F 3/011

{Arrangements for interaction with the human body, e.g. for user immersion in virtual reality (blind teaching G09B 21/00)}

Relationships with other classification places

Diagnosis; surgery; identification: A61B

Recognition of data; presentation of data; record carriers; handling record carriers: G06K

References

Limiting references

This place does not cover:

Blind teaching	G09B 21/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring of parameters or motion of the human body or parts thereof for diagnostic purposes	A61B 5/00
For handicapped people in general	A61F 4/00
Games using an electronically generated display and player-operated input means	A63F 13/20
Robot control	B25J
Stereoscopic optical systems	G02B 30/00
Recognising human body or animal bodies	G06V 40/10
Acquiring or recognising human faces, facial parts, facial sketches, facial expressions	G06V 40/16
Tactile signalling	G08B
Virtual reality arrangements for interacting with music, including those with tactile feedback	G10H 1/00
For electrophonic musical instruments	G10H 1/344

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Electronic switches characterised by the way in which the control signals are generated	H03K 17/94

G06F 3/012

{Head tracking input arrangements}

Definition statement

This place covers:

For the scope of this group, Head-tracking is interpreted as covering face detection and tracking.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Head-tracking for image generation in head-mounted display	G02B 27/0093, G02B 27/01
Use of head-tracking for image generation	G06T 7/00, G06T 11/00
3D image generation in augmented reality	G06T 19/006
Using viewer tracking	H04N 13/366

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

HMD	Head-Mounted Display

G06F 3/013

{Eye tracking input arrangements (G06F 3/015 takes precedence)}

References

Limiting references

This place does not cover:

Input arrangements based on nervous system activity detection	G06F 3/015

Informative references

Attention is drawn to the following places, which may be of interest for search:

Apparatus for testing the eyes and instruments for examining the eyes	A61B 3/00
Instruments for determining or recording eye movement	A61B 3/113
Acquiring or recognising eyes	G06V 40/18

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "eye tracking" and "gaze tracking"

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G06F 3/014

{Hand-worn input/output arrangements, e.g. data gloves}

Definition statement

This place covers:

Also covers hand-worn keyboards

Relationships with other classification places

Manipulators; chambers provided with manipulation devices: B25J

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Finger worn arrangements for converting the position or the displacement of a member into a coded form	G06F 3/03, G06F 2203/0331

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Data glove (sometimes called a "wired glove" or "cyberglove")	an input device for human–computer interaction worn like a glove

G06F 3/015

{Input arrangements based on nervous system activity detection, e.g. brain waves [EEG] detection, electromyograms [EMG] detection, electrodermal response detection}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Detecting bioelectric signals for diagnostic purpose	A61B 5/0006, A61B 5/24
Bioelectrical control, e.g. myoelectric	A61F 2/72

G06F 3/016

{Input arrangements with force or tactile feedback as computer generated output to the user}

Definition statement

This place covers:

Dynamic force or tactile feedback arrangements. Also passive feedback arrangements but only if they are dynamically reconfigurable under computer control, e.g. buttons raised from a touchpad surface using electronic muscle or similar.

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Relationships with other classification places

- Manipulators; chambers provided with manipulation devices: B25J
- Conjoint control of vehicle sub-units of different type or different function; control systems specially adapted for hybrid vehicles; road vehicle drive control systems for purposes not related to the control of a particular sub-unit: B60W
- Systems acting by means of fluids; fluid-pressure actuators, e.g. servo-motors: F15B
- Control or regulating systems in general: G05B
- Mechanical control devices: G05G

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Passive (and non reconfigurable) feedback arrangements on a touchscreen, e.g. overlays with reliefs for indicating keys of a virtual keyboard	G06F 3/04886
Hand grip control means for manipulators	B25J 13/02
Tactile feedback for vehicle driver	B60W 50/16
Servo-motor systems giving the operating person a "feeling" of the response of the actuated device	F15B 13/14
Means for enhancing the operator's awareness of arrival of the controlling member (knob, handle) at a command or datum position; Providing feel, e.g. means for creating a counterforce	G05G 5/03
Tactile presentation of information, e.g. Braille display	G09B 21/001
Keyboards characterised by tactile feedback features	H01H 13/85
Piezoelectric actuators	H10N 30/20

G06F 3/017

{Gesture based interaction, e.g. based on a set of recognized hand gestures (interaction based on gestures traced on a digitiser G06F 3/04883)}

Definition statement

This place covers:

Gesture interaction as a sequence and/ or a combination of user movements captured using various sensing techniques such as (among others) cameras monitoring the user, arrangements for interaction with the human body, input by means of a device moved freely in 3D space or opto-electronic detection arrangements.

References

Limiting references

This place does not cover:

Gestures made on the surface of a digitiser and/or in close proximity to this surface for digitisers capable of touchless position sensing and/or measuring also the distance in the Z direction	G06F 3/04883

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for interaction with the human body	G06F 3/011
Detection arrangements using opto-electronic means	G06F 3/0304
Input by means of (pointing) device or object moved freely in 3D space	G06F 3/0346
Acquiring or recognising (static) human faces, facial parts, facial sketches, facial expressions	G06V 40/16
Recognising movements or behaviour, e.g. recognition of gestures, dynamic facial expressions; Lip-reading	G06V 40/20
Lip-reading assisted speech recognition	G10L 15/24

G06F 3/018

{Input/output arrangements for oriental characters}

Relationships with other classification places

Handling natural language data: G06F 40/00

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inputting characters	G06F 3/0233
Handling non-Latin characters, e.g. kana-to-kanji conversion	G06F 40/129
Processing of non-Latin text	G06F 40/53

G06F 3/02

Input arrangements using manually operated switches, e.g. using keyboards or dials

Definition statement

This place covers:

Input arrangements using manually operated switches, e.g. using keyboards or dials, insofar as they are stand-alone devices or integrated in a fixed computer system. Includes wired or wireless keyboards which are not mechanically linked to a portable computer.

Relationships with other classification places

- Electric switches; relays; selectors; emergency protective device: H01H
- Pulse technique: H03K

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details related to integrated keyboard of portable computers	G06F 1/1662

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Keyboard switches per se	H01H 13/70
Electronic switches characterised by the way in which the control signals are generated	H03K 17/94

G06F 3/0202

{Constructional details or processes of manufacture of the input device}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Special layout of keys	G06F 3/0219
Palm(wrist)-rests not integrated in the keyboard	A47B 21/0371
Wrist worn wrist rests	A61F 5/0118
Document holders for typewriters	B41J 29/15
Input/Output devices for watches	G04G 21/00
Details of keys/push buttons	H01H 3/12
Switches having rectilinearly-movable operating part or parts	H01H 13/00
Constructional details of keyboards having such switches	H01H 13/70
Electronic switching or gating i.e. not by contact-making or -braking	H03K 17/00
Proximity switches	H03K 17/945
Touch switches with electronic switching	H03K 17/96
Capacitive touch switches	H03K 17/962
Force resistance transducer	H03K 17/9625
Optical touch switches	H03K 17/9627
Piezoelectric touch switches	H03K 17/964
Resistive touch switches	H03K 17/9645
Keyboard, i.e. having a plurality of control members, with electronic switching	H03K 17/967
With optoelectronic devices	H03K 17/969
With magnetic movable elements	H03K 17/972
With capacitive movable elements	H03K 17/98

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

RSI	Repetitive Stress Injuries

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G06F 3/0205

{Lever arrangements for operating keyboard cursor control keys in a joystick-like manner}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Integration of a mini joystick in a portable computer	G06F 1/169
Integration of a mini joystick in a keyboard	G06F 3/0213
Details of the interface with a computer	G06F 3/038
Joysticks with a pivotable rigid stick	G05G 9/047

G06F 3/0208

{Arrangements for adjusting the tilt angle of a keyboard, e.g. pivoting legs (for keyboards integrated in a laptop computer G06F 1/1667)}

References

Limiting references

This place does not cover:

Adjusting the tilt angle of the integrated keyboard in a mobile computer	G06F 1/1667

G06F 3/021

{Arrangements integrating additional peripherals in a keyboard, e.g. card or barcode reader, optical scanner}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details of barcode readers	G06K 7/00

G06F 3/0213

{Arrangements providing an integrated pointing device in a keyboard, e.g. trackball, mini-joystick (for pointing devices integrated in a laptop computer G06F 1/169; joysticks G05G 9/047; constructional details of pointing devices G06F 3/033)}

References

Limiting references

This place does not cover:

Integration of a mini joystick in a portable computer	G06F 1/169

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Constructional details of pointing devices	G06F 3/033
Joysticks with a pivotable rigid stick	G05G 9/047

G06F 3/0216

{Arrangements for ergonomically adjusting the disposition of keys of a keyboard (for keyboards integrated in a laptop computer G06F 1/1664)}

References

Limiting references

This place does not cover:

For keyboards integrated in a laptop computer	G06F 1/1664

G06F 3/0219

{Special purpose keyboards}

Definition statement

This place covers:

Any keyboard designed or modified to control a specific software application or specific hardware, e.g. by integrating dedicated keys. Key layouts in alternative to the QWERTY standard are also classified in this group.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Devices for teaching typing	G09B 13/00

G06F 3/0221

{Arrangements for reducing keyboard size for transport or storage, e.g. foldable keyboards, keyboards with collapsible keys (G06F 3/0216 takes precedence; for keyboards integrated in a laptop computer G06F 1/1666)}

References

Limiting references

This place does not cover:

Arrangements for reducing the size of the integrated keyboard in a portable computer	G06F 1/1666
Arrangements for ergonomically adjusting the disposition of keys of a keyboard	G06F 3/0216

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G06F 3/0224

{Key guide holders}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Document holders for typewriters	B41J 29/15

G06F 3/0227

{Cooperation and interconnection of the input arrangement with other functional units of a computer (G06F 3/023 - G06F 3/037 take precedence)}

Definition statement

This place covers:

Input arrangements using manually operated switches, e.g. using keyboards or dials, further comprising cooperation and interconnection of the input arrangement with other functional units of a computer.

References

Limiting references

This place does not cover:

Arrangements for converting discrete items of information into a coded form. Arrangements for converting the position or the displacement of a member into a coded form	G06F 3/023 - G06F 3/037

Informative references

Attention is drawn to the following places, which may be of interest for search:

Keyboards integrating additional peripherals	G06F 3/021
Arrangements for converting the position or the displacement of a member into a coded form	G06F 3/03

G06F 3/023

Arrangements for converting discrete items of information into a coded form, e.g. arrangements for interpreting keyboard generated codes as alphanumeric codes, operand codes or instruction codes

Definition statement

This place covers:

Keyboard interfaces and drivers; peripherals emulating a keyboard (e.g. producing "keystroke input" signals); devices providing additional buttons or foot operated switches and connected between keyboard and PC.

Also comprises KVM switches.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Virtual keyboards displayed on a touchscreen	G06F 3/04886
Coding in connection with keyboards, i.e. coding of the position of operated keys	H03M 11/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

KVM	a KVM switch allows a user to control one or multiple computer(s) from one or multiple KVM device(s)

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

KVM	Keyboard, Video, Mouse

G06F 3/0231

{Cordless keyboards}

Definition statement

This place covers:

Constructional details related to the wireless link, e.g. position of the IR transmitter/receiver as well as protocol details for the wireless transmission of keyboard codes.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Means for saving power, monitoring of peripheral devices	G06F 1/325
Information transfer between I/O devices and CPU, e.g. on bus	G06F 13/38

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Cordless keyboards	wireless keyboards; they are also often called according to the technology used: infrared keyboard, radio keyboard, WLAN keyboard, Bluetooth® keyboard

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G06F 3/0233

{Character input methods}

Definition statement

This place covers:

Character input using a reduced number of keys, e.g. with respect to the alphabet, i.e. multivalued keys. Covers character input methods wherein a character is entered by tracing it on a matrix of switches (keys). Covers character input methods where a character is entered as a sequence of strokes on different keys or on a same key.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction with virtual keyboards displayed on a touchscreen	G06F 3/04886

G06F 3/0234

{using switches operable in different directions}

Definition statement

This place covers:

Keyboards or keypads having keys that can be operated not only vertically but also laterally to actuated separate switches associated to different key codes.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Character input using (e.g. 2 or 4 or 8) directional cursor keys for selecting characters in cooperation with displayed information	G06F 3/0236

G06F 3/0235

{using chord techniques (G06F 3/0234 takes precedence)}

Definition statement

This place covers:

Chord keyboards even if they are split in two or more parts, i.e. the predominant feature is the fact that chording is required to enter a character.

References

Limiting references

This place does not cover:

Character input using switches operable in different directions	G06F 3/0234

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Chord	only an almost simultaneous depression of several keys

G06F 3/0236

{using selection techniques to select from displayed items}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selecting from displayed items by using keys for other purposes than character input	G06F 3/0489

G06F 3/0237

{using prediction or retrieval techniques}

Definition statement

This place covers:

Character input using retrieval techniques from a database or dictionary based on previously inputted characters, e.g. for predicting and proposing word completion alternatives.

Covers inter alia T9, iTap and similar techniques.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Converting codes to words or guess-ahead of partial word inputs	G06F 40/274

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

T9 (stands for Text on 9 keys)	a predictive text input technology for mobile phones, developed by Tegic Communications
iTap	a predictive text technology for mobile phones, developed by Motorola

G06F 3/0238

{Programmable keyboards (key guide holders G06F 3/0224)}

Definition statement

This place covers:

Any keyboard in which the function assigned to all or some of the keys can be reprogrammed, e.g. changing alphabetical keys according to language, programming dedicated function keys.

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References

Limiting references

This place does not cover:

Key guide holders	G06F 3/0224

Informative references

Attention is drawn to the following places, which may be of interest for search:

Virtual keyboards on a touchscreen	G06F 3/04886
Scrambling keyboard with display keys in electronically operated locks	G07C 9/00698
Scrambling keyboard in electronically banking systems (POS,ATM)	G07F
Display on the key tops of musical instruments:	G10H
Switches with programmable display	H01H 9/181
Display on the key tops in general	H01H 2219/00
Telephone set with programmable function keys	H04M 1/2472

G06F 3/027

for insertion of the decimal point

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Display of decimal point	G06F 3/1407
Complete desk- top or hand- held calculators	G06F 15/02

G06F 3/03

Arrangements for converting the position or the displacement of a member into a coded form

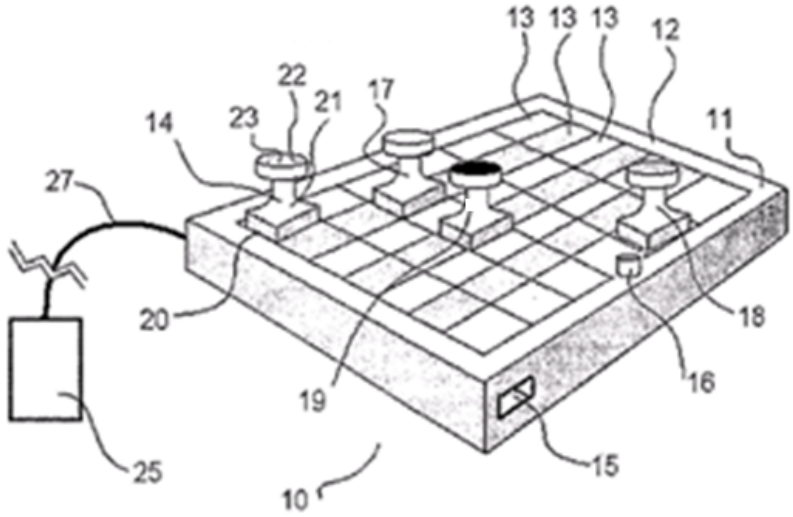
Definition statement

This place covers:

This group is used only for "exotic" input devices corresponding to the wording of the definition and not fitting in any of the subgroups, for example arrangements detecting the position or the displacement of tangible user interfaces comprising RFIDs tags or bar codes interacting with a surface (such as chessboard-like surface) where the position detection technique is not covered by any of the subgroups of G06F 3/03.

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Example:



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction with a tangible user interface other than detecting its location or displacement	G06F 3/00
Electronic game devices per se	A63F
Coordinate identification of nuclear particle tracks	G01T 5/02
Telemetry of coordinates	G08C 21/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

A Tangible User Interface (TUI)	a user interface in which a person interacts with digital information through a physical environment, i.e. by manipulating physical objects (e.g. in the same way as moving pieces of a game on a tablet), often using RFID or NFC

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

TUI	Tangible User Interface
RFID	Radio-Frequency IDentification
NFC	Near Field Communication

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G06F 3/0304

{Detection arrangements using opto-electronic means (constructional details of pointing devices not related to the detection arrangement using opto-electronic means G06F 3/033; optical digitisers G06F 3/042)}

Relationships with other classification places

If the moving part is the sensor then the subject-matter belongs to G06F 3/0304, if the observed target (e.g. finger) is moving then the subject-matter belongs to G06F 3/042.

References

Limiting references

This place does not cover:

Constructional details of pointing devices not related to the detection arrangement using opto-electronic means	G06F 3/033
Digitisers using opto-electronic means	G06F 3/042

Informative references

Attention is drawn to the following places, which may be of interest for search:

Systems where the position detection is based on the raster scan of a cathode-ray tube (CRT) with a light pen	G06F 3/037
Measuring arrangements characterised by the use of optical means	G01B 11/00
Optical encoders	G01D 5/34
Position fixing using optical waves	G01S 5/16, G01S 17/00
Prospecting or detecting by optical means	G01V 8/00
Static switches using electro-optical elements in general	H03K 17/78
Optical switches	H03K 17/941
Optical touch switches	H03K 17/9627

G06F 3/0312

{for tracking the rotation of a spherical or circular member, e.g. optical rotary encoders used in mice or trackballs using a tracking ball or in mouse scroll wheels (tracking relative movement in co-operation with a regularly or irregularly patterned surface, e.g. as in optical mice G06F 3/0317; constructional details of scroll or thumb-wheels G06F 3/0362; optical rotary encoders G01D 5/3473)}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Thumb wheel switches	H01H 19/001

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G06F 3/0317

{in co-operation with a patterned surface, e.g. absolute position or relative movement detection for an optical mouse or pen positioned with respect to a coded surface}

Definition statement

This place covers:

Tracking relative movement in co-operation with a regularly or irregularly patterned surface, e.g. arrangements for detecting relative movement of an optical mouse with respect to a generic surface optically detected as irregularly patterned (table, desk top, ordinary mouse pad) or with respect to a surface (e.g. mouse pad) encoded with an optically detectable regular pattern.

Arrangements for detecting absolute position of a member with respect to a regularly patterned surface, e.g. pen optically detecting position-indicative tags printed on a paper sheet.

G06F 3/033

Pointing devices displaced or positioned by the user {, e.g. mice, trackballs, pens or joysticks}; Accessories therefor (digitisers characterised by the transducing means G06F 3/041)

References

Limiting references

This place does not cover:

Digitisers characterised by the transducing means	G06F 3/041

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of optical sensing in input devices	G06F 3/0304
Arrangement for interfacing a joystick to a computer	G06F 3/038
Constructional details of joysticks	G05G 9/047

Special rules of classification

For finger worn pointing devices covered by this group and its subgroups add the Indexing Code G06F 2203/0331.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

RSI	Repetitive Stress Injury

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G06F 3/0338

with detection of limited linear or angular displacement of an operating part of the device from a neutral position, e.g. isotonic or isometric joysticks

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Integration of a mini joystick in a portable computer	G06F 1/169
Integration of a mini joystick in a keyboard	G06F 3/0213
Sliders, in which the moving part moves in a plane	G06F 3/03548
Details of the interface with a computer	G06F 3/038
Joysticks with a pivotable rigid stick	G05G 9/047
Switches with generally flat operating part depressible at different locations	H01H 25/041

G06F 3/0346

with detection of the device orientation or free movement in a three-dimensional [3D] space, e.g. 3D mice, 6-DOF [six degrees of freedom] pointers using gyroscopes, accelerometers or tilt-sensors

Definition statement

This place covers:

Devices sensing their own position or orientation in a three dimensional space, allowing thereby the user to input up to 6 coordinates (position + orientation) by moving the device. Covers inter alia 3D mice.

Relationships with other classification places

Remote control based on movements G08C.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

3D input gestures	G06F 3/017
Input devices using opto-electronic sensing	G06F 3/0304

G06F 3/03542

{Light pens for emitting or receiving light}

Definition statement

This place covers:

Pens detecting the presence of light on one point (such as a CRT scanning beam).

Light emitting pens positioned in contact or proximity of the pointed position.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pens comprising an optical sensor for 1 or 2 dimensional position detection	G06F 3/0304
Light emitting pointers per se used for marking with a light spot the pointed position from a distance	G06F 3/0346

G06F 3/03543

{Mice or pucks (G06F 3/03541 takes precedence)}

References

Limiting references

This place does not cover:

Mouse/trackball convertible-type devices, in which the same ball is used to track the 2-dimensional relative movement	G06F 3/03541

Special rules of classification

Specific Indexing Codes G06F 2203/0332 - G06F 2203/0337 are associated to this group for some constructional details.

G06F 3/03545

{Pens or stylus}

Definition statement

This place covers:

Pens other than optically sensing pens or light pens (e.g. for use in combination with a digitiser). Constructional details of pens in general irrespectively of the interaction technology.

Relationships with other classification places

Pens used for handwriting recognition:G06V 30/1423, G06V 10/12.

References

Limiting references

This place does not cover:

Details of optically sensing pens	G06F 3/0317
Light pens	G06F 3/03542

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G06F 3/03547

{Touch pads, in which fingers can move on a surface}

Definition statement

This place covers:

Touch surface for sensing the relative motion of a finger over the surface.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digitisers	G06F 3/041

Special rules of classification

Specific Indexing Codes G06F 2203/0338 and G06F 2203/0339 are associated to this group for some constructional details.

G06F 3/03549

{Trackballs (G06F 3/03541 takes precedence)}

References

Limiting references

This place does not cover:

Mouse/trackball convertible-type devices, in which the same ball is used to track the 2-dimensional relative movement	G06F 3/03541

G06F 3/0362

with detection of one-dimensional [1D] translations or rotations of an operating part of the device, e.g. scroll wheels, sliders, knobs, rollers or belts

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Input arrangements for vehicle instruments	B60K 35/10
Incremental encoders	G01D 5/244, G01D 5/347
Sliding switches	H01H 15/00
Rotary encoding wheels -"thumb-wheel switches"	H01H 19/001

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G06F 3/038

Control and interface arrangements therefor, e.g. drivers or device-embedded control circuitry

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control circuits or drivers for touchscreens or digitisers	G06F 3/0416
Graphical user interfaces (GUI) in general	G06F 3/048
Pointing device drivers modified to control cursor appearance or behaviour taking into account the presence of displayed objects	G06F 3/04812

G06F 3/0386

{for light pen}

Definition statement

This place covers:

Tracking a projected light spot generated by a light pen or a "laser pointer" indicating a position on a display surface, drivers for light pen systems.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Light emitting pointers per se used for marking with a light spot the pointed position from a distance	G06F 3/0346
Light emitting pens positioned in contact or proximity of the pointed position	G06F 3/03542
Light pen using the raster scan of a CRT	G06F 3/037

G06F 3/039

Accessories therefor, e.g. mouse pads

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Furniture aspects	A47B 21/00
Platforms for supporting wrists as table extension	A47B 21/0371

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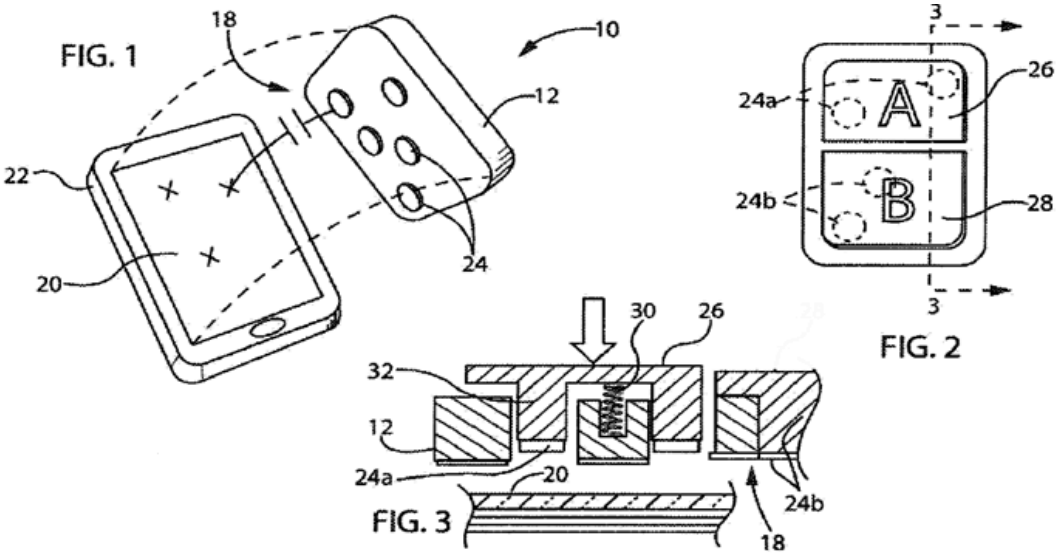
G06F 3/0393

{Accessories for touch pads or touch screens, e.g. mechanical guides added to touch screens for drawing straight lines, hard keys overlaying touch screens or touch pads}

Definition statement

This place covers:

For example:



G06F 3/041

Digitisers, e.g. for touch screens or touch pads, characterised by the transducing means

Definition statement

This place covers:

Position sensing of movable objects such as fingers or pens in contact with a surface or within a relative small distance to this surface (hovering).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Touchscreens integrated in a portable computer	G06F 1/1643, G06F 1/1692
Integration of touchpad in a portable computer (laptop, PDA)	G06F 1/169
3D input gestures	G06F 3/017
Integration of touchpad in a keyboard	G06F 3/0213
True 3D computer input devices with a freely movable member	G06F 3/0346
Pens for interaction between user and computer	G06F 3/03545

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Constructional details of touchpads	G06F 3/03547
Accessories for pointing devices	G06F 3/039
Touch interaction within a graphical user interface [GUI]	G06F 3/0488

Special rules of classification

In this area, Indexing Codes G06F 2203/04101 - G06F 2203/04114 dealing with details which may be related to different sensing technologies are used in parallel to the classification scheme.

Subgroups G06F 3/0412 and G06F 3/0416 -G06F 3/04186 are not explicit to a specific sensing technology but describe details about the integration within a display or the driving/interface of the digitiser.

For documents belonging to these subgroups, if further relevant details related to the sensing technology are disclosed, the corresponding subgroup of G06F 3/041 that is best related to the sensing technology employed should be doubly allocated as invention information.

If the sensing technology is indicated only with minor details, the sensing technology (if any) should be indicated as additional information.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Surface	either as a physical surface or as a virtual one, such as a virtual interaction plane floating in the air

G06F 3/0412

{Digitisers structurally integrated in a display}

Definition statement

This place covers:

Structural details and methods of driving a combination of displays with digitisers that share at least one constitutive part of both the touch sensing technology as well as the display technology (e.g. a common electrode for LCD control and a touch electrode (i.e. driving or sensing) for capacitive touch sensing, a common electrode being used as a guard/shield electrode in touch sensing, or a common electrode that is specifically floated during a touch driving/sensing period).

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Examples:

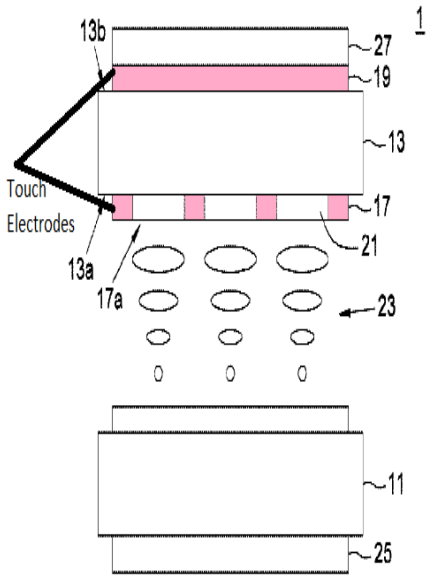


FIG. 1A

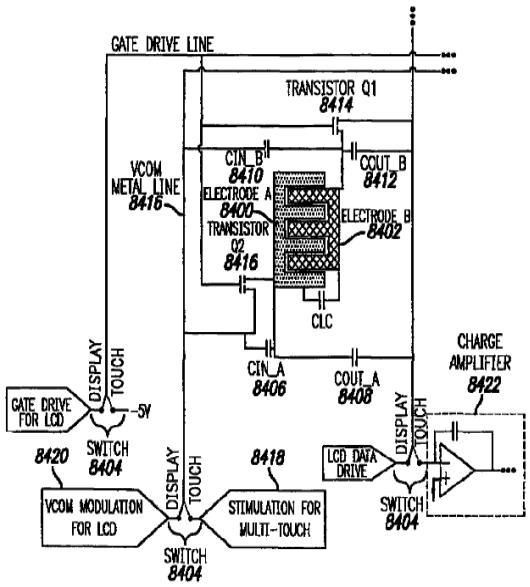


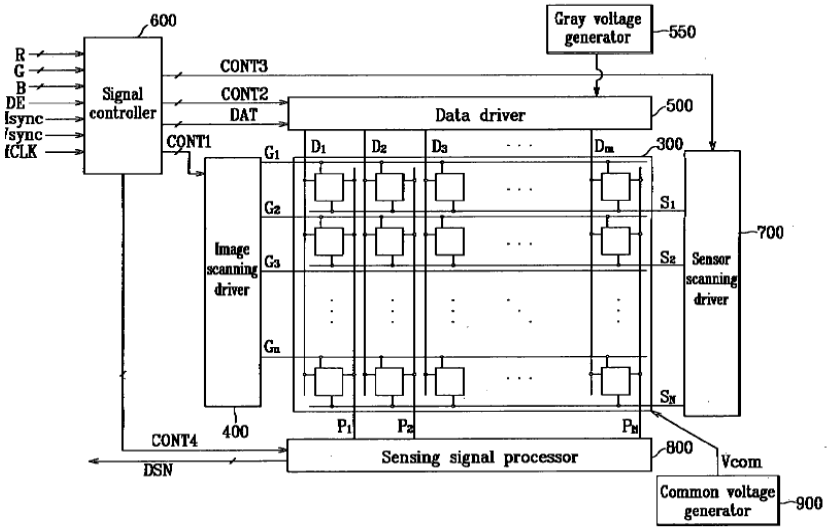
FIG. 84

Structural details and methods of driving a display and a digitizer in which the digitizer is either wholly or in part within the structural confines that make up the display panel of the display device (e.g., a sensor pixel that is adjacent to the display pixel) or the sensor is arranged to utilize at least one structural component of the display panel (e.g. such as the top substrate of the display pane).

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Examples:

FIG. 1



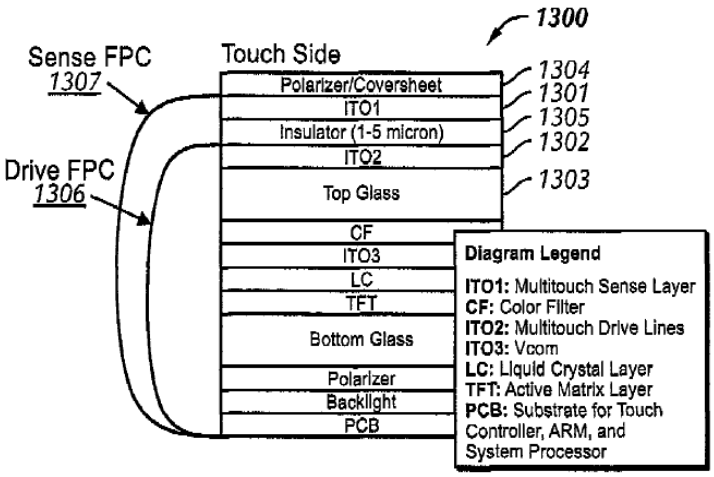
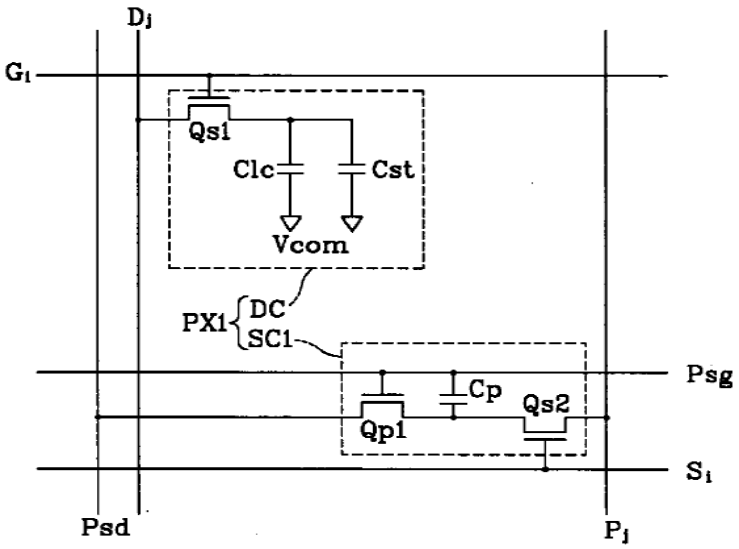


FIG. 13



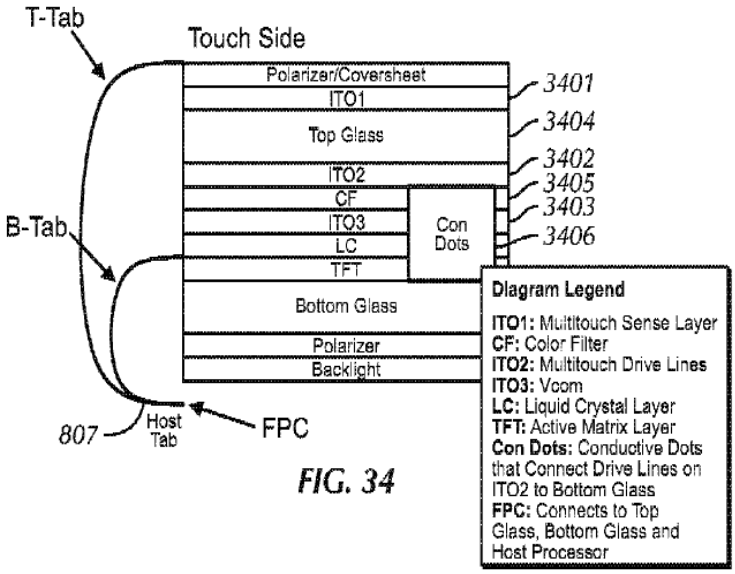


FIG. 34

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details of LCDs	G02F 1/13
Driving details of LED/OLED	G09G 3/30
Driving details of LCDs	G09G 3/36
Construction details of OLED displays	H10K 59/40

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Special rules of classification

Documents disclosing both a specific display panel (LCD, OLED etc.) and touch sensing are doubly classified in the relevant areas (for example: G02F for LCD, H10K for OLEDs, and G09G for methods of driving displays), pertaining to the respective types of display panels as well as in G06F 3/0412.

Devices in which a component is shared between touch detection circuitry and display driving circuitry, for example, a shared electrode for touch detection and display driving wherein the details of both the touch detection and the display driving are disclosed should be classified in the relevant areas either G09G (depending upon the type of display device) as well as in G06F 3/0412.

Devices in which construction details of both LCD panel and touch components are disclosed, but touch detection is only nominally disclosed should be classified only in G02F 1/13338 and only classified in G06F 3/0412 as an Additional.

Construction details of OLED display components integrated with touch detection components wherein the disclosure primarily concerns the OLED and minimally recites touch circuitry is classified in H10K 59/40 and only classified in G06F 3/0412 as an Additional.

G06F 3/0414

{using force sensing means to determine a position}

Definition statement

This place covers:

Touch position determined by the analysis of the signals provided by pressure/force sensors.

Relationships with other classification places

Measuring force or stress in general: G01L 1/00.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pressure sensors for measuring the pressure or force exerted on the touch surface without providing the touch position	G06F 2203/04105
Tactile force sensors	G01L 5/226
Force resistance touch switches	H03K 17/9625
Piezoelectric touch switches	H03K 17/964

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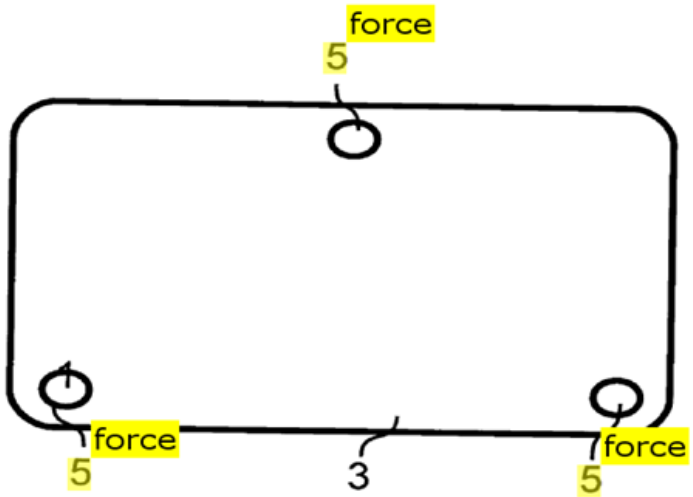
G06F 3/04142

{the force sensing means being located peripherally, e.g. disposed at the corners or at the side of a touch sensing plate}

Definition statement

This place covers:

Touch position determined by the analysis of the signals provided by a plurality (reduced number) of discrete pressure/force sensors disposed at several points of (e.g. under) the touch sensing surface, e.g. at the corners or the side of a touch sensing plate.



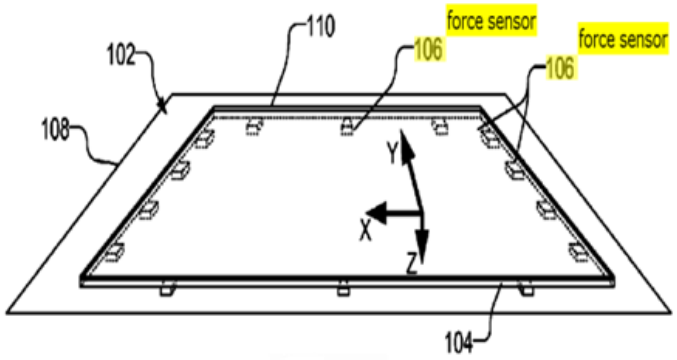
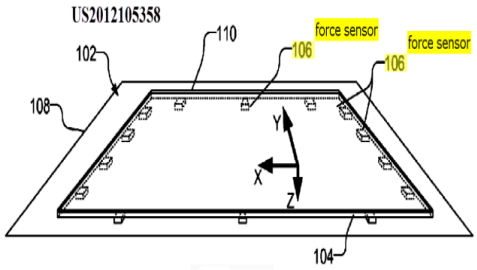


Fig.3

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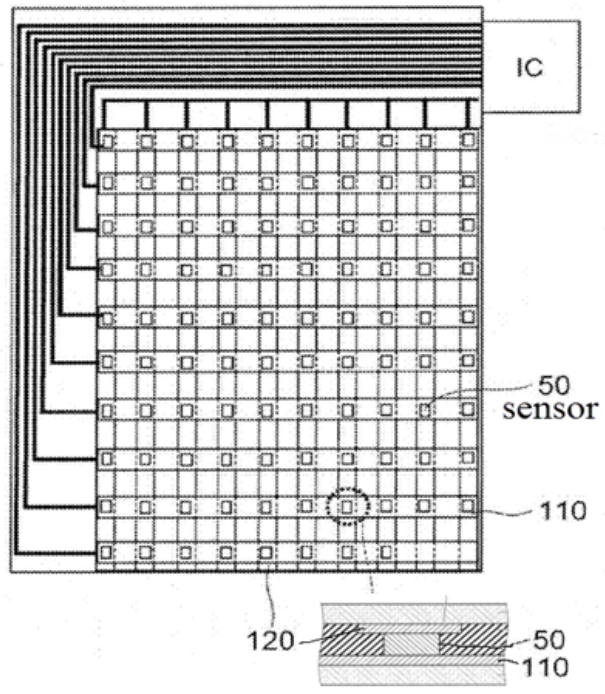
G06F 3/04144

{using an array of force sensing means (position sensing using the local deformation of sensor cells G06F 3/0447)}

Definition statement

This place covers:

Touch position determined by the analysis of the signals provided by either virtual pressure sensors generated by intersection nodes of a grid of sensing lines interacting with a pressure sensitive medium or an array of discrete pressure/force sensors delivering a variable (not a single Boolean 0/1) signal, the array extending over the whole area of the touch sensing surface, e.g. a grid of sensors disposed under the touch sensing surface.



References

Limiting references

This place does not cover:

Position sensing using the local deformation of sensor cells	G06F 3/0447

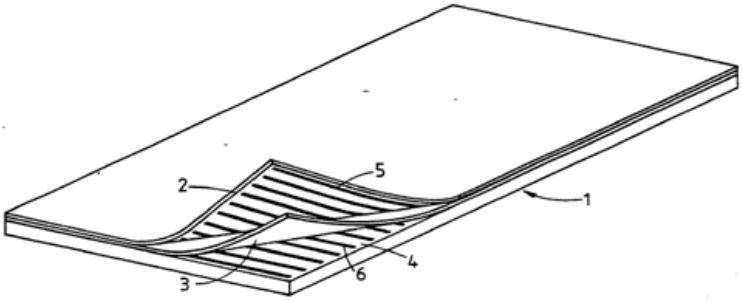
G06F 3/04146

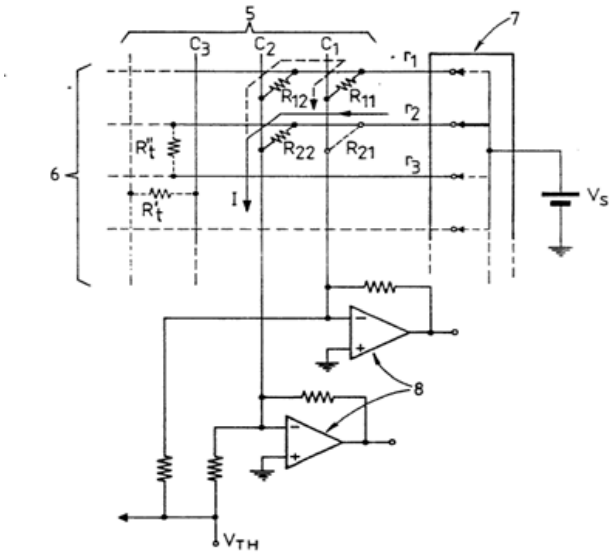
{using pressure sensitive conductive elements delivering a boolean signal and located between crossing sensing lines, e.g. located between X and Y sensing line layers}

Definition statement

This place covers:

Digitisers having a grid of crossing wires brought into virtual contact when pressure is exerted on the interaction surface, the virtual contact is established through a pressure sensitive layer disposed between the wire layers and made of a material that resistance diminishes under an applied pressure used to provide a "binary" output. The touch position is determined only by the contacting wires (scanning line and column) and not by the analog value of the sensed signal.





References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Tactile force sensors	G01L 5/226
Force resistance touch switches	H03K 17/9625
Piezoelectric touch switches	H03K 17/964

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G06F 3/0416

{Control or interface arrangements specially adapted for digitisers}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Touch interaction with a GUI	G06F 3/0488

G06F 3/04162

{for exchanging data with external devices, e.g. smart pens, via the digitiser sensing hardware}

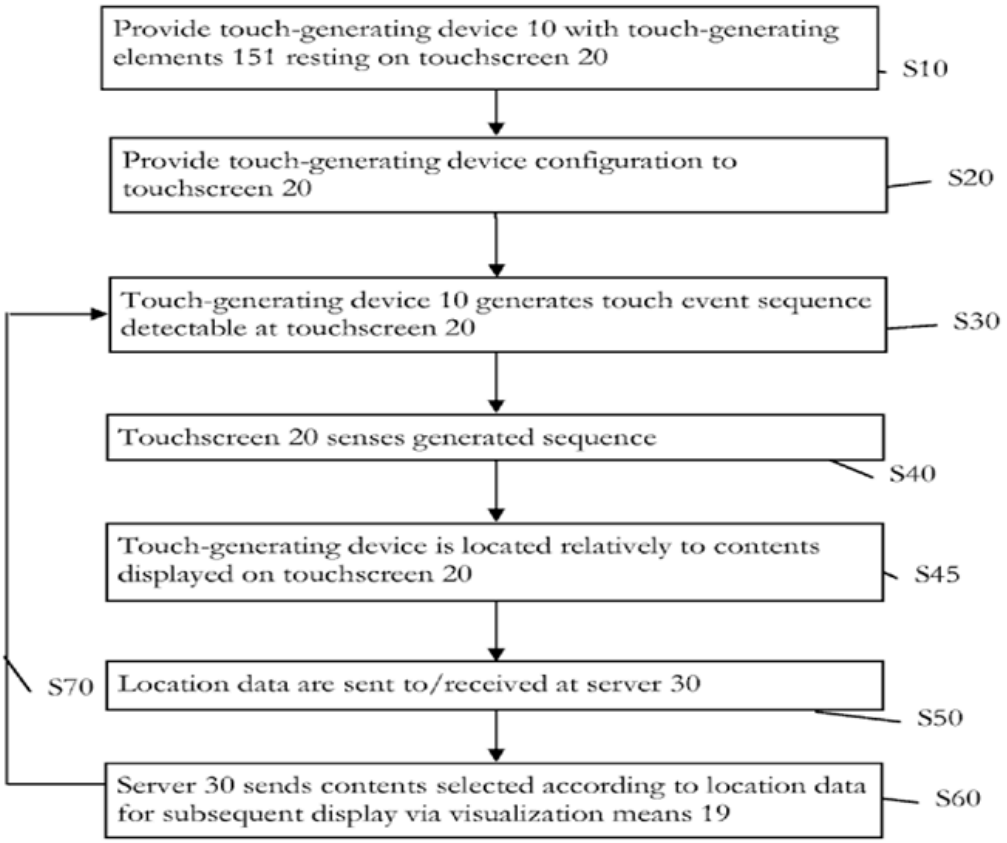
Definition statement

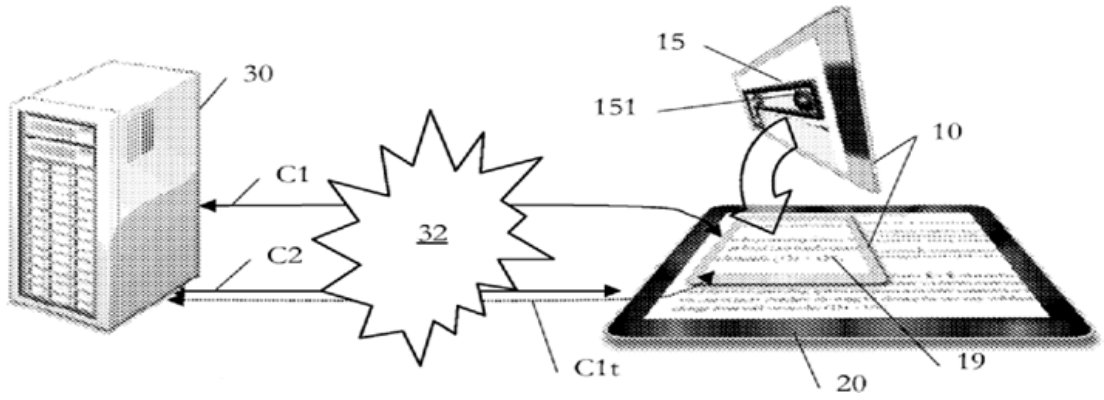
This place covers:

Digitiser control allowing exchange of data with external devices via the digitiser sensing hardware (touch sensing electrodes, touch sensing coils, etc...), including exchange of information with smart pens as long as it concerns data transmission via the touch detection hardware.

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Not for transmission of data between devices using only transmission paths other than the touch sensing hardware (e.g. wired or wireless network).





References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Remote control transmission over wireless link	G08C 17/00
Near-field transmission systems	H04B 5/00
Data switching networks	H04L 12/00
Mobile phones interface using two way short range wireless interface	H04M 1/72412

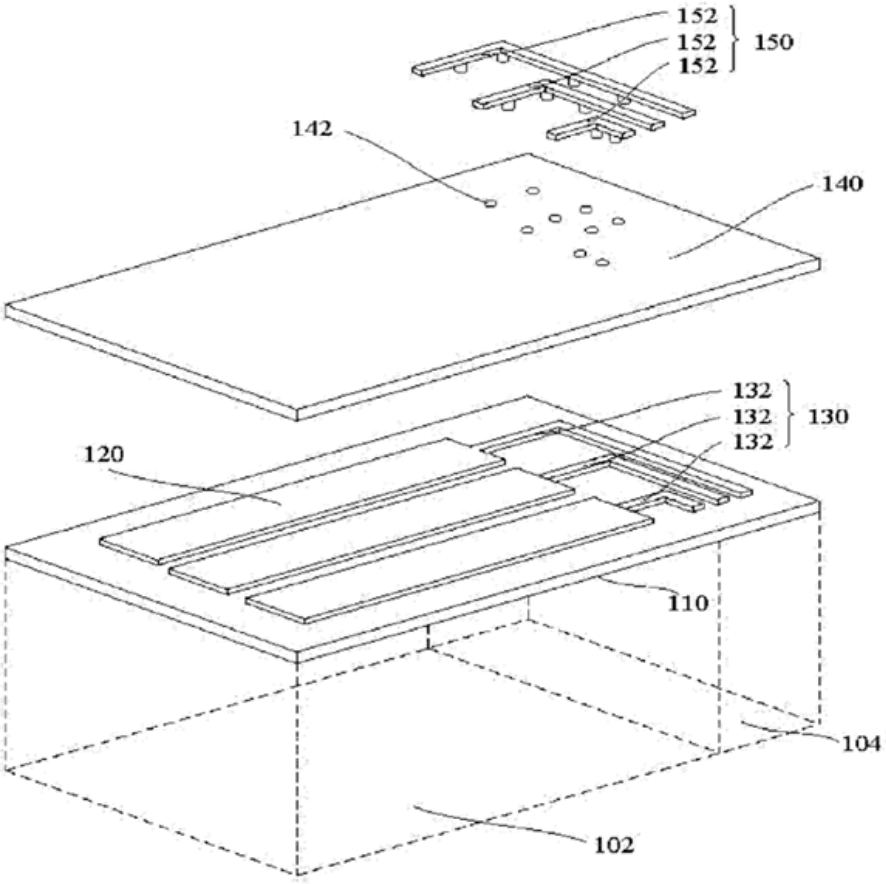
G06F 3/04164

{Connections between sensors and controllers, e.g. routing lines between electrodes and connection pads}

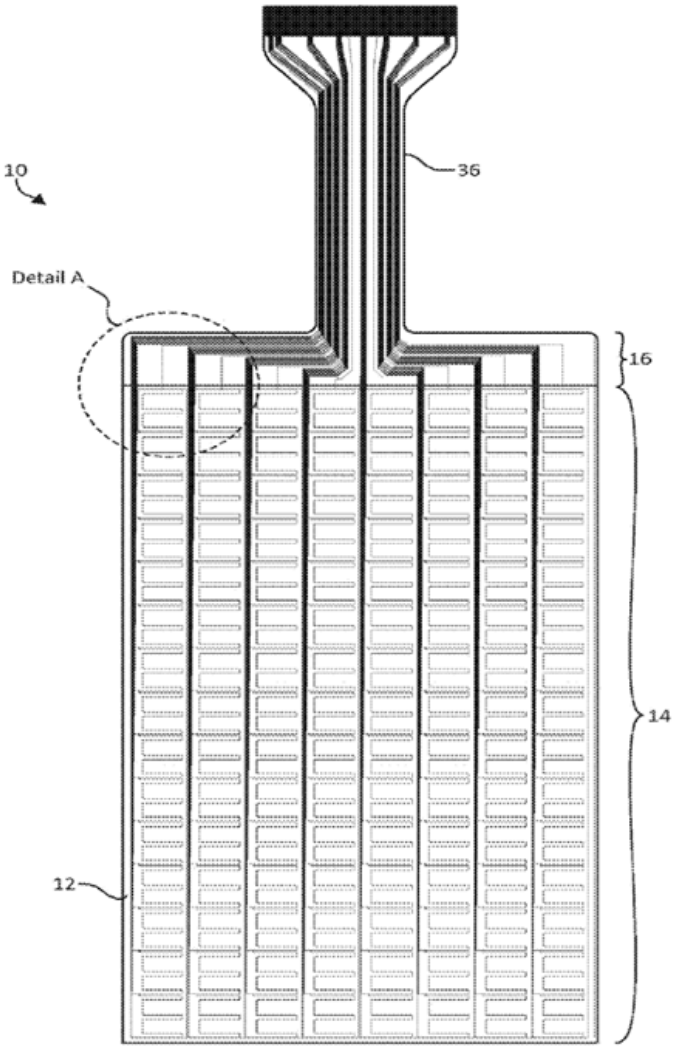
Definition statement

This place covers:

Routing between sensing electrodes and controller or connector, details on wiring and connectors.



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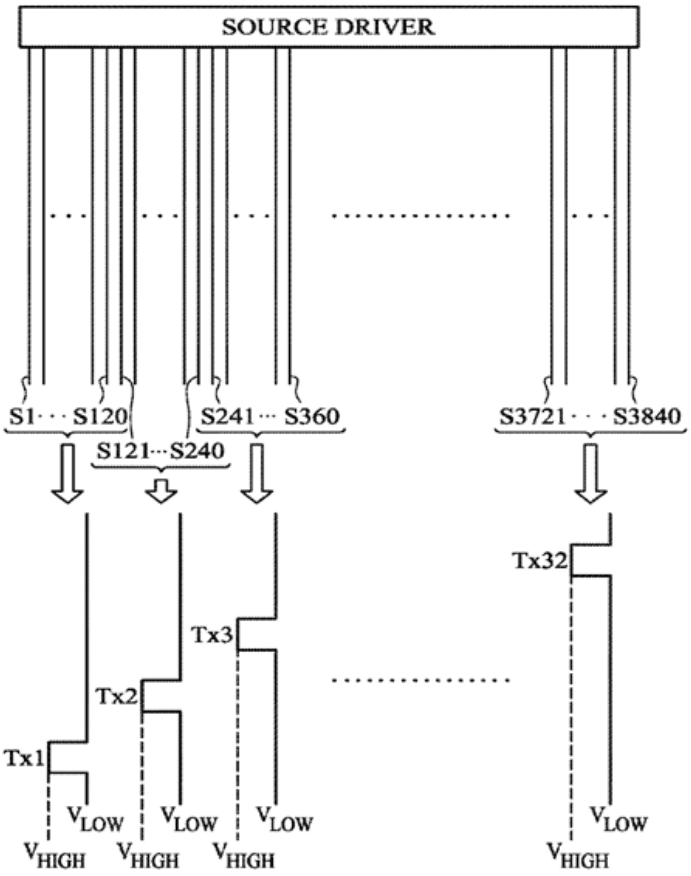
G06F 3/04166

{Details of scanning methods, e.g. sampling time, grouping of sub areas or time sharing with display driving (Synchronisation with the driving of the display or the backlighting unit to avoid interferences generated internally G06F 3/04184)}

Definition statement

This place covers:

For example grouping electrodes for changing the detection speed, resolution or sensitivity (including proximity distance), detection of multiple touches, detection of both pen and finger or, combination of multiple touch technologies.



References

Limiting references

This place does not cover:

Synchronisation with the driving of the display or the backlighting unit to avoid interferences generated internally	G06F 3/04184

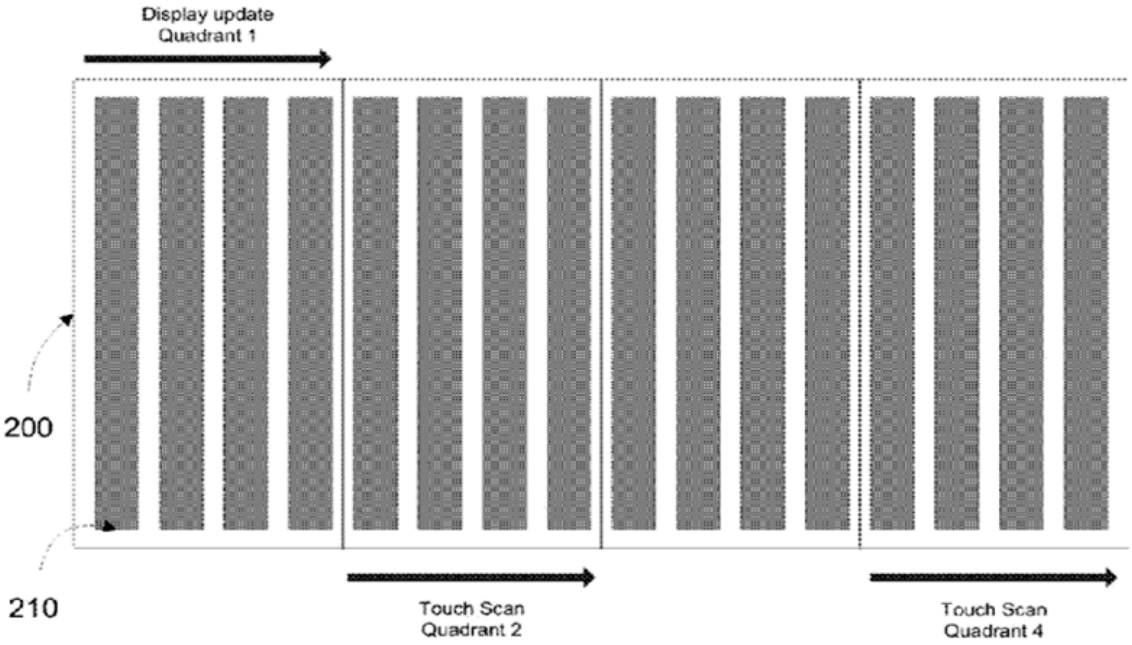
G06F 3/04184

{Synchronisation with the driving of the display or the backlighting unit to avoid interferences generated internally}

Definition statement

This place covers:

Synchronisation of the touch detection signals with the display (or backlight) driving signals whenever the digitiser is integrated in the display or not.



G06F 3/04186

{Touch location disambiguation}

Definition statement

This place covers:

Correcting or resolving an ambiguous detected touch, resulting from either

- an ambiguous touch location measured by the digitiser (e.g. correcting a detected large single touch into more than one smaller and adjacent touches, a partial touch at an edge of a digitiser into a full touch, a detected touch with an unwanted detected event like hover/palm rejection, cracks, water droplets, impurities, ghost touches, or gravity center due to tilt/angle of the input device) or
- an ambiguous interaction with a GUI on a touch screen, wherein the touch location as measured by the digitiser is unambiguous (e.g. correcting a detected touch to a user intended touch position)

Special rules of classification

Documents disclosing disambiguation of an interaction with a GUI on a touch screen, wherein the touch location as measured by the digitiser is unambiguous, should be doubly classified in G06F 3/0488 and below.

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G06F 3/042

by opto-electronic means

Relationships with other classification places

Optical scanners: G06K 7/10544.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pens detecting optically their absolute position with respect to a coded surface	G06F 3/0317
Systems where the position detection is based on the screen scanning with a light pen	G06F 3/0386, G06F 3/037
Measuring arrangements characterised by the use of optical means	G01B 11/00
Optical encoders	G01D 5/34
Position fixing using optical waves	G01S 5/16, G01S 17/00
Prospecting or detecting by optical means	G01V 8/00
Static switches using electro-optical elements in general	H03K 17/78
Optical switches	H03K 17/941
Optical touch switches	H03K 17/9627

Special rules of classification

When there is a doubt whether the subject matter belongs to G06F 3/0304 and below or to G06F 3/042 and below, the rule of thumb is: if the moving part is the sensor then it belongs to G06F 3/0304 and below, if the observed target (e.g. finger) is moving then it belongs to G06F 3/042 and below. In any case, the subclasses G06F 3/042 and below are used only in the context of interaction with a surface as defined in G06F 3/041 or in close proximity of this surface; they are not used in the context of a true 3D interactive environment.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

FTIR	Frustrated Total Internal Reflection

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G06F 3/0421

{by interrupting or reflecting a light beam, e.g. optical touch-screen}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Beam	a narrow beam emitted in a given direction, not as a bright band of light or as an omnidirectional lightening; in the context of beams propagating from one side towards receivers on the opposite side in a grid like arrangement, the beam may have a triangular (or conical) shape with a slightly broader opening angle in order to be sensed by several receivers on the opposite side but not covering the whole array of receivers.

G06F 3/0423

{using sweeping light beams, e.g. using rotating or vibrating mirror}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of moving scanning beam in optical scanners	G06K 7/10603

G06F 3/043

using propagating acoustic waves

Definition statement

This place covers:

Also documents where the acoustic wave is produced by knocking or rubbing the movable member (finger or pen) on the touch surface without any other vibration generator.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Infra/ultrasonic mechanical vibration generators	B06B 1/00
Manufacture of resonators or networks using SAW	H03H 3/08

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

SAW	Surface Acoustic Waves

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G06F 3/0433

{in which the acoustic waves are either generated by a movable member and propagated within a surface layer or propagated within a surface layer and captured by a movable member}

Definition statement

This place covers:

Position detection using pens able either to emit acoustic waves using a dedicated wave generator (e.g. piezoelectric or mechanical vibrators, ultrasound generators or sparks) or to sense the propagating waves arriving through the surface.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Documents where the movable member (finger or pen) generates the waves but has no acoustic source	G06F 3/043
Piezoelectric vibrators	H10N 30/20

G06F 3/0436

{in which generating transducers and detecting transducers are attached to a single acoustic waves transmission substrate}

Definition statement

This place covers:

Passive movable member (finger or pen) disturbing the propagating waves within the substrate.

G06F 3/044

by capacitive means

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Means for converting the output of a sensing member to another variable by varying capacitance	G01D 5/24
Capacitive proximity switches	H03K 17/955
Capacitive touch switches	H03K 17/962

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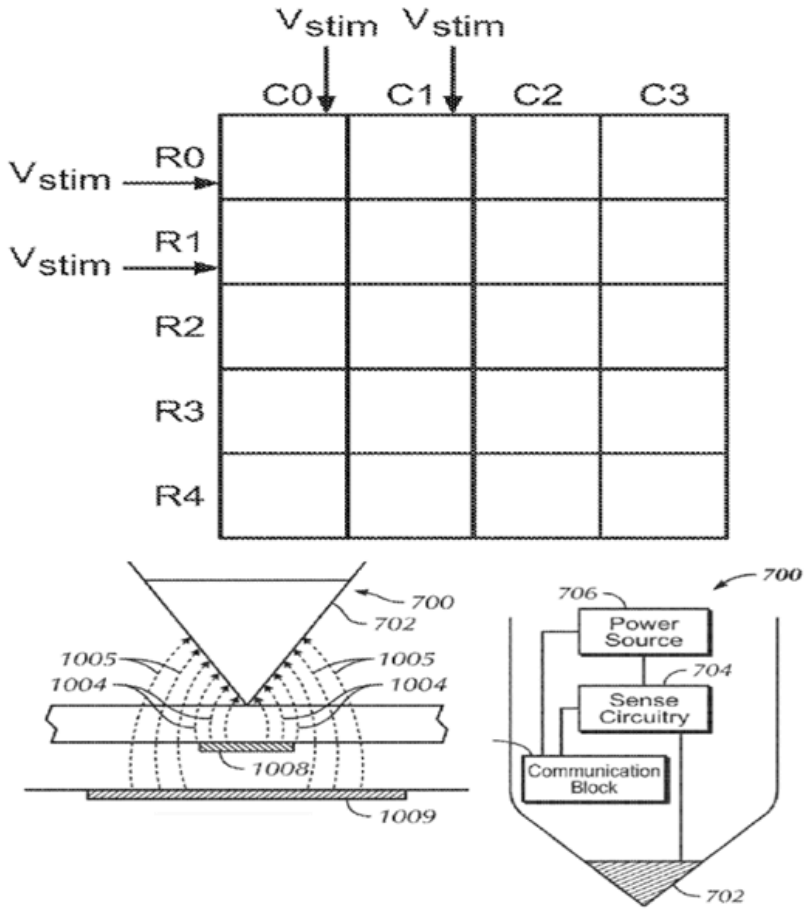
G06F 3/0441

{using active external devices, e.g. active pens, for receiving changes in electrical potential transmitted by the digitiser, e.g. tablet driving signals}

Definition statement

This place covers:

Digitisers using the capacitive coupling between the edge of a pointing pen or a similar sensing device and touch sensing conductors (electrodes) of the position sensing surface wherein the pen detects changes in electric potential of the conductors generated by the tablet (e.g. tablet driving signals); corresponding to JP FI: G06F 3/044.



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transmission of data between devices using the touch sensing hardware as transmission path	G06F 3/04162

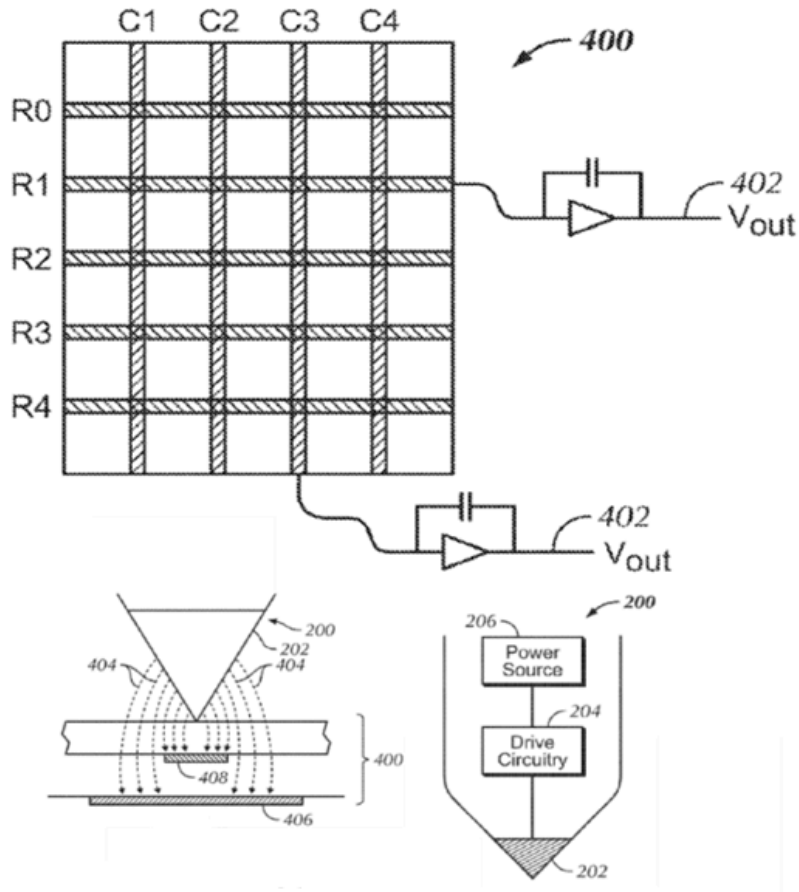
G06F 3/0442

{using active external devices, e.g. active pens, for transmitting changes in electrical potential to be received by the digitiser}

Definition statement

This place covers:

Digitisers using the capacitive coupling between the edge of a pointing pen or a similar input device and touch sensing conductors (electrodes) of the position sensing surface wherein active pens generate changes in electric potential of tablets, corresponding to JP FI: G06F 3/044.



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transmission of data between devices using the touch sensing hardware as transmission path	G06F 3/04162

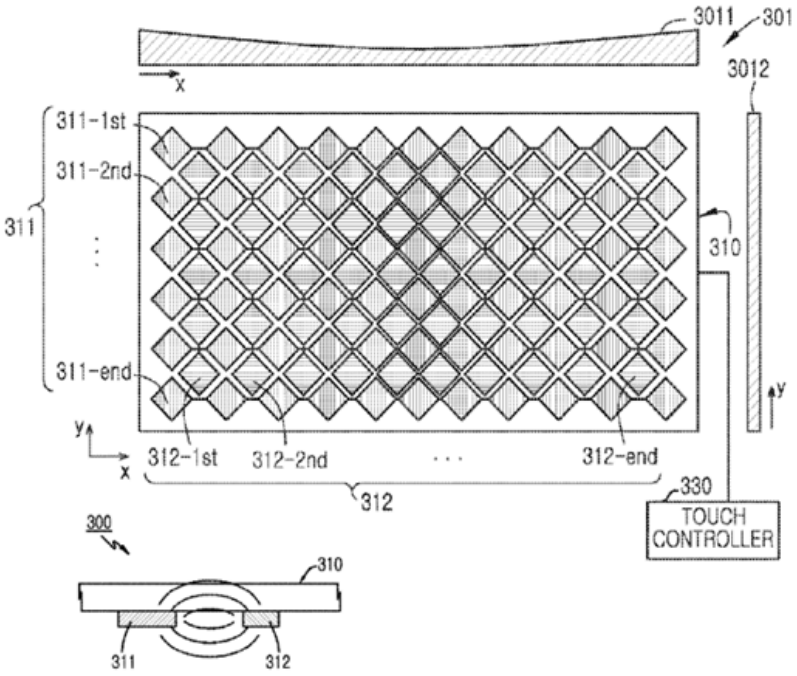
G06F 3/0443

{using a single layer of sensing electrodes}

Definition statement

This place covers:

Digitisers using a single layer of sensing electrodes, i.e. sense and/or drive electrodes. The electrodes may be interconnected by bridges at crossings. The connecting bridge may be in another layer but all the sensing electrodes are in the same one.



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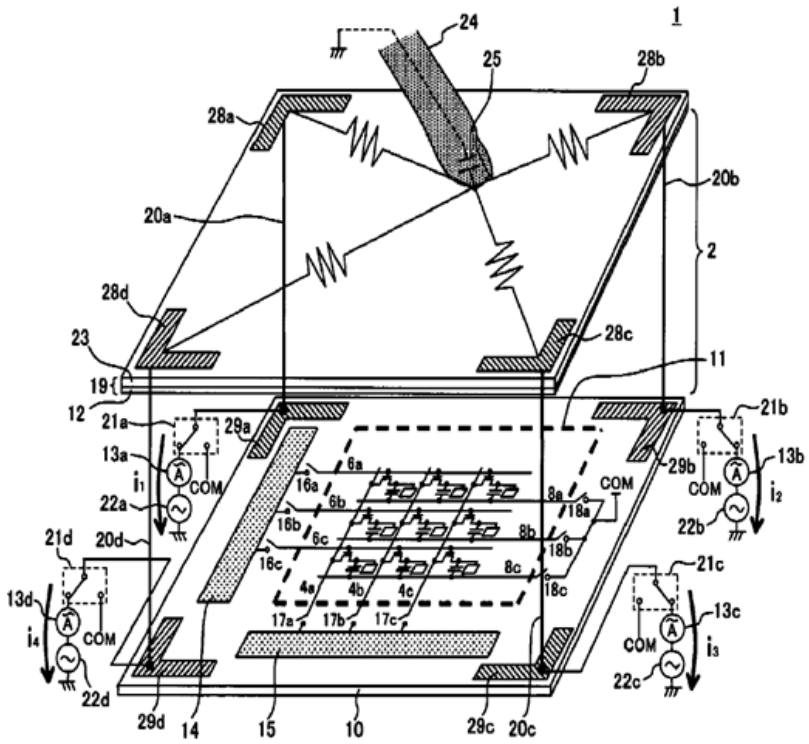
G06F 3/0444

{using a single conductive element covering the whole sensing surface, e.g. by sensing the electrical current flowing at the corners}

Definition statement

This place covers:

Digitisers using a single layer of sensing electrode which is made of a single piece of conducting material extending on the detection area and covered by a dielectric material.



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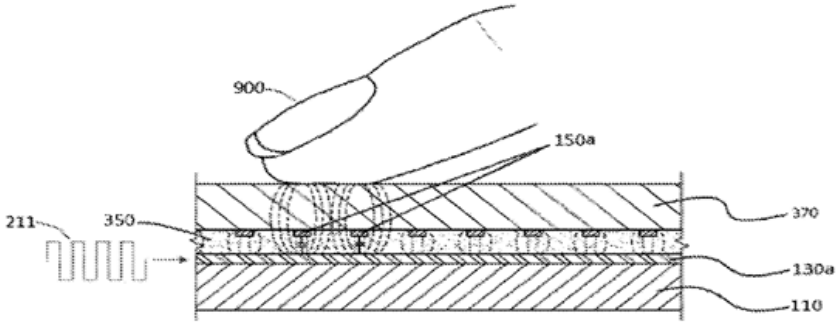
G06F 3/0445

{using two or more layers of sensing electrodes, e.g. using two layers of electrodes separated by a dielectric layer}

Definition statement

This place covers:

Digitisers using at least two layers of sensing electrodes, i.e. sense and/or drive electrodes, separated either by a solid dielectric layer or by a gap which could be filled by a dielectric material.



G06F 3/0446

{using a grid-like structure of electrodes in at least two directions, e.g. using row and column electrodes}

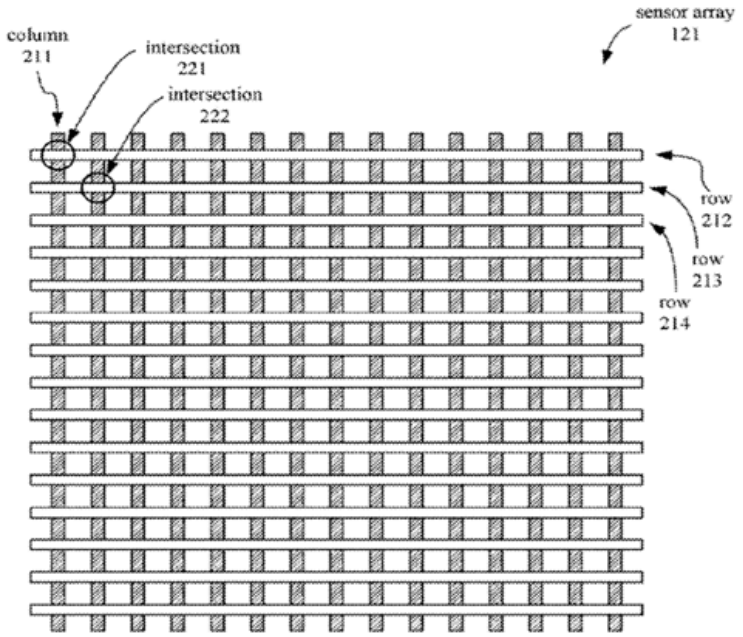
Definition statement

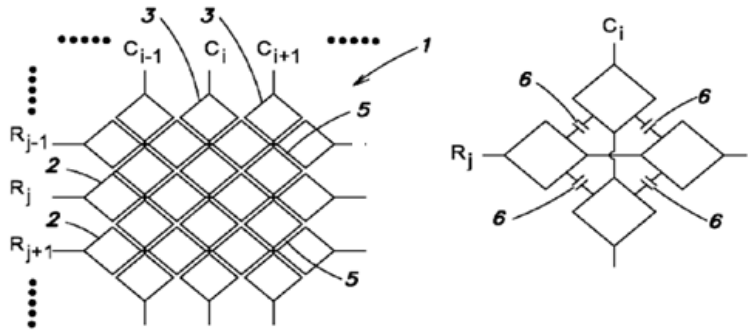
This place covers:

Digitisers comprising a plurality of sets of parallel sensing and/or driving electrodes extending in at least two crossing directions; each "row" or "column" electrode may be either a single piece electrode

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or a plurality of interconnected electrodes (e.g. via bridges over the electrodes in the crossing direction) making a virtual electrode extending along the given direction.





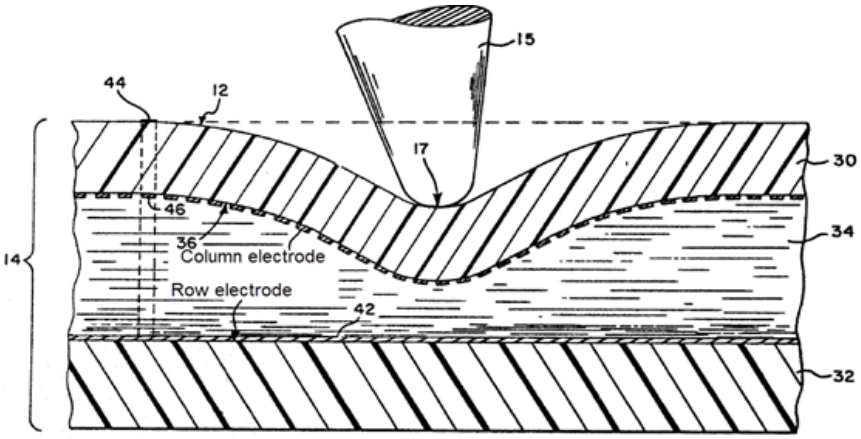
G06F 3/0447

{Position sensing using the local deformation of sensor cells}

Definition statement

This place covers:

Digitisers comprising an array of cells, e.g. made by the crossing of "row" and "column" electrodes, which are deformed under the pressure of a touching object, inducing a change in their capacitance.



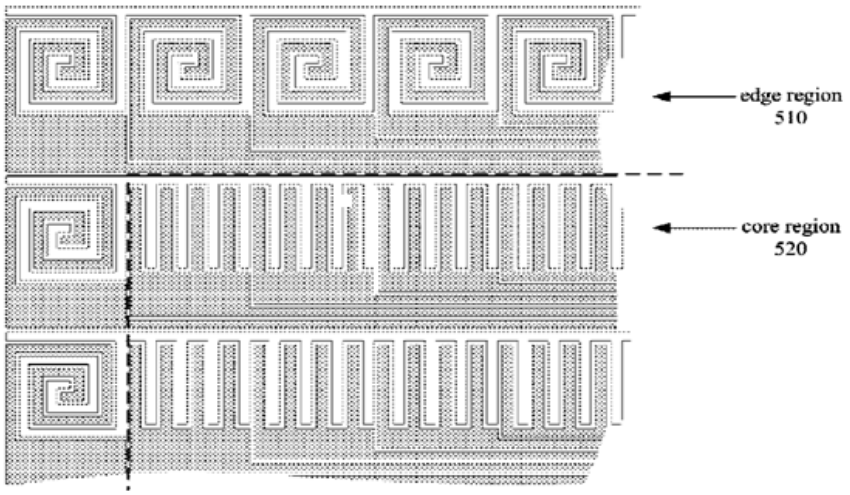
G06F 3/0448

{Details of the electrode shape, e.g. for enhancing the detection of touches, for generating specific electric field shapes, for enhancing display quality}

Definition statement

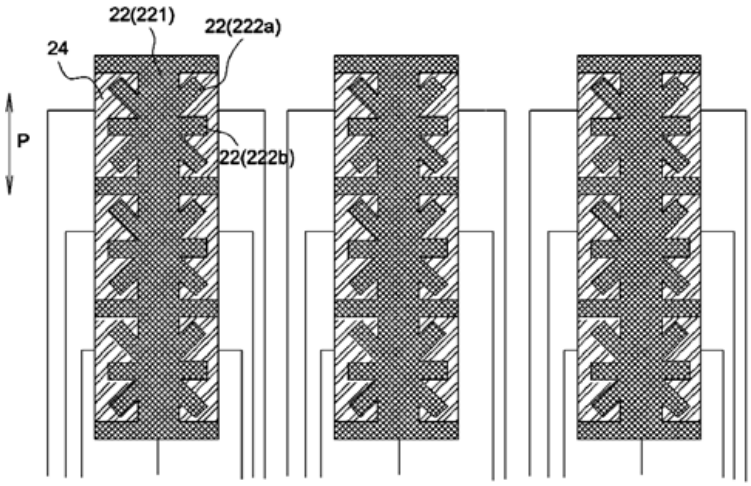
This place covers:

The electrodes have shapes optimised to obtain a specific effect, e.g. increasing fringe field, better resolution or avoiding moiré effect.



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If the electrode design or pattern exhibits an irregular or non-conventional shape without mentioning any specific effect then this symbol should be allocated as additional information.



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Touch switches	H03K 2017/9602

G06F 3/045

using resistive elements, e.g. a single continuous surface or two parallel surfaces put in contact

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Resistive potentiometers	G01D 5/165
Resistive touch switches	H03K 17/9645

G06F 3/046

by electromagnetic means

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Means for converting the output of a sensing member to another variable by varying inductance	G01D 5/20
Electromagnetic proximity switches using a magnetic detector	H03K 17/95

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G06F 3/047

using sets of wires, e.g. crossed wires

Definition statement

This place covers:

Digitisers having a grid of crossing wires brought into contact when pressure is exerted on the interaction surface. The contact may be a direct contact or through a pressure sensitive switch making a connection between the wires. It includes arrays of switches integrated in a display where a galvanic contact is established between rows and columns when the user presses the display surface.

Special rules of classification

When wires or switches are integrated in a display, G06F 3/0412 should also be used.

G06F 3/048

Interaction techniques based on graphical user interfaces [GUI]

Definition statement

This place covers:

Subject matter where the focus is on the way the user can interact with the displayed data, usually by means of pointing devices, irrespective of the type of data treated by the software application or the type of device embedding data processing capability.

As to the design of an interaction technique, this is most commonly determined by one or more of three factors, also in combination:

- the specific behaviour or appearance, of the graphical element or virtual environment;
- the kind of input events that can be generated by a specific input device used to interact with the displayed elements of the GUI;
- the type of operation or function to be performed with relation to these elements.

Relationships with other classification places

GUIs are widely used to interact with any type of software application, (e.g. operating system, word-processing or information retrieval applications, spreadsheets, etc.), executed on a general-purpose computer or on a specific device (e.g. car navigation system, telephone, photocopy machine).

Documents mentioning or implying the presence of a standard GUI in the context of the disclosure of a specific software application or a specific device capable of processing data related to its specific function, should be in general classified in the appropriate subclasses related to those software applications or specific devices.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hardware interface between computer and display	G06F 3/14
User interface programs, e.g. command shells, help systems, UIMS	G06F 9/451
Input/output arrangements of navigation systems	G01C 21/36
Program-control in industrial systems	G05B 19/00
Drawing of charts or graphs	G06T 11/26
Editing figures and text	G06T 11/60

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Control arrangements or circuits for visual displays	G09G 5/00
Display of multiple viewports	G09G 5/14
Interaction with a remote controller on a TV display	H04N 21/42204
End user interface for interactive television or video on demand	H04N 21/47

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

GUI	Graphical User Interface

G06F 3/0481

based on specific properties of the displayed interaction object or a metaphor-based environment, e.g. interaction with desktop elements like windows or icons, or assisted by a cursor's changing behaviour or appearance

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Cursor (also called (mouse) pointer)	an indicator used to show the position on a computer display that will respond to input from a text input or pointing device

G06F 3/04812

Interaction techniques based on cursor appearance or behaviour, e.g. being affected by the presence of displayed objects

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction techniques based on cursor behaviour involving tactile or force feedback	G06F 3/016
Interaction techniques for the selection of a displayed object	G06F 3/04842

G06F 3/04815

Interaction with a metaphor-based environment or interaction object displayed as three-dimensional [3D], e.g. changing the user viewpoint with respect to the environment or object

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Video games	A63F 13/00

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Navigational instruments, e.g. visual route guidance using 3D or perspective road maps (including 3D objects and buildings)	G01C 21/3635, G01C 21/3638
3D image rendering in general	G06T 15/00
Perspective computation in 3D image rendering	G06T 15/20
Navigation within 3D models or images (Walk- or flight-through a virtual museum, a virtual building, a virtual landscape etc.)	G06T 19/003

G06F 3/04817

using icons (graphical or visual programming using iconic symbols G06F 8/34)

Definition statement

This place covers:

Documents describing icons having a specific (or unconventional) design or specific properties.

References

Limiting references

This place does not cover:

Graphical programming languages using iconic symbols	G06F 8/34

G06F 3/0482

Interaction with lists of selectable items, e.g. menus

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

User interfaces specially adapted for operating a cordless or mobile telephone by selecting functions from two or more displayed items, e.g. menus or icons	H04M 1/72469
Menu-type displays in TV receivers	H04N 21/47

G06F 3/0483

Interaction with page-structured environments, e.g. book metaphor

Definition statement

This place covers:

Documents which relate to tabs.

Interaction techniques of e-books when they are heavily book-inspired.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electronic books, also known as e-books	G06F 15/02, G06F 15/0283

G06F 3/0484

for the control of specific functions or operations, e.g. selecting or manipulating an object, an image or a displayed text element, setting a parameter value or selecting a range

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Edit or processing of text	G06F 40/10

G06F 3/04842

Selection of displayed objects or displayed text elements (G06F 3/0482 takes precedence)

Definition statement

This place covers:

GUI interaction techniques specifically designed for selecting a displayed object, e.g. a window or an icon.

Selection by a pointing device (in the sense of G06F 3/03) such as a mouse, a joystick, a digitiser, etc.

References

Limiting references

This place does not cover:

Interaction with lists of selectable items, e.g. menus	G06F 3/0482

Special rules of classification

There are some older documents relating to selection by keyboard classified here. However, all new documents related to the latter are now classified in G06F 3/0489.

Every time a set of displayed of objects can be consider as structured as a "list of selectable items", the interaction technique for selecting an item should be classified in G06F 3/0482.

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G06F 3/04845

for image manipulation, e.g. dragging, rotation, expansion or change of colour

Definition statement

This place covers:

Image manipulation, e.g. dragging or rotation of the whole image, resizing of objects, changing their colour etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Image data processing or generation, in general	G06T
Editing figures and text; Combining figures or text	G06T 11/60

G06F 3/0485

Scrolling or panning

Definition statement

This place covers:

Documents dealing with panning control.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Scrolling	"Dragging" in some applications, i.e. depicting a user gesture which is not causing a motion of a previously selected object, but rather a motion of a reference within a given context.

G06F 3/0486

Drag-and-drop

Definition statement

This place covers:

Drag and drop operations comprise moving by the user a previously selected object, and finally releasing said object.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction techniques to control scrolling	G06F 3/0485

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Dragging	"Scrolling", i.e. depicting a user gesture which is not causing a motion of a previously selected object, but rather a motion of a reference within a given context.

G06F 3/0488

using a touch-screen or digitiser, e.g. input of commands through traced gestures

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details of digitisers	G06F 3/041
Details of input/output arrangements of navigation systems including use of a touch screen and gestures	G01C 21/3664

G06F 3/04883

for inputting data by handwriting, e.g. gesture or text

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

3D input gestures	G06F 3/017
Handwriting per se	G06V 30/1423
Digital ink recognition	G06V 30/32
Signature recognition	G06V 40/30

G06F 3/04886

by partitioning the display area of the touch-screen or the surface of the digitising tablet into independently controllable areas, e.g. virtual keyboards or menus

Definition statement

This place covers:

Virtual keyboards displayed on a touchscreen or as a template on a tablet.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for projecting a virtual keyboard in a portable computers	G06F 1/1673

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Character input methods like chording, prediction or disambiguation used on a keyboard	G06F 3/0233
Programmable (hardware) keyboards	G06F 3/0238
Entering handwritten data, e.g. gesture or text	G06F 3/04883
Converting codes to words or guess-ahead of partial word inputs	G06F 40/274

G06F 3/0489

using dedicated keyboard keys or combinations thereof

Definition statement

This place covers:

The use of keyboard keys dedicated to specific functions, e.g. <Scroll Lock>, <Home>, <PgUp> keys, as well as the use of specific combinations of keyboard keys, e.g. <Ctrl>+<A>, <Ctrl>+<C>, whereby the "+" means that the two keys have to be pressed together.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selecting from displayed items by using keys for character input	G06F 3/0236
Automatic teller machines (ATM)	G07F 19/20
Adjusting display parameters	G09G 5/00

G06F 3/04892

Arrangements for controlling cursor position based on codes indicative of cursor displacements from one discrete location to another, e.g. using cursor control keys associated to different directions or using the tab key (arrangements for controlling cursor position based on coordinate signals G06F 3/038)

References

Limiting references

This place does not cover:

Arrangements for controlling cursor position based on coordinate signals	G06F 3/038

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G06F 3/05

Digital input using the sampling of an analogue quantity at regular intervals of time {, input from a/d converter or output to d/a converter}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sample-and-hold arrangements	G11C 27/02
Sampling per se	H03K 17/00

G06F 3/06

Digital input from, or digital output to, record carriers {, e.g. RAID, emulated record carriers or networked record carriers}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error detection, error correction, monitoring per se regarding storage systems	G06F 11/00
Accessing or addressing within memory systems or architectures	G06F 12/00
Information retrieval	G06F 16/00
Recording or reproducing devices per se	G11B

G06F 3/0601

{Interfaces specially adapted for storage systems}

Definition statement

This place covers:

Physical and/or logical interfaces between a host or a plurality of hosts and a storage device or a plurality of storage devices or storage system related to data/command path and data placement techniques.

Storage devices include devices with rotating magnetic and optical storage media as well as solid state devices, or non-volatile electronic storage elements.

Interfaces to an emulated rotating storage device in (flash) memory.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error detection, error correction, monitoring per se	G06F 11/00
Accessing, addressing or allocation within memory systems	G06F 12/00

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Interconnection of, or transfer of information between memories, I/O devices, CPUs	G06F 13/00
File systems; file servers	G06F 16/10
Recording or reproducing devices per se	G11B 3/00 - G11B 33/00
Cryptographic protocols	H04L 9/00
Network security protocols	H04L 63/00
Protocols for real-time services in data packet switching networks	H04L 65/00
Network protocols for data switching network services	H04L 67/00

Special rules of classification

Each document should receive regarding "invention information":

- at least one classification in the range G06F 3/0602 - G06F 3/0626 for the technical effect achieved and
- at least one classification in the range G06F 3/0628 - G06F 3/0667 for the technique used and
- at least one classification in the range G06F 3/0668 - G06F 3/0689 for the infrastructure involved.

The classification of "additional information" is optional. CPC symbols in the range G06F 2206/1004 - G06F 2206/1014 should be used for classifying "additional information".

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Storage system	An integrated collection of (a.) storage controllers and/or host bus adapters, (b.) storage devices such as disks, CD-ROMs, tapes, media loaders and robots, and (c.) any required control software, that provides storage services to one or more computers

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- host
- computer
- PC
- PDA
- smartphone
- (micro)processor
- CPU
- terminal
- client

G06F 3/0605

{by facilitating the interaction with a user or administrator}

Definition statement

This place covers:

Facilitating administration like automating recurrent tasks, selecting and presenting management information to the system user or administrator.

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G06F 3/0607

{by facilitating the process of upgrading existing storage systems, e.g. for improving compatibility between host and storage device}

Definition statement

This place covers:

Facilitating administration in relation to modification of existing systems, improving compatibility and scalability.

G06F 3/0608

{Saving storage space on storage systems}

Definition statement

This place covers:

Effects leading to the reduction of the volume of data stored and the storage space requirements e.g. storage efficiency: the ratio of storage system's effective capacity to its raw capacity.

Special rules of classification

This group is often combined with the technique G06F 3/0641: data de-duplication.

G06F 3/0611

{in relation to response time}

Definition statement

This place covers:

Reducing I/O operation latency time, i.e. the time between the making of an I/O request and the completion of the request's execution.

G06F 3/0613

{in relation to throughput}

Definition statement

This place covers:

Increasing I/O operation throughput, i.e. the number of I/O requests satisfied in a given time e.g. expressed in I/O requests/second (IOPS).

G06F 3/0614

{Improving the reliability of storage systems}

Definition statement

This place covers:

Only reliability effects with a technique specific for G06F 3/06 should be classified in this subgroup range.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error detection or correction of the data by redundancy in operations	G06F 11/14
Redundancy in hardware using active fault-masking	G06F 11/20

G06F 3/0616

{in relation to life time, e.g. increasing Mean Time Between Failures [MTBF]}

Definition statement

This place covers:

Increasing the life expectancy measured in e.g. Mean Time Between Failures (MTBF)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

User address space allocation in block erasable memory:	G06F 12/0246
Auxiliary circuits for EPROMs:	G11C 16/06

Special rules of classification

The subject covered by this group is often described in relation to non-volatile semiconductor memory (arrays), which are, as peculiar storage infrastructure, also classified in G06F 3/0679 or G06F 3/0688

G06F 3/0617

{in relation to availability}

Definition statement

This place covers:

Increasing availability, i.e. the amount of time the system is available during those time periods it is expected to be available, measured in e.g. hours of downtime in a year.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error detection or correction of the data by redundancy in operations	G06F 11/14
Redundancy in hardware using active fault-masking:	G06F 11/20

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G06F 3/0619

{in relation to data integrity, e.g. data losses, bit errors}

Definition statement

This place covers:

Avoiding data to be altered or lost in operation or by accident.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Adding special bits or symbols to the coded information in memories:	G06F 11/1008
Point-in-time backing up or restoration of persistent data	G06F 11/1446
Redundancy in hardware by mirroring:	G06F 11/2056
Error detection or correction in digital recording or reproducing:	G11B 20/18

G06F 3/062

{Securing storage systems}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protecting data against unauthorised access or modification	G06F 21/60
Protecting computer components used for data storage	G06F 21/78
Arrangements for network security	H04L 63/00

G06F 3/0622

{in relation to access}

Definition statement

This place covers:

Securing storage systems by preventing unauthorised access to the storage system, e.g. with a password.

G06F 3/0623

{in relation to content}

Definition statement

This place covers:

Securing storage systems by protecting the data content, e.g. by scrambing the content.

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G06F 3/0625

{Power saving in storage systems}

Definition statement

This place covers:

Reducing the power consumption of a storage system, i.e. power efficiency.

Power saving in storage systems with a plurality of storage devices external to the computer.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Power saving in a single storage device inside a computer	G06F 1/3221
Driving, starting, stopping record carriers	G11B 19/00

Special rules of classification

This group is usually combined with the technique G06F 3/0634 (configuration or reconfiguration of storage systems by changing the state or mode of one or more devices).

This group is usually combined with the infrastructure G06F 3/0689 (disk arrays) or G06F 3/067 (distributed storage).

G06F 3/0626

{Reducing size or complexity of storage systems}

Definition statement

This place covers:

Reducing the physical size, simplifying the physical integration of storage systems

Special rules of classification

This group is often combined with G06F 3/0658 (controller construction) in order to characterise the technique for the "invention information", e.g. System On Chip (SOC) controller.

G06F 3/0628

{making use of a particular technique}

Definition statement

This place covers:

This group is the hierarchical head group for the range G06F 3/0629 - G06F 3/0667 related to particular storage techniques and is not used for classification.

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G06F 3/0629

{Configuration or reconfiguration of storage systems}

Definition statement

This place covers:

Configuration or reconfiguration aspects.

The general management of storage system features and behaviours through the control of changes made to hardware, software, firmware and related resources throughout the life cycle of the storage system.

G06F 3/0631

{by allocating resources to storage systems}

Definition statement

This place covers:

Allocating physical and/or logical storage resources, including storage elements, storage devices, appliances, virtual devices, disk volume and file resources.

Relationships with other classification places

Virtualisation techniques for the allocation of storage areas such as thin-provisioning are classified in G06F 3/0665.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Management of already existing partitions	G06F 3/0644
Allocation of resources in multiprogramming arrangements	G06F 9/50
Addressing or allocation	G06F 12/02

G06F 3/0632

{by initialisation or re-initialisation of storage systems}

Definition statement

This place covers:

- The startup and initial configuration of a storage device, system, piece of software or network.
- The process of installing or removing hardware or software components required for a system or subsystem to function.
- Assignment of the operating parameters of a system, subsystem or device, such as designating a disk array's member disks or extents and parameters such as stripe depth, RAID model, cache allowance, etc.
- The collection of a system's hardware and software components and operating parameters.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program loading or initiating	G06F 9/445

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Discovery of storage device array configuration	Assignment of the disks and operating parameters for a disk array by setting parameters such as stripe depth, RAID model, cache allowance, spare disk assignments, etc. The arrangement of disks and operating parameters that results from such an assignment.

G06F 3/0634

{by changing the state or mode of one or more devices}

Definition statement

This place covers:

Changing the operating state or mode or parameters of one or more storage devices e.g. changing the rotational speed (measured in RPM) or powering on/off or spinning up/down one or more storage devices.

Special rules of classification

This group is often assigned when there is a power saving effect mentioned see G06F 3/0625

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Massive Array of Idle Disks (MAID)	A storage system comprising an array of disk drives that are powered down individually or in groups when not required. MAID storage systems reduce the power consumed by a storage array, at the cost of increased Mean Time To Data.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

MAID	Massive Array of Idle Disks

G06F 3/0635

{by changing the path, e.g. traffic rerouting, path reconfiguration}

Definition statement

This place covers:

Changing the configuration of a storage system by changing the interconnections in between storage system components or changing the routes over which the data flows from the host to the storage device and vice versa e.g. storage switches, storage ports, routing aspects in storage systems.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Distributed storage of data in networks, e.g. transport arrangements for network file system [NFS], storage area networks [SAN] or network attached storage [NAS]	H04L 67/1097

Special rules of classification

This group is usually combined with G06F 3/0607: improving administration by facilitating the process of upgrading existing storage systems.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Access path	The combination of adapters, addresses and routes through a switching fabric used by a computer to communicate with a storage device.

G06F 3/0637

{Permissions}

Definition statement

This place covers:

Techniques related to the right of a user or host or group of users or group of hosts to access specific parts of a storage system, e.g. zoning, locking , shared access

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protecting computer components used for data storage	G06F 21/78
Access control in arrangements for network security e.g. Access Control Lists (ACL)	H04L 63/10

Special rules of classification

This group is usually combined with the effect G06F 3/0622: securing storage system in relation to access

G06F 3/0638

{Organizing or formatting or addressing of data}

Definition statement

This place covers:

Data organising, formatting or addressing, e.g. compression of data in general in a storage interface.

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Mapping aspects: conversion between two address spaces, such as the conversion between physical disk block addresses and logical disk block addresses of virtual disks presented to operating environments by control software, i.e. by using mapping tables which contain the correspondence between the two address spaces being mapped to each other.

Partitioning of storage systems, i.e. the creation of partitions.

Relationships with other classification places

- Creation of partitions in a formatted disk is classified in G06F 3/0638.
- Allocation of existing partitions is classified in G06F 3/0631.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Translation of protocol format and protocol data in a data movement	G06F 3/0661
Image compression	G06T 9/00
Audio compression	G10L 19/00
Time compression or expansion in a recording device	G11B 20/00007
Compression in general	H03M 7/30
Data compression in computer networks	H04L 69/04
Video compression	H04N 19/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Partitioning	Presentation of the usable storage capacity of a disk or array to an operating environment in the form of several virtual disks whose aggregate capacity approximates that of the underlying physical or virtual disk. Partitioning is common in MS-DOS, Windows, and UNIX environments. Partitioning is useful with hosts that cannot support the full capacity of a large disk or array as one device. It can also be useful administratively, for example, to create hard subdivisions of a large virtual disk.

G06F 3/064

{Management of blocks}

Definition statement

This place covers:

Techniques related to the management of blocks in storage systems

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Block	The unit in which data is stored and retrieved on disk and tape devices; the atomic unit of data recognition (through a preamble and block header) and protection (through a CRC or ECC).

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Block addressing	An algorithm for uniquely identifying blocks of data stored on disk or tape media by number, and then translating these numbers into physical locations on the media.

G06F 3/0641

{De-duplication techniques}

Definition statement

This place covers:

Techniques related to data de-duplication, i.e. the replacement of multiple copies of data - at variable levels of granularity - with references to a shared copy in order to save storage space and/or bandwidth.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Using de-duplication of the data stored as backup	G06F 11/1453
File systems; File servers	G06F 16/10
Compression in general	H03M 7/30

Special rules of classification

This group is usually combined with G06F 3/0608: saving storage space

G06F 3/0643

{Management of files}

Definition statement

This place covers:

Techniques related to the management of files in storage systems, e.g. low level file system aspects like File Allocation Tables (FAT)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

User address space allocation	G06F 12/0223
File systems; file servers	G06F 16/10
Processing unordered random access data using directory or table look-up	G06F 16/9017
Table of contents on record carriers (VTOC)	G11B 27/327

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G06F 3/0644

{Management of space entities, e.g. partitions, extents, pools}

Definition statement

This place covers:

Techniques related to the management of space entities in storage systems, e.g. management of partitions, extents, pools

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Creation of space entities (allocating resources to storage systems)	G06F 3/0631
User address space allocation	G06F 12/0223
File systems; File servers	G06F 16/10
Table of contents on record carriers (VTOC)	G11B 27/327
Distributed storage of data in networks, e.g. transport arrangements for network file system [NFS], storage area networks [SAN] or network attached storage [NAS]	H04L 67/1097

G06F 3/0646

{Horizontal data movement in storage systems, i.e. moving data in between storage devices or systems}

Definition statement

This place covers:

Aspects of horizontal moving of data between storage devices or systems.

G06F 3/0647

{Migration mechanisms}

Definition statement

This place covers:

Movement of data or information between information systems, formats, or media. Migration is performed for reasons such as possible decay of storage media, obsolete hardware or software (including obsolete data formats), changing performance requirements (see tiered storage), the need for cost efficiencies etc.

Special rules of classification

HSM and Tiered storage aspect are usually combined with G06F 3/0685 (hierarchical storage) in order to characterise the infrastructure.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Tiered storage	Storage that is physically partitioned into multiple distinct classes based on price, performance or other attributes. Data may be dynamically moved among classes in a tiered storage implementation based on access activity or other considerations.
Hierarchical Storage Management (HSM)	The automated migration of data objects among storage devices, usually based on inactivity. Hierarchical storage management is based on the concept of a cost-performance storage hierarchy. By accepting lower access performance (higher access times), one can store objects less expensively.

G06F 3/0649

{Lifecycle management}

Definition statement

This place covers:

Data Lifecycle Management (DLM) comprising the policies, processes, practices, services and tools used to align the business value of data with the most appropriate and cost-effective storage infrastructure from the point in time when data is created through its final disposition. Data is aligned with business requirements through management policies and service levels associated with performance, availability, recoverability, cost, etc. DLM is a subset of Information Lifecycle Management (ILM).

By automatically moving less frequently accessed objects to lower levels in the hierarchy, higher cost storage is freed for more active objects, and a better overall cost to performance ratio is achieved

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File systems; File servers	G06F 16/10
Details of archiving in file system administration	G06F 16/113
Details of hierarchical storage management (HSM) systems	G06F 16/185

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- Retention policy
- Retention time

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G06F 3/065

{Replication mechanisms}

Definition statement

This place covers:

Replication is the technique of sharing information so as to ensure consistency between redundant resources, such as software or hardware components, to improve reliability, fault-tolerance, or accessibility.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Backing up (Point in time copy), restoring or mirroring files or drives	G06F 11/1402
Redundancy in hardware by mirroring	G06F 11/2056

Special rules of classification

This group is usually combined with G06F 3/0614 (improving the reliability of storage systems) and subgroups in order to characterise the effect achieved by the replication mechanism.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- Remote copy
- Mirroring
- Snapshot

G06F 3/0652

{Erasing, e.g. deleting, data cleaning, moving of data to a wastebasket}

Definition statement

This place covers:

Erasing of data in storage systems including secure erasure.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File systems; File servers	G06F 16/10
Delete operations in file systems	G06F 16/162
Cleaning, erase control related to flash memory management	G06F 2212/7205
Clearing memory, e.g. to prevent the data from being stolen	G06F 2221/2143

Special rules of classification

This group is often combined with G06F 3/0623 (securing storage systems in relation to content) in order to characterise the effect achieved by the invention

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Data shredding	The technique of deleting data that is intended to make the data unrecoverable. One such process consists of repeated overwrites of data on disk. Data shredding is not generally held to make data completely unrecoverable in the face of modern forensic techniques—that requires shredding of the disks themselves.

G06F 3/0653

{Monitoring storage devices or systems}

Definition statement

This place covers:

Monitoring aspects related to storage interfaces, i.e. extra functionality for observing properties of a running storage device or storage system in its normal operating conditions without inputting test data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Thermal management in cooling means	G06F 1/206
Power management	G06F 1/3203
Monitoring for error detection	G06F 11/0751
Verification or detection of system hardware configuration:	G06F 11/2002
Monitoring per se of computing systems	G06F 11/34
Intrusion detection	G06F 21/566
Monitoring of control systems	G05B 23/02
Monitoring, i.e. supervising the progress of recording or reproducing	G11B 27/36
Network monitoring	H04L 43/00
Network monitoring to detect or protect against malicious traffic	H04L 63/1408
Monitoring testing in wireless networks	H04W 24/00

G06F 3/0656

{Data buffering arrangements}

Definition statement

This place covers:

Arrangements using one or more buffers whereby a buffer is a memory device or programming construct, used to hold data momentarily as it moves along an I/O path or between software components.

Typically, a solid state memory device is used as a buffer. However, any storage device with faster access properties in relation to the storage device it is buffering can be used, e.g. a disk drive can act as a buffer for a tape device.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Changing the speed of data flow, e.g. FIFO buffers per se	G06F 5/06
Partitioned buffers	G06F 5/065
Caches for peripheral storage systems, e.g. disk caches	G06F 12/0866
Detection or prevention of read or write errors by using a data buffer	G11B 19/044

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Buffer	A region of a physical memory storage used to temporarily hold data while it is being moved from one place to another. It often adjusts timing by implementing a queue algorithm in memory, simultaneously writing data into the queue at one rate and reading it at another rate.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- FIFO
- queue

G06F 3/0658

{Controller construction arrangements}

Definition statement

This place covers:

Constructional details of the storage interface not elsewhere provided for.

Physical connecting arrangements not elsewhere provided for.

Hardware arrangements of storage interface components like processors, bridges, offload engines, state machines

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Information transfer on a bus, bus structures	G06F 13/40
Disposition of constructional parts in recording /reproducing devices	G11B 33/12
Electrical connectors	H01R 13/00

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G06F 3/0659

{Command handling arrangements, e.g. command buffers, queues, command scheduling}

Definition statement

This place covers:

Techniques related to command decoding and execution and command transformation and routing including command buffering, command queuing, command scheduling

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Data buffering	G06F 3/0656

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

I/O scheduling	Term used to describe the method computer operating systems decide the order in which block I/O operations will be submitted to storage volumes.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- I/O scheduling
- disk scheduling

G06F 3/0661

{Format or protocol conversion arrangements}

Definition statement

This place covers:

Techniques related to the conversion of recording formats, e.g. conversion from Count Key Data (CKD) format from a mainframe to Fixed Block Architecture (FBA) format of an open systems computer.

Techniques related to the conversion of storage protocols; bridging hardware e.g. conversion from Small Computer System Interface (SCSI) protocol to an Advanced Technology Attachment (ATA) protocol.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Information transfer using universal interface adapter:	G06F 13/382
Coupling between buses in general using bus bridges	G06F 13/4027

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G06F 3/0662

{Virtualisation aspects}

Definition statement

This place covers:

Storage virtualisation refers to:

- The act of abstracting, hiding, or isolating the internal functions of a storage (sub)system or service from applications, host computers, or general network resources, for the purpose of enabling application and network-independent management of storage or data.
- The application of virtualisation to storage services or devices for the purpose of aggregating functions or devices, hiding complexity, or adding new capabilities to lower level storage resources.

G06F 3/0664

{at device level, e.g. emulation of a storage device or system}

Definition statement

This place covers:

Devices presented to an operating environment by control software or by a volume manager. From an application standpoint, a virtual device is equivalent to a physical one. In some implementations, virtual devices may differ from physical ones at the operating system level, e.g., booting from a host based disk array may not be possible.

Storage device emulation, e.g. disk emulation.

Storage (sub)system emulation, e. g. Virtual Tape System.

Port virtualisation on a storage network switch, storage interface virtualisation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program control for peripheral devices where the program performs an input/output emulation function	G06F 13/105

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Virtual disk	A set of disk blocks presented to an operating environment as a range of consecutively numbered logical blocks with disk-like storage and I/O semantics.
Virtual tape	A virtual device with the characteristics of a tape.

Virtual tape: a virtual device with the characteristics of a tape.

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G06F 3/0665

{at area level, e.g. provisioning of virtual or logical volumes}

Definition statement

This place covers:

Storage area virtualisation, i.e. the act of applying virtualisation to one or more area based (storage) services for the purpose of providing a new aggregated, higher level—e.g., richer, simpler, more secure—storage area service to clients.

Thin provisioning.

Dynamic allocation of logical volumes.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Thin provisioning (also, dynamic provisioning)	A technology that allocates the physical capacity of a volume or file system as applications write data, rather than preallocating all the physical capacity at the time of provisioning.

G06F 3/0667

{at data level, e.g. file, record or object virtualisation}

Definition statement

This place covers:

Object virtualisation:

- The use of virtualisation to present several underlying objects as one single composite object.
- The use of virtualisation to present an integrated object interface when object data and metadata are managed separately in the storage system.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File systems; File servers	G06F 16/10

G06F 3/0668

{adopting a particular infrastructure}

Special rules of classification

In this subrange, the physical storage infrastructure should be classified and not the virtualised infrastructure if present. If the virtualised storage infrastructure is important, this should be classified in G06F 3/0664.

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G06F 3/067

{Distributed or networked storage systems, e.g. storage area networks [SAN], network attached storage [NAS]}

Definition statement

This place covers:

Architectures comprising multiple storage systems interconnected by a network allowing access from multiple hosts with emphasis on storage related aspects.

Depicted below, an exemplary connection of storage device to a host through a network.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Distributed file systems implemented using NAS architecture	G06F 16/1824
Distributed storage of data in networks, e.g. transport arrangements for network file system [NFS], storage area networks [SAN] or network attached storage [NAS]	H04L 67/1097

G06F 3/0671

{In-line storage system}

Definition statement

This place covers:

Architectures with a direct host to storage system connection attachment.

Depicted below, an exemplary connection of storage device(s) to a host through a direct connection.



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G06F 3/0673

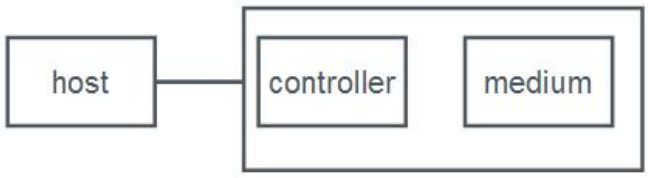
{Single storage device}

Definition statement

This place covers:

Storage systems comprising a single controller controlling one or more storage media, e.g. drums.

Depicted below, an exemplary architecture for a single storage device.



G06F 3/0674

{Disk device}

Definition statement

This place covers:

Storage devices being a spinning disk drive, i.e. a non-volatile, randomly addressable, data storage device.

G06F 3/0676

{Magnetic disk device}

Definition statement

This place covers:

Storage devices being a magnetic disk drive, e.g. HDD, DASD.

G06F 3/0677

{Optical disk device, e.g. CD-ROM, DVD}

Definition statement

This place covers:

Optical disk drives, e.g. CDROM, DVD, WORM optical disk.

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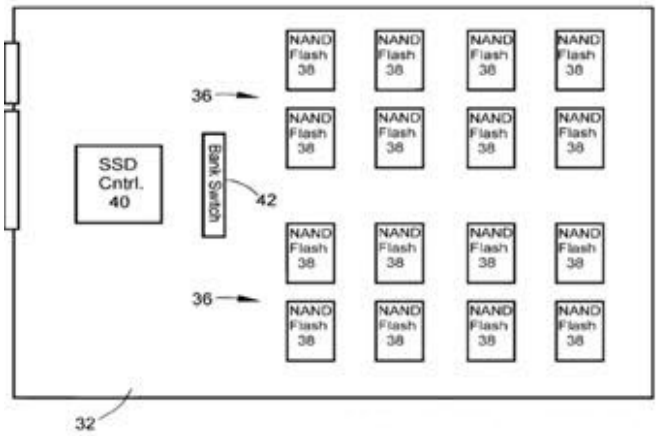
G06F 3/0679

{Non-volatile semiconductor memory device, e.g. flash memory, one time programmable memory [OTP]}

Definition statement

This place covers:

Semiconductor storage devices, e.g. SSD (solid state drive), flash memory, one time programmable memory (OTP).



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Low level flash management such as logical to physical address mapping, erase management and wear levelling	G06F 12/0246
Auxiliary circuits for EPROMs	G11C 16/06

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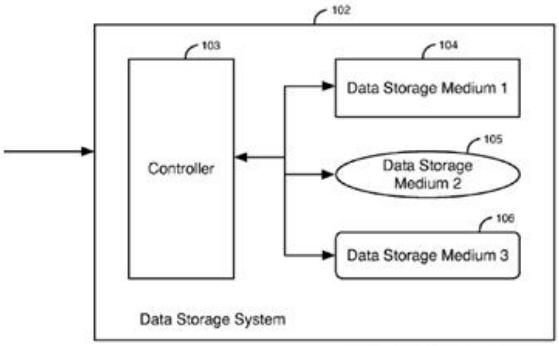
G06F 3/068

{Hybrid storage device}

Definition statement

This place covers:

Storage devices comprising a controller and multiple storage medium types, e.g. magnetic and semiconductor mediums sharing the same controller.



G06F 3/0682

{Tape device}

Definition statement

This place covers:

Storage devices being spinning tape devices, i.e. a non-volatile, serial addressable data storage device.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital recording/reproducing, formatting on tapes	G11B 20/1201

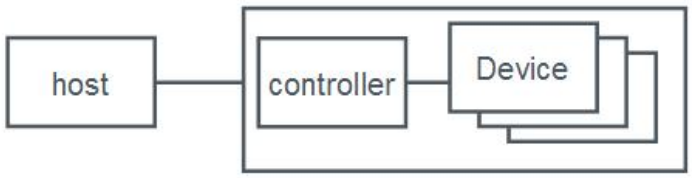
G06F 3/0683

{Plurality of storage devices}

Definition statement

This place covers:

Storage systems comprising multiple controllers and a plurality of storage devices.



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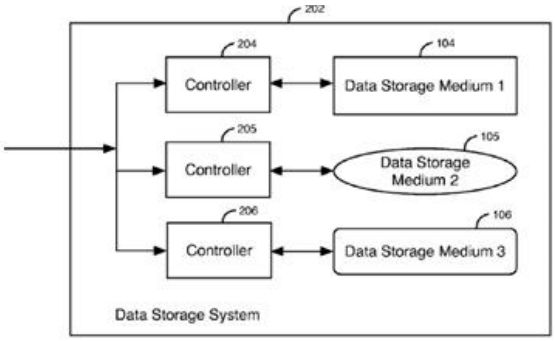
G06F 3/0685

{Hybrid storage combining heterogeneous device types, e.g. hierarchical storage, hybrid arrays}

Definition statement

This place covers:

Storage systems comprising multiple controllers and multiple storage medium types, e.g. SSD, HDD and tapes combined; FC-HDD, SATA-HDD, SCSI-HDD combined.



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

User address space allocation in block erasable memory	G06F 12/0246
Auxiliary circuits for EPROMs	G11C 16/06

G06F 3/0686

{Libraries, e.g. tape libraries, jukebox}

Definition statement

This place covers:

Storage systems providing automatic access to multiple media cartridges typically via an automatic loading robot, e.g. tape library, media changer, juke box.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Control of automated cassette changing arrangements	G11B 15/689
Control systems for magazines of disc records	G11B 17/22

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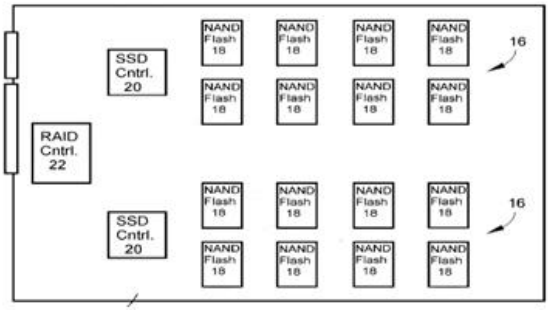
G06F 3/0688

{Non-volatile semiconductor memory arrays}

Definition statement

This place covers:

Storage systems comprising multiple controllers and multiple semiconductor storage devices.



G06F 3/0689

{Disk arrays, e.g. RAID, JBOD}

Definition statement

This place covers:

Storage systems comprising multiple controllers and multiple spinning disk drives, e.g. RAID, JBOD.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error Correction Coding (ECC) for RAID	G06F 11/1076

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

RAID	Redundant Array of Independent Disks (originally: of Inexpensive disks)
JBOD	Just a Bunch Of Drives

G06F 3/08

from or to individual record carriers, e.g. punched card {, memory card, integrated circuit [IC] card or smart card}

Definition statement

This place covers:

Interfaces between a host or a plurality of hosts and a memory card reader or a plurality of memory card readers in relation to the data/command path and data placement techniques.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Information transfer using universal interface adapter	G06F 13/382
Methods or arrangements for sensing record carriers	G06K 7/00
Memory card, integrated circuit (IC) card, smart card, record carriers for use with machines and with at least a part designed to carry digital markings	G06K 19/00
Record carriers with integrated circuit chips	G06K 19/07
Coded identity card or credit card with a coded signal	G07F 7/10
Active credit-cards provided with means to personalise their use	G07F 7/1008

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- Memory card
- Integrated Circuit (IC) card
- Smart card
- Intelligent card
- Active card

G06F 3/09

Digital output to typewriters

Definition statement

This place covers:

Old technology related to interfaces with typewriters.

Special rules of classification

Not used for classification of new documents.

G06F 3/12

Digital output to print unit {, e.g. line printer, chain printer}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital output to typewriter	G06F 3/09
Arrangements for producing a permanent visual presentation of the output data using printers	G06K 15/02

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G06F 3/1201

{Dedicated interfaces to print systems}

Definition statement

This place covers:

Interfaces between a host or a plurality of hosts and a printer device or a plurality of printer devices. Techniques for preparing the print job, sending it to a printer and printing it.

References

Limiting references

This place does not cover:

Digital output to typewriter	G06F 3/09
Controlling a printer in view of its graphical performance	B41J 29/393
Printing of alphanumeric characters	G06K 15/02
Special arrangements for scanning and reproduction of pictures, e.g. photographs, facsimile	H04N 1/00

Special rules of classification

This group contains older documents (published before the year 2000) from which the majority are not reorganised in the G06F 3/1201 and its subgroups. No new/recent documents should be classified in G06F 3/1201.

Each new document should receive regarding "invention information":

- at least one class in the sub-groups of G06F 3/1202 for the technical effect achieved;
- at least one class in the sub-groups of G06F 3/1223 for the technique used and
- optionally one class in the sub-groups of G06F 3/1278 for the infrastructure involved.

Class in G06F 3/1278 is added only if the infrastructure plays a major role in the "invention information".

The classification of "additional information" is optional.

Indexing Code symbols in the sub-groups of G06F 3/1202 and/or G06F 3/1223 and/or G06F 3/1278 and/or G06F 2206/15 should be used for classifying "additional information".

The older documents should be retrieved using Indexing Codes:

- G06F 3/1293 Printer information exchange with computer;
- G06F 3/1294 Status or feedback related to information exchange;
- G06F 3/1295 Buffering means;
- G06F 3/1296 Printer job scheduling or printer resource handling;
- G06F 3/1297 Printer code translation, conversion, emulation, compression; Configuration of printer parameters;
- G06F 3/1298 Printer language recognition, e.g. program control language, page description language.

The "additional information" can be found by combining the above Indexing Code(s) with the Indexing Code G06F 3/1201.

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Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "image forming device/apparatus", "image processing device/apparatus", "image printing device/ apparatus", "image output device/apparatus", "image control device/apparatus" and "information processing device/apparatus" and "MFP Multi-Function Printer"

G06F 3/1202

{specifically adapted to achieve a particular effect}

Special rules of classification

This group is not used for classifying documents in it, but to introduce one of the three classification criteria mentioned in the "Special rules for classification" section of G06F 3/1201.

G06F 3/1203

{Improving or facilitating administration, e.g. print management}

Definition statement

This place covers:

All general aspects of printing management which do not fit in the sub-groups.

G06F 3/1204

{resulting in reduced user or operator actions, e.g. presetting, automatic actions, using hardware token storing data}

Definition statement

This place covers:

Preventing the user or operator from / avoiding the need for doing complicated and burdensome actions related to the printing of a document.

G06F 3/1205

{resulting in increased flexibility in print job configuration, e.g. job settings, print requirements, job tickets}

Definition statement

This place covers:

Assisting or helping the user during print job configuration, e.g. increasing granularity in job configuration, achieving more customised settings, proposing suitable settings, preventing selection of incompatible or undesirable print options.

Special rules of classification

This group is usually combined with G06F 3/1253 and its sub-groups in order to characterise the technique for the "invention information".

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G06F 3/1206

{resulting in increased flexibility in input data format or job format or job type}

Definition statement

This place covers:

Assisting or helping the user to send a print job regardless of the format or type of data that should be printed. Facilitating usage of old print systems with new print systems, more specifically when compatibility between old data formats and new data formats should be achieved.

G06F 3/1207

{resulting in the user being informed about print result after a job submission}

Definition statement

This place covers:

All aspects that make the user aware of what happened with the print job after it being sent.

Special rules of classification

This group is usually combined with G06F 3/1259 and its sub-groups in order to characterise the technique for the "invention information".

G06F 3/1208

{resulting in improved quality of the output result, e.g. print layout, colours, workflows, print preview}

Definition statement

This place covers:

Assisting the user to increase the quality of print output (e.g. matching print output to what was intended by the user, increasing the appeal of the print output), e.g. by using preview screens, test printing. Actions or processing directed to higher fidelity.

Special rules of classification

This group is usually combined with G06F 3/1253 and its sub-groups in order to characterise the technique for the "invention information".

G06F 3/1209

{resulting in adapted or bridged legacy communication protocols, e.g. emulation, protocol extension}

Definition statement

This place covers:

Facilitating usage of old print systems with new print systems, more specifically when compatibility between protocols should be achieved. Modifying/enhancing legacy communication protocols to extend their use into (additional) printing environments or print-related functionality (e.g. modifying Bluetooth® to adapt to printing --> Basic Printing Profile (BPP)).

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G06F 3/121

{Facilitating exception or error detection and recovery, e.g. fault, media or consumables depleted}

Definition statement

This place covers:

Assisting or helping the user to predict or deal with faults, e.g. device faults, lack of consumables, communication errors. Recovering from faults.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error or fault reporting or storing	G06F 11/0766

G06F 3/1211

{Improving printing performance}

Definition statement

This place covers:

All aspects of making the job to be printed faster that do not fit in the sub-groups.

G06F 3/1212

{achieving reduced delay between job submission and print start}

Definition statement

This place covers:

Decreasing the time between sending a print job (e.g. pressing "print" button) and actual start of the same job at the print device.

G06F 3/1213

{at an intermediate node or at the final node}

Definition statement

This place covers:

Achieving decreasing the time at the node where the job is either temporarily stored (e.g. computer, server, printer) or actually printed (the printer).

G06F 3/1214

{at the submitting node}

Definition statement

This place covers:

Achieving decreasing the time at the node where the job is initiated from (e.g. computer, server, printer).

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G06F 3/1215

{achieving increased printing speed, i.e. reducing the time between printing start and printing end}

Definition statement

This place covers:

Decreasing the time actually spent to print the job, once printing has commenced, at the print device.

References

Limiting references

This place does not cover:

Reducing the time between arriving of the job at the printer till actual print process starts.	G06F 3/1213.

G06F 3/1217

{achieving reduced idle time at the output device or increased asset utilization}

Definition statement

This place covers:

Decreasing the time during which the printer is doing nothing.

G06F 3/1218

{Reducing or saving of used resources, e.g. avoiding waste of consumables or improving usage of hardware resources}

Definition statement

This place covers:

Saving resources of the printer used for printing a job.

G06F 3/1219

{with regard to consumables, e.g. ink, toner, paper}

Definition statement

This place covers:

Preventing waste of used consumables (see for example US2011051164).

G06F 3/122

{with regard to computing resources, e.g. memory, CPU}

Definition statement

This place covers:

Optimal usage of system's hardware resources.

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References

Limiting references

This place does not cover:

Reducing the number of required printer devices	G06F 3/1217.

G06F 3/1221

{with regard to power consumption}

Definition statement

This place covers:

Power saving; reducing energy consumption.

Special rules of classification

This group is usually combined with G06F 3/1229 and its sub-groups in order to characterise the technique for the "invention information".

G06F 3/1222

{Increasing security of the print job}

Definition statement

This place covers:

Adding secure aspects to a print job. Preventing unauthorised printing of a job, limiting the printing based on user credentials.

Special rules of classification

This group is usually combined with G06F 3/1238, G06F 3/1239 or G06F 3/1234 in order to characterise the technique for the "invention information".

G06F 3/1223

{specifically adapted to use a particular technique}

Special rules of classification

This group is not used for classifying documents in it, but to introduce one of the three classification criteria mentioned in the "Special rules for classification" section of G06F 3/1201.

G06F 3/1224

{Client or server resources management}

Definition statement

This place covers:

All aspects that deal with the software or hardware resources of the client or server which do not fit in the sub-groups (see e.g. US2011013223, US2009007151).

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G06F 3/1225

{Software update, e.g. print driver, modules, plug-ins, fonts}

Definition statement

This place covers:

Updating or installing printer drivers on the client or server. Adding additional functionality to existing printer drivers (e.g. installing plug-ins, downloading printer definition files). Support for newly installed printers by replacing/updating existing drivers.

G06F 3/1226

{Discovery of devices having required properties}

Definition statement

This place covers:

The client or the server sends requests to find suitable printers for printing based on certain requirements, e.g. colour, double side printing, finishing options, status, location, supported encryption, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Device discovery specifically adapted for a queued job and aiming at e.g. load balancing or optimised printing	G06F 3/126
Network management	H04L 41/00
For service discovery	H04L 61/4541
Network services	H04L 67/50
Network applications for service discovery	H04L 67/51

G06F 3/1227

{Printer definition files}

Definition statement

This place covers:

Printer properties and commands to invoke/execute the printing properties are described in a separate file and can be used by an application program to convert a print job according to certain printer properties without a printer driver. The file can be used by the printer driver as well, e.g. for supporting different printers (see e.g. "Service Item File" in US6897974).

References

Limiting references

This place does not cover:

Driverless printing	G06F 3/1228

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G06F 3/1228

{Printing driverless or using generic drivers}

Definition statement

This place covers:

Specific printer drivers are not used but also printer definition files are not used. Usually a thin client with limited resources is involved. Generic drivers normally are designed to support plurality of different types/models of printers and/or different operating systems.

G06F 3/1229

{Printer resources management or printer maintenance, e.g. device status, power levels}

Definition statement

This place covers:

Device status when checked only in relation to printing of a job - power-level (e.g. on, off, power saving mode), operating or not, reasons for the malfunctions. Logging of device status. All aspects for managing the device which do not fit in the sub-groups.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Print job status	G06F 3/1259
Network management	H04L 41/00
for service discovery	H04L 61/4541
Network services	H04L 67/50
Network applications for service discovery	H04L 67/51

G06F 3/123

{Software or firmware update, e.g. device firmware management}

Definition statement

This place covers:

Downloading or updating of printer's firmware. Installing new software for supporting newly added hardware or additional functions (e.g. image processing functions, resident fonts, support for new data formats).

G06F 3/1231

{Device related settings, e.g. IP address, Name, Identification}

Definition statement

This place covers:

Update or initialisation of the printer specific properties - IP address, Device name (see e.g. EP1372059, US2005151988).

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References

Limiting references

This place does not cover:

Printer device capabilities	G06F 3/1232

G06F 3/1232

{Transmitting printer device capabilities, e.g. upon request or periodically}

Definition statement

This place covers:

Transmitting to the requestor printing device capabilities, e.g. double side printing, finishing options, dpi, colour or b/w, ppm (see e.g. EP1435565, EP1178393).

References

Limiting references

This place does not cover:

Printer device properties/settings, not related to printing capabilities, i.e. IP address. This aspect is covered in	G06F 3/1231.

G06F 3/1234

{Errors handling and recovery, e.g. reprinting (G06F 3/1261 takes precedence)}

Definition statement

This place covers:

How to handle received jobs or the job currently being printed in case of error, e.g. reprint only the portion that was not printed, reprint the full job, delete the job and ask the host to send it again.

References

Limiting references

This place does not cover:

Alternate printer taking over the job from the failed device.	G06F 3/1261.

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error or fault reporting or storing	G06F 11/0766

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G06F 3/1235

{caused by end of consumables, e.g. paper, ink, toner}

Definition statement

This place covers:

Specific aspects for recovering from errors caused by end of consumables - paper, ink, toner.

G06F 3/1236

{Connection management}

Definition statement

This place covers:

All aspects relating to connection between devices - client<->printer, server<->printer, printer<->printer. (see e.g. US2011019231 or US2011019231).

G06F 3/1237

{Print job management}

Definition statement

This place covers:

General aspects of job management that do no fit in the sub-groups.

References

Limiting references

This place does not cover:

Print device management	G06F 3/1229

G06F 3/1238

{Secure printing, e.g. user identification, user rights for device usage, unallowed content, blanking portions or fields of a page, releasing held jobs}

Definition statement

This place covers:

Based on user/content credentials allowing/disabling usage of the printer as a whole.

References

Limiting references

This place does not cover:

Virus detection and handling.	G06F 21/56

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G06F 3/1239

{Restricting the usage of resources, e.g. usage or user levels, credit limit, consumables, special fonts}

Definition statement

This place covers:

Limiting the use of printing as such (e.g. credit limit) or limiting the use of printers (e.g. time the printer can be used, e.g. only 1 hour a day, only after 17:00). Restricting configuration options, e.g. to plain paper, to black ink only, double-sided or n-up printing, lower resolution, limited image effects.

Special rules of classification

This group is usually combined with G06F 3/1219 or G06F 3/122 in order to characterise the effect achieved by the "invention information".

G06F 3/124

{Parallel printing or parallel ripping}

Definition statement

This place covers:

Printing or ripping several portions of a job at the same time.

Special rules of classification

This group is usually combined with G06F 3/1215 in order to characterise the effect achieved by the "invention information".

G06F 3/1241

{Dividing a job according to job requirements, e.g. black/white and colour pages, covers and body of books, tabs}

Definition statement

This place covers:

Print job is divided and different parts are sent to different devices having different properties.

References

Limiting references

This place does not cover:

Dividing for parallel printing	G06F 3/124

G06F 3/1242

{Image or content composition onto a page}

Definition statement

This place covers:

Composing or overlaying content from different sources, e.g. different documents, onto a page.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

2D [Two Dimensional] image generation	G06T 11/60
Image acquisition	G06V 10/10

G06F 3/1243

{Variable data printing, e.g. document forms, templates, labels, coupons, advertisements, logos, watermarks, transactional printing, fixed content versioning}

Definition statement

This place covers:

Print data for a page is generated by combining two sets of content (such as text, graphics and images), one set being constant from page to page (fixed content) and the other set being different (variable content) for every page. The combining of fixed and variable data may take place at any step in a print workflow.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Document retrieval systems	G06F 16/93
Editing, e.g. inserting or deleting	G06F 40/166

G06F 3/1244

{Job translation or job parsing, e.g. page banding}

Definition statement

This place covers:

All aspects of transforming the print job in order to be printed which do not fit in the sub-groups, e.g. parsing in order to eliminate repetitive data, colour transformation, font transformation.

G06F 3/1245

{by conversion to intermediate or common format}

Definition statement

This place covers:

Conversion or translation of the initial document or print job to a format which is not yet ready to be handled by a target printer but is useful for certain manipulation, e.g. faster to transmit, more efficient to store, easy to secure. Conversion or translation to a format which, although it could be suitable to certain printers, may not be suitable for the target printer (e.g. converting to a print format before target printer is known).

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G06F 3/1246

{by handling markup languages, e.g. XSL, XML, HTML}

Definition statement

This place covers:

Parsing of print jobs written in one of the mark-up languages.

G06F 3/1247

{by conversion to printer ready format}

Definition statement

This place covers:

Conversion or translation of the initial print job (or the job in an intermediate format) to a format which is ready to be handled by the target printer.

G06F 3/1248

{by printer language recognition, e.g. PDL, PCL, PDF}

Definition statement

This place covers:

Parsing of the job in order to find a certain mark (or keyword) that identify the language of the job.

G06F 3/125

{Page layout or assigning input pages onto output media, e.g. imposition}

Definition statement

This place covers:

Arrangement of the product's pages (e.g. document pages) on the output medium (e.g. paper sheets or media roll).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pagination	G06F 40/114

G06F 3/1251

{for continuous media, e.g. web media, rolls}

Definition statement

This place covers:

Specifically adapted to when media to be fed by the printer is of long length, e.g. web media, rolls.

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G06F 3/1252

{for sheet based media}

Definition statement

This place covers:

Specifically adapted to when media to be fed by the printer is of short length, e.g. sheets (regardless of whether said media is to be folded or cut after printing. See e.g.US2010039670).

G06F 3/1253

{Configuration of print job parameters, e.g. using UI at the client}

Definition statement

This place covers:

All aspects of configuring how the job should be printed which do not fit in the sub-groups.

G06F 3/1254

{Automatic configuration, e.g. by driver}

Definition statement

This place covers:

Automatic allocation of (some) print settings by software, e.g. print driver, (on the client or server) when a print job is to be printed.

Special rules of classification

Double classification possible if G06F 3/1239 also apply.

G06F 3/1255

{Settings incompatibility, e.g. constraints, user requirements vs. device capabilities}

Definition statement

This place covers:

Limiting the possibilities given to the user at the time of configuring print job, e.g. in b/w printer hide the option for colour printing, hide the option for double side printing if the printer does not support it or if "transparencies" is selected as media (see e.g. WO2010016234).

Comparing how the job should be printed and what the printer can offer when the job is sent from the client. Automatic adjusting of some of job's settings in order to fit the printer's settings or asking the user to solve the conflict settings manually (see e.g. EP1986410).

Special rules of classification

This group is usually combined with G06F 3/1204 or G06F 3/1208 in order to characterise the effect achieved by the "invention information".

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G06F 3/1256

{User feedback, e.g. print preview, test print, proofing, pre-flight checks}

Definition statement

This place covers:

Techniques for checking how the job will look like when printed either by using a preview on a display, by checks performed by software (pre-flight, pre-press) or by real print of part of the job.

Special rules of classification

This group is usually combined with G06F 3/1208 in order to characterise the effect achieved by the "invention information"

G06F 3/1257

{by using pre-stored settings, e.g. job templates, presets, print styles}

Definition statement

This place covers:

Previously defined settings are stored (e.g. as a template) and, when configuring a new print job, the stored settings are used instead of selecting a value for each print option.

References

Limiting references

This place does not cover:

Document templates, i.e. fixed content..	G06F 3/1242

Special rules of classification

This group is usually combined with G06F 3/1204 in order to characterise the effect achieved by the "invention information".

G06F 3/1258

{by updating job settings at the printer}

Definition statement

This place covers:

Changing/updating of settings of a received or currently being created print job using UI of the printer.

G06F 3/1259

{Print job monitoring, e.g. job status}

Definition statement

This place covers:

Supervising of a print job after being sent for printing, e.g. printed, failed, queued. Job status can be requested (by the sending node) or received automatically after job sending.

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References

Limiting references

This place does not cover:

Printer device status	G06F 3/1229.

Special rules of classification

This group is usually combined with G06F 3/1207 in order to characterise the effect achieved by the "invention information".

G06F 3/126

{Job scheduling, e.g. queuing, determine appropriate device}

Definition statement

This place covers:

Techniques relating to where and/or when the job should be printed which do not fit in the sub-groups. Queuing the jobs before printing, e.g. waiting a long job to finish. Finding a printer based on the job requirements.

References

Limiting references

This place does not cover:

Determining appropriate device aiming at providing the user with more print destinations or at installing required software for discovered devices	G06F 3/1226.

G06F 3/1261

{by using alternate printing}

Definition statement

This place covers:

Determining different (alternative) device for printing a job if the designated device can not print the job, e.g. due to failure, lacking of resources or excessive delay expected (see e.g. US7027169).

References

Limiting references

This place does not cover:

The same job printed by the same print device after recovered from a failure (i.e. reprinted)	G06F 3/1234

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G06F 3/1262

{by grouping or ganging jobs}

Definition statement

This place covers:

Combining several print jobs in one job (group job), printing print jobs in batches (e.g. jobs requiring same media or same post-processing, jobs submitted by the same user or intended for the same recipient) (see e.g.WO2008039689).

G06F 3/1263

{based on job priority, e.g. re-arranging the order of jobs, e.g. the printing sequence}

Definition statement

This place covers:

Changing the order of print jobs according certain priorities - either user-defined or automatically determined.

G06F 3/1264

{by assigning post-processing resources}

Definition statement

This place covers:

Determining resources to perform actions/functions on printed output (i.e. after printing) as specified by the job settings (e.g. folding, cutting, trimming, binding).

G06F 3/1265

{Printing by reference, e.g. retrieving document/image data for a job from a source mentioned in the job}

Definition statement

This place covers:

The print job as submitted does not comprise the document or print data that should be printed but only a reference to it or to its location (e.g. a URL, a file path). The document is later (e.g. when queuing the job or shortly before printing should commence) obtained from its location.

G06F 3/1267

{Job repository, e.g. non-scheduled jobs, delay printing}

Definition statement

This place covers:

Storing a print job for a certain time before it being printed (e.g. a job to be printed at or after a certain time) or in case it should be re-printed subsequently. Storing the job until certain condition is fulfilled, e.g. user authorisation, recovering from an error state...

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References

Limiting references

This place does not cover:

Normal queuing, e.g. waiting a previous job to finish..	G06F 3/126

G06F 3/1268

{Job submission, e.g. submitting print job order or request not the print data itself}

Definition statement

This place covers:

Sending a request to print a job. The real job data will be sent or requested later. All aspects of sending a print request (e.g. submitting a document for printing, submitting a print job or a print order) which do not fit in the sub-groups.

References

Limiting references

This place does not cover:

Printing by reference	G06F 3/1265.

Special rules of classification

Specific ways to send a request to print a job, e.g. scanning a page with a barcode and receiving printed pages with information identified by the barcode from a remote source.

G06F 3/1269

{by broadcasting server}

Definition statement

This place covers:

Server storing user's desires about receiving printed materials, e.g. subscription, and sending personalized print jobs to all users (or users' printers) accordingly.

G06F 3/127

{by using hot folders, e.g. folder for which print settings or print data management rules are set in advance}

Definition statement

This place covers:

Folders with associated printing instructions (e.g. print settings or print-related tasks, such as automatic notifications). When a document or job is sent to a folder it will be processed according to the printing instructions associated with the folder.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Print workflow management	G06F 3/1275

G06F 3/1271

{Job submission at the printing node, e.g. creating a job from a data stored locally or remotely (G06F 3/1238 takes precedence)}

Definition statement

This place covers:

Using the UI of the printer to configure a new job. The data for the job could be stored on the printer or at a different location, e.g. server.

References

Limiting references

This place does not cover:

Releasing a stored job according to the user identification	G06F 3/1238

Informative references

Attention is drawn to the following places, which may be of interest for search:

Printing by reference	G06F 3/1265

G06F 3/1272

{Digital storefront, e.g. e-ordering, web2print, submitting a job from a remote submission screen}

Definition statement

This place covers:

Configuring and submitting a job using online based resources, e.g. accessing remote print service providers, choosing from web based content.

G06F 3/1273

{Print job history, e.g. logging, accounting, tracking}

Definition statement

This place covers:

Creating, managing and using of print job history (see e.g. EP1860546).

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G06F 3/1274

{Deleting of print job}

Definition statement

This place covers:

Specifically instructing or managing job deletion based on certain criteria, e.g. memory usage, privacy, avoiding mixing of received jobs (see e.g. US2005275864).

G06F 3/1275

{Print workflow management, e.g. defining or changing a workflow, cross publishing}

Definition statement

This place covers:

Designing or modifying the steps to be performed to a print request from choosing document(s) to be printed to finalising the printed job (e.g. post-processing actions). Adding conditional steps, e.g. what should happen in case of certain events (see e.g.US2008170254).

G06F 3/1276

{within a printer driver, e.g. driver resides either on a server or on a client}

Definition statement

This place covers:

Print workflow management is done by the driver, regardless where it resides - client or server.

G06F 3/1277

{using filter pipeline, e.g. outside the driver, adding traps}

Definition statement

This place covers:

No driver is involved in the filter pipeline. Workflow formed by pieces of software, called "filters" (see e.g. US2002135800).

References

Limiting references

This place does not cover:

Filters within a printer driver.	G06F 3/1276

G06F 3/1278

{specifically adapted to adopt a particular infrastructure}

Special rules of classification

This group is not used for classifying documents in it, but to introduce one of the three classification criteria mentioned in the "Special rules for classification" section of G06F 3/1201.

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G06F 3/1279

{Controller construction, e.g. aspects of the interface hardware}

Definition statement

This place covers:

All aspects of hardware structure of the interface controller of the printer device if the "invention information" mainly focuses on them.

G06F 3/128

{Direct printing, e.g. sending document file, using memory stick, printing from a camera}

Definition statement

This place covers:

Printing from an USB stick or digital camera directly connected to the printer device.

G06F 3/1281

{Multi engine printer devices, e.g. one entity having multiple output engines}

Definition statement

This place covers:

Printer device having plurality of print engines in order to increase printing speed.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Parallel printing or parallel ripping	G06F 3/124.

G06F 3/1289

{in server-client-printer device configuration, e.g. the server does not see the printer}

Definition statement

This place covers:

Network configuration where the information from the server to the printer device always goes via the client.

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G06F 3/129

{in server-printer device-client configuration, e.g. print flow goes from server to printer and then bidirectional from printer to client, i.e. the client does not communicate with the server}

Definition statement

This place covers:

Network configuration where the client accesses the server via the printer.

G06F 3/13

Digital output to plotter {; Cooperation and interconnection of the plotter with other functional units}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for producing a permanent visual presentation of the output data using plotters	G06K 15/22

G06F 3/14

Digital output to display device {; Cooperation and interconnection of the display device with other functional units}

Definition statement

This place covers:

- Interfaces between processor and display system (with or without a standard bus).
- Multiple busses connecting processor, display system and/or other subsystems: e.g. video zoom busses, multimedia busses besides the standard bus.
- Data being furnished to the display system being generated by a multiplicity of sources.
- Data of different types being furnished to the system that displays the data (it can be a display system or a complete computer).
- Interfaces between the host and the display system, especially for system that have a structure different from the structure outlined above (older or special systems).
- Plurality of symbol or graphics generators cooperating with one display unit.
- Aspects of the operating system that have impact on the display system and are not related to a particular aspect of the physical construction of the display.
- Transferring data from an Internet host to the display system.
- kvm-switches, if they (also) switch between a plurality of data sources (i.e. computers).

Relationships with other classification places

Data handling that is pertinent neither to the kind of visualisation unit that is used nor to the frame buffer access is to be classified in G09G 5/39.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for producing a permanent visual presentation of the output data	G06K 15/00
Control of display in general	G09G
Kvm-switches, only linked to one computer as data source	G09G 5/006
Audio-visual communications	H04N 7/14

Special rules of classification

When a standard bus is present, documents will be classified only if they contain details of the standard interface that are peculiar for the display system; "Non-standard" bus interfaces include all bus interfaces (SPI, LVDS, MIPI).

G06F 3/1415

{with means for detecting differences between the image stored in the host and the images displayed on the displays}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital output to display device involving copying of the display data of a local workstation or window to a remote workstation or window so that an actual copy of the data is displayed simultaneously on two or more displays	G06F 3/1462

G06F 3/1423

{controlling a plurality of local displays, e.g. CRT and flat panel display}

Definition statement

This place covers:

Display devices in which more than one display unit is connected to the display system, irrespective of the type of display.

Relationships with other classification places

In cases where one display (device) controller controls two displays, group G09G 2360/04 should be considered for classification.

Controlling a plurality of local displays, with or without display controller: When more than one display terminal is controlled by a local host and some details of the display controller are present, this should be classified in group G06F 3/1423. The controlling of "plurality of displays" takes precedence over the "display controller" in group G09G 5/363.

Conflict between "plurality of local displays" and "conversion of CRT signals for a flat panel":

Group G09G 5/366 covers display systems with more than one display, namely the CRT and the LCD. In these cases, classification should be given in G06F 3/1423 or G06F 3/1431 or G06F 3/1438 and

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G09G 5/366: if the subject matter is mainly the interface, then classification in groups G06F 3/1423 or G06F 3/1431 or G06F 3/1438 is preferred; if it is the graphic controller, then symbol G09G 5/366 should be given. For search see also G09G 2360/04.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Using a single graphics controller	G06F 3/1431
Using more than one graphics controller	G06F 3/1438

G06F 3/1431

{using a single graphics controller}

Definition statement

This place covers:

One single graphics controller (VGA, SVGA or other systems) controls two or more display units. Often one graphics controller card has interface circuitry for interfacing to CRT and to flat panel.

Special rules of classification

Documents are classified in G06F 3/1431 or G06F 3/1438 if there is a "graphics controller" present in the system, i.e. an interface between the standard bus and the display terminal that contains a graphics processor and a frame bufer. If the plurality of displays are connected to the host processor in a different, non standard, way, or if it is not possible to determine if a graphics controller is present (like for example in the old fashoned "terminals"), the documents will be classified in G06F 3/1423.

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G06F 3/1446

{display composed of modules, e.g. video walls}

Definition statement

This place covers:

Illustrative example of subject matter classified in this group:

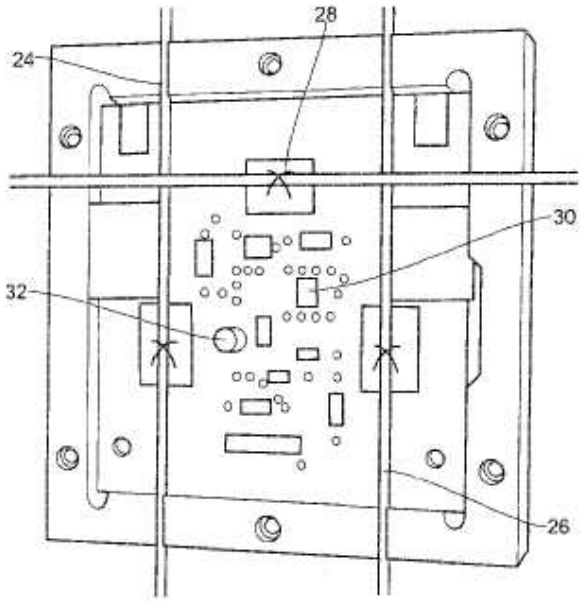


FIG. 3

Special rules of classification

See also G09G 2300/026

G06F 3/1454

{involving copying of the display data of a local workstation or window to a remote workstation or window so that an actual copy of the data is displayed simultaneously on two or more displays, e.g. teledisplay}

Definition statement

This place covers:

Also screen sharing where the framebuffer is sent to remote displays, as is commonly done in application sharing (well known as Virtual Network Computing (VNC)).

Examples:

- Remote display on X-windows terminals: the rendering is done centrally, and only the modified sections of the frame buffers are sent to the remote stations. This is a case of remote local display. There is no teledisplay in this case because the remote display stations are acting as terminals of the host.
- Teledisplay: A collaborative work support system that is performed on plural computers each of which is assigned for an operator, and supports collaborative work in which the plural computers

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display common data and each operator operates the displayed common data through his own computer.

- Sharing of display panel information between several screens in classrooms with a white board.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction techniques specific for application sharing, as now several users may want to interact with the same display	G06F 3/0481
Multiprogramming arrangements; (implementation details of the sharing technique if not framebuffer based, i.e. really the inner workings, exchanged data structures	G06F 9/46, G06F 9/54
Office automation, groupware	G06Q 10/10
Electronic classroom, remote teaching	G09B 5/00, G09B 7/00
Network arrangements for conferencing, chatrooms, etc	H04L 12/18
Real-time session protocols	H04L 65/1101
Network arrangements or protocols for supporting network services or applications	H04L 67/00
Protocols for games, networked simulations or virtual reality	H04L 67/131
Telephonic multimedia conference systems	H04M 3/567
Videophones	H04N 7/14

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

CSCW	Computer Supported Collaborative Work

In patent documents, the following words/expressions are often used as synonyms:

- "Application sharing" and "Shared application"
- "Groupware" and "Computer Supported Collaborative Work"

G06F 3/1462

{with means for detecting differences between the image stored in the host and the images displayed on the remote displays}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital output to display device with means for detecting differences between the image stored in the host and the images displayed on the displays	G06F 3/1415

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G06F 3/147

using display panels

Definition statement

This place covers:

Display panels: LEDs, PDP, LCD, etc. Interconnection of POS (point of sales) terminals.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Data processing in buying/selling transactions, e.g. when dealing with POS terminals	G06Q 30/06
Arrangements of circuits for control of indicating devices using static means to present variable information	G09G
Services or facilities specially adapted for wireless communication networks	H04W 4/00
Services making use of the location of users or terminals	H04W 4/02

G06F 3/1475

{with conversion of CRT control signals to flat panel control signals, e.g. adapting the palette memory}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

with conversion of CRT control signals to flat panel control signals	G09G 5/366

G06F 3/16

Sound input; Sound output (speech processing G10L)

Definition statement

This place covers:

General computer sound interfaces for interaction with computer programs or users

References

Limiting references

This place does not cover:

Speech processing	G10L

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Handling natural language data	G06F 40/00
Coding of audio signals in musical instruments	G10H
Devices for the storage of speech signals	G11B 27/00
Amplifiers	H03F
Gain or frequency control	H03G 3/00
Broadcasting	H04H
Encoding of compressed speech signals for transmission or storage	H04L
Spatial sound recording	H04R 5/00
Spatial sound reproduction	H04S

G06F 3/162

{Interface to dedicated audio devices, e.g. audio drivers, interface to CODECs}

Definition statement

This place covers:

Dedicated hardware or software components for interfacing to an audio device i.e. translating the audio stream from a host into a format accepted by the audio device and vice-versa. Providing hardware emulation for an audio source. Intermediation with OS when receiving audio to preserve sound quality. Connecting a host to a mobile phone to aid processing audio to enhance quality Adapting drivers to different audio source formats

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interfacing to a peripheral in general	G06F 13/385
CODECs per se	G10L 19/16, G10L 19/24

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

CODEC	coding/decoding, compression/decompression of an audio signal

G06F 3/165

{Management of the audio stream, e.g. setting of volume, audio stream path}

Definition statement

This place covers:

Management from a host of the audio device by means of the interface control for modifying the operation of the audio device. Only for control of the audio device/system from the host. Controlling the audio settings such as volume, mute or filters. Controlling the audio stream path (switch output destination). Switch on or off of computer audio devices. Controlling the audio play, pause or replay.

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Relationships with other classification places

Dedicated to TV appliances: H04N 7/00

Network security protocols H04L 9/40

Control of speech to text/text to speech conversion: G10L 13/00 and G10L 15/00

G06F 3/167

{Audio in a user interface, e.g. using voice commands for navigating, audio feedback}

Definition statement

This place covers:

Interface to a computer user by means of an audio device to send commands to the computer or receive feed-back on an action. Limited to the navigation in a menu and sending control commands. Moving a mouse pointer on a screen using audio. Scrolling through a menu using audio. User interface of an audio card. Audio indicators to focus attention.

Relationships with other classification places

User interaction and feedback in general: G06F 3/01

User interaction in a menu in general: G06F 3/048

Speech recognition per se: G10L 15/26, G10L 15/22

G06F 5/00

Methods or arrangements for data conversion without changing the order or content of the data handled

Definition statement

This place covers:

Data format conversions; Conversion between packed and unpacked BCD.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coding, decoding or code conversion, in general	H03M
Conversion of the form of the representation of individual digits	H03M 5/00
Code conversion	H03M 7/00
Parallel/series conversion	H03M 9/00

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G06F 5/01

for shifting, e.g. justifying, scaling, normalising {(digital stores in which the information is moved stepwise, e.g. shift-registers G11C 19/00; digital stores in which the information circulates G11C 21/00)}

Definition statement

This place covers:

Shifting which modifies the value being shifted, e.g. in arithmetic or for implementing shift instructions in processors; in particular the shifting functionality provided and the logic implementing it.

References

Limiting references

This place does not cover:

Exception handling	G06F 7/49905
Rounding	G06F 7/49942
Sign extension	G06F 7/49994
Electrical details of cells	G11C
Digital stores in which the information is moved stepwise, e.g. shift-registers	G11C 19/00
Digital stores in which the information circulates	G11C 21/00

Special rules of classification

Use of Indexing Codes:

Indexing Codes G06F 7/49905, G06F 7/49942, G06F 7/49994 are use for secondary aspects (non-invention information).

G06F 5/012

{in floating-point computations}

Definition statement

This place covers:

Details of the shifting arrangement.

References

Limiting references

This place does not cover:

Denomination or exception handling	G06F 7/499

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G06F 5/015

{having at least two separately controlled shifting levels, e.g. using shifting matrices (G06F 5/012 takes precedence)}

Definition statement

This place covers:

For example, barrel shifter with multiple shifting stages.

References

Limiting references

This place does not cover:

Methods or arrangements for data conversion without changing the order or content of the data handled for shifting in floating-point computations	G06F 5/012

G06F 5/06

for changing the speed of data flow, i.e. speed regularising {or timing, e.g. delay lines, FIFO buffers; over- or underrun control therefor (G06F 7/78 takes precedence)}

Definition statement

This place covers:

Shift registers with certain functionality and logic implementing it.

Buffer systems in general.

FIFO [First In, First Out] using linked lists.

Fifos of the types "shift-in, individual-out" or "individual -in, shift-out".

Effectuating transfer of data between different clock domains

References

Limiting references

This place does not cover:

Arrangements for changing the order of data flow	G06F 7/78

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reordering based on contents of data in general	G06F 7/22
FIFO with priority-controlled output	G06F 13/18

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G06F 5/08

having a sequence of storage locations, the intermediate ones not being accessible for either enqueue or dequeue operations, e.g. using a shift register {(G06F 5/065 takes precedence; shift registers per se G11C 19/00)}

Definition statement

This place covers:

E.g. physical shifting of data.

References

Limiting references

This place does not cover:

FIFOs of the types "shift-in, individual-out" or "individual-in, shift-out"	G06F 5/06
Partitioned buffers, e.g. allowing multiple independent queues, bidirectional FIFO's	G06F 5/065
Shift registers per se	G11C 19/00

G06F 5/10

having a sequence of storage locations each being individually accessible for both enqueue and dequeue operations, e.g. using random access memory {(G06F 5/065 takes precedence)}

References

Limiting references

This place does not cover:

Partitioned buffers, e.g. allowing multiple independent queues, bidirectional FIFO's	G06F 5/065

Informative references

Attention is drawn to the following places, which may be of interest for search:

Addressing methods of the memory	G06F 12/02, G11C 8/00

G06F 5/12

Means for monitoring the fill level; Means for resolving contention, i.e. conflicts between simultaneous enqueue and dequeue operations

Definition statement

This place covers:

E.g. signal generated / action taken before buffer runs full/empty.

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G06F 5/14

for overflow or underflow handling, e.g. full or empty flags

Definition statement

This place covers:

Signal generated / action taken when buffer is already full/empty.

G06F 5/16

Multiplexed systems, i.e. using two or more similar devices which are alternately accessed for enqueue and dequeue operations, e.g. ping-pong buffers

Definition statement

This place covers:

Alternating address by address, i.e. Odd-even.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Addressing methods of the memory	G06F 12/02, G11C 8/00

G06F 7/00

Methods or arrangements for processing data by operating upon the order or content of the data handled (logic circuits H03K 19/00)

Definition statement

This place covers:

The methods and arrangements in this main group are one level above logic circuits.

Examples of such methods and arrangements are: arithmetic circuits implemented using basic logic gates, implementation of complex logic gates, and implementation at transistor level, specially designed for arithmetic operations.

Other examples are:

Logical operations on words per se;

Finite state machines;

Grey System Theory (method of handling uncertainty),

- Asynchronous digital pipeline = clock-less operation of logical operations.

References

Limiting references

This place does not cover:

Logic circuits, i.e. Implementation of basic logical circuits (AND, NAND, OR, NOR, EXOR, EXNOR), at transistor level	H03K 19/00

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Logical operations on words in combination with arithmetic operations	G06F 7/57
Arrays of processors with common control	G06F 15/80
Information retrieval, or database structures therefor	G06F 16/00
Conversion between different representations of Boolean functions, e.g. Boolean formula synthesis from Karnaugh maps, generation of Reed-Muller expansions	G06F 17/00
Complex mathematical operations	G06F 17/10

Special rules of classification

Documents classified in G06F 7/00 should also be further classified in the appropriate indexing codes G06F 2207/00 - G06F 2207/7295.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Individual record carriers	Designates physically distinct carriers carrying digital information, e.g. sheets, cards.

G06F 7/02

Comparing digital values (G06F 7/06, {G06F 7/22,} G06F 7/38 take precedence)

Definition statement

This place covers:

For example, bit string matching, character string matching.

References

Limiting references

This place does not cover:

Arrangements for sorting, selecting, merging or comparing data on individual record carriers	G06F 7/06
Arrangements for sorting or merging computer data on continuous record carriers, e.g. tape, drum, disc	G06F 7/22
Methods or arrangements for performing computations using exclusively denominational number representation, e.g. using binary, ternary, decimal representation	G06F 7/38

Informative references

Attention is drawn to the following places, which may be of interest for search:

Information retrieval	G06F 16/00
Comparing pulses	H03K 5/22

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G06F 7/026

{Magnitude comparison, i.e. determining the relative order of operands based on their numerical value, e.g. window comparator}

Definition statement

This place covers:

Magnitude comparison generating less-than, greater-than, equal-to signals.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Min or max functions producing one of the two input values	G06F 7/544

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Window comparator	determines in which window defined by multiple values a certain value falls

G06F 7/06

Arrangements for sorting, selecting, merging, or comparing data on individual record carriers

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sorting of postal letters	B07C
Conveying record carriers from one station to another	G06K 13/02

G06F 7/22

Arrangements for sorting or merging computer data on continuous record carriers, e.g. tape, drum, disc

Definition statement

This place covers:

Classification of digital data.

Maximum, minimum or median value of a set of data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Minimum or maximum of two values	G06F 7/544

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Pattern recognition	G06F 18/00

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "Batcher sorter" , "bitonic sorter" and "odd-even merge"

G06F 7/38

Methods or arrangements for performing computations using exclusively denominational number representation, e.g. using binary, ternary, decimal representation

Definition statement

This place covers:

E.g. documents on number representations without dealing with the technical circuit implementation.

G06F 7/544

for evaluating functions by calculation {(G06F 7/4824 takes precedence)}

References

Limiting references

This place does not cover:

Using signed-digit representation	G06F 7/4824

Informative references

Attention is drawn to the following places, which may be of interest for search:

With a look-up table	G06F 1/02
Complex mathematical operations	G06F 17/10

G06F 7/58

Random or pseudo-random number generators

Definition statement

This place covers:

Generation or transformation of stochastic functions; generation of output with certain random characteristics; post processing, e.g. pattern elimination, whitening, reducing auto-correlation or bias; breakdown detection.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transformation of stochastic functions by table look-up	G06F 1/03
Lottery apparatus	G07C 15/00

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Random pulse generators, random bit generators	H03K 3/84
Secret telegraphic communication	H04L 9/00

Special rules of classification

Random bit generators: In case of a bit sequence, which could be seen as a random number sequence, classification is done both in the appropriate (sub)group in G06F 7/58 and in H03K 3/84.

Methods both valid for random and pseudo-random number generators should be classified in the head group (G06F 7/58) and not in a sub-group, even if a specific PRNG/RNG is discussed.

Double classification head group / main group only

- on basis of other aspects, e.g. possibly non-trivial PRNG or RNG also disclosed
- in case it is not sure that the method is valid for both RNG and PRNG

Use of keywords

Pseudo-random number generators i.e. only deterministic PRNGs;mixed RNGs in G06F 7/588 if more than one type of pseudo-random number generator is discussed:- in case these PRNGs are clearly trivial: classify in head group (G06F 7/582) - in case a PRNG might be non-trivial: classify in relevant sub-group(s)	G06F 7/582
Using finite field arithmetic, e.g. using a linear feedback shift registergenerators including the 2**n state with all zeroes in G06F 7/582	G06F 7/584
Random number generators, i.e. based on natural stochastic processes also mixed PRNG/RNGs Considered as random (G06F 7/588) are methods based on - radioactivity, zener, race, chaos- uncertain moment of pressing a key	G06F 7/588
Using non-contact-making devices, e.g. tube, solid state device; using unspecified devicese.g. 2's complementing	G06F 7/48
Using coordinate rotation digital computer (CORDIC)i.e. CORDIC in non-complex environment: G06F 7/5446	G06F 7/4818
Using signed-digit representationBinary multipliers and dividers often use signed-digit representation internally for one operand or the result; see therefor "recoded" or "Booth" multipliers in G06F 7/523 - G06F 7/5338 and "recoded" or "SRT" dividers in G06F 7/535 - G06F 7/5375.	G06F 7/4824
Computations with numbers represented by a non-linear combination of denominational numbers, e.g. rational number, logarithmic number system, floating-point numbers (conversion to or from floating-point codes H03M 7/24) (G06F 7/4806, G06F 7/4824, G06F 7/49, G06F 7/491, G06F 7/544 take precedence)e.g. fused multiply add (FMA) also here, but add G06F 7/5443	G06F 7/483
Logarithmic number system mainly for non-trivial operations such as addition.multiplication of binary operands via the log-domain is in G06F 7/5235	G06F 7/4833
Adding; Subtracting (G06F 7/4833 takes precedence)e.g. floating-point addition	G06F 7/485
Dividingi.e. floating-point division	G06F 7/4873

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Multiplying i.e. floating-point multiplication If in fact only the mantissa-multiplication is treated, classification should be made in another group, unless special features for switching between fixed and floating point operands are described.	G06F 7/4876
Computations with a radix, other than binary, 8, 16 or decimal, e.g. ternary, negative or imaginary radices, mixed radix (non-linear PCM, G06F 7/4824 takes precedence) N-ary logic	G06F 7/49
Multiplying; Dividing MULTIPLICATION ONLY division goes into G06F 7/4915, whether it uses 8421 code or not	G06F 7/496
Mantissa overflow or underflow in handling floating-point numberse.g. exponent adjustment	G06F 7/49915
Normalisation mentioned as feature only 'i.e use of normalisationImplementation of floating-point normalisers: G06F 5/012	G06F 7/49936
Significance controli.e. number of significant bits	G06F 7/49942
Implementation of IEEE-754 StandardNote: The standard uses sign magnitude representation	G06F 7/49957
Rounding to nearest (G06F 7/49957 takes precedence)Note: The IEEE-754 way is "rounding to nearest even", which is rounds to nearest, and only when exactly in the middle to nearest even. Though rounding to nearest odd may in fact round to an even number, it normally doesn't.	G06F 7/49963
Rounding towards zero (G06F 7/49957 takes precedence)e.g. as in IEEE-754	G06F 7/49978
Rounding away from zeroway of rounding not provided for in IEEE-754	G06F 7/49984
Interval arithmetici.e. computations with intervals as values	G06F 7/49989
Adding; Subtracting (G06F 7/4806, G06F 7/4824, G06F 7/483 - G06F 7/491, G06F 7/544 take precedence) only binary, radix 8, radix 16..	G06F 7/50
using carry switching, i.e. the incoming carry is connected directly to the carry output under control of a carry propagate signal Full adders having in general the form1-bit adder stages (ripple carry)	G06F 7/503
with simultaneous carry generation for or propagation over two or more stages e.g. using group carry signals, e.g. carry skip; all smart carry schemes except carry look-ahead and carry select/ conditional sum are in G06F 7/506	G06F 7/506
using selection between two conditionally calculated carry or sum values e.g. carry select, conditional sum	G06F 7/507
for multiple operands, e.g. digital integrators i.e. operand-parallel addition of 3 or more operands (this is mainly "3" or "a lot");multipliers in G06F 7/52	G06F 7/509
word-serial, i.e. with an accumulator-registeri.e. OPERAND serial!	G06F 7/5095
Multiplying; Dividing (G06F 7/4806, G06F 7/4824, G06F 7/483 - G06F 7/491, G06F 7/544 take precedence) very rare cases only; normally documents are classified in one of the subgroups (or both) This subgroup does not cover G06F 7/5443: multiplier-accumulators ($f = \sum a_i x_i$), including simple cases f = ax + b, f = ax+ by **G06F15/347**: vector multipliers, matrix multipliers G06F 7/68: binary rate multipliers/dividers G06F 7/724: finite field multipliers	G06F 7/52

In serial-parallel fashion, i.e. one operand being entered serially and the other in parallel (G06F 7/533 takes precedence) In old documents these multipliers are often called "parallel", in newer documents they are often called "serial"!	G06F 7/527
with row-wise addition of partial products i.e. adding two rows each cycleIn majority: "add to accumulator and shift"	G06F 7/5272
In parallel-parallel fashion, i.e. both operands being entered in parallel (G06F 7/533 takes precedence) e.g. single cells for cellular array multiplierse.g. arrays of undetermined type	G06F 7/53
Using indirect methods, e.g. quarter-square method, via logarithmic domainif operands stay in the log-domain then G06F 7/4833 ;quarter-square see XP013079891	G06F 7/5235
in serial-serial fashion, i.e. both operands are entered serially (G06F 7/533 takes precedence) e.g. Lyon multipliers (see XP007901470)	G06F 7/525
with row-wise addition of partial productsi.e. adding two rows each cycle	G06F 7/5272
with column-wise addition of partial productse.g. adding one column each cycle with a parallel counter	G06F 7/5277
In parallel-parallel fashion, i.e. both operands being entered in parallel (G06F 7/533 takes precedence) e.g. single cells for cellular array multipliers;e.g. arrays of undetermined type	G06F 7/53
With row-wise addition of partial products (G06F 7/5324 takes precedence) cellular array multipliers with ripple carry (=within rows) also skewed arrays of the type "McCanny & McWhirter"e.g. linear chain of cascaded adders	G06F 7/5306
With column-wise addition of partial products, e.g. using Wallace tree, Dadda counters (G06F 7/5324 takes precedence)e.g. adder trees	G06F 7/5318
Partitioned, i.e. using repetitively a smaller parallel-parallel multiplier or using an array of such smaller multipliers each smaller multiplier larger than 1 bit; multiprecision; also array multipliers A) n × m bit multiplier consisting of an array of k × l multipliers, k being a submultiple of n and l being a submultiple of m respectively, followed by an array or tree of adders, e.g. of Wallace type. B) n × m bit multiplication realised by a single k × l multiplier, k and l as above, used repetitively and followed by an accumulator.The k × l bit multipliers may be single ROM's for example.Not to be confused with multi-bit-scanning, where a selection among precalculated multiples of the multiplicand is made; if the k × l bit multipliers itself are of the latter type, double classification may be appropriate.	G06F 7/5324
Reduction of the number of iteration steps or stages, e.g. using the Booth algorithm, log-sum, odd-even for Booth, use the subgroups! Note: the term "Booth" is often incorrectly used when intending to say "modified Booth". A Booth recoder module inputs some, e.g. two, consecutive bits and sends a 'Booth carry' to a more significant module. A modified Booth recoder module inputs some, at least three, consecutive bits, the most significant of which is also input to the next higher recoder module. In modified Booth the recoder modules are not connected to each other via a carry.	G06F 7/533
By skipping over strings of zeroes or ones, e.g. using the Booth Algorithme.g. using operand processing, e.g. simple (radix-2, 1st order) Booth, also canonical recoding to NAF form (sequential recoding with carry)	G06F 7/5332

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By using multiple-bit-scanning, i.e. by decoding groups of successive multiplier bits in order to select an appropriate pre-calculated multiple of the multiplicand as a partial product i.e. processing multiple bits per iteration (radix > 2) without overlap, e.g. using positive precalculated multiples only groups of MR-bits are decoded for selecting multiples of MD e.g. 2-bit groups: 3-bit groups: 00 0 × MD 000 0 × MD 01 1 × MD 001 1 × MD 10 2 × MD 010 2 × MD 11 3 × MD 011 3 × MD 100 4 × MD 101 5 × MD 110 6 × MD 111 7 × MDMultiples,that are not a power of 2(3x,7x, etc)have to be precalcultated or looked up in a table.	G06F 7/5334
Each bitgroup having two new bits, e.g. 2nd order MBAi.e. radix-4 modified Booth, i.e. 2nd order modified Booth	G06F 7/5338
Reduction of the number of iteration steps or stages, e.g. using the Sweeny-Robertson-Tocher (SRT) algorithm (not used, see G06F 7/535 or G06F 7/5375)NOT USED, non-restoring in general gets the KW non-restoring,SRT in particular goes in G06F 7/5375	G06F 7/537
Non restoring calculation, where each digit is either negative, zero or positive, e.g. SRT; (WARNING Not complete. Provisionally see G06F 7/535 + G06F 7/5375) almost empty - everything is in Indexing Code G06F 7/5375	G06F 7/5375
For evaluating functions by calculation (with a look-up table G06F 17/10; complex mathematical operations G06F 17/10; G06F 7/4806, G06F 7/4824 take precedence) e.g. min, max of two operands, absolute value, (sum of) absolute differencefinding a maximum value of a set (e.g. during sorting) is in G06F 7/22; direct table lookup of function values is in G06F 1/03 ;table lookup of coefficients during computation goes here, put "table lookup" in the TXT field;	G06F 7/544
Sum of products (for applications thereof, see the relevant places, e.g. G06F 17/10, H03H 17/00) e.g. MACs; fused multiply add (FMA) for floating point are in G06F 7/483 with G06F 7/5443	G06F 7/5443
using crossaddition algorithms, e.g. CORDIC e.g. sin, cos, tan, sinh, cosh, tanh;CORDIC on complex numbers: G06F 7/4818	G06F 7/5446
Powers or roots, e.g. Pythagorean sumse.g. powers by multiplying the operand by itself (which is not possible with non-integer powers)	G06F 7/552
Arithmetic logic units (ALU), i.e. arrangements or devices for performing two or more of the operations covered by groups G06F 7/483-G06F 7/556 or for performing logical operations (instruction execution G06F 9/30; G06F 7/49, G06F 7/491 take precedence; logic gate circuits H03K 19/00)e.g. arrangements for performing more than one operation using the same circuitry	G06F 7/57
Basic arithmetic logic units, i.e. devices selectable to perform either addition, subtraction or one of several logical operations, using, at least partially, the same circuitry: Note: multiplication is not seen as "basic"	G06F 7/575

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G06F 7/60

Methods or arrangements for performing computations using a digital non-denominational number representation, i.e. number representation without radix; Computing devices using combinations of denominational and non-denominational quantity representations {, e.g. using difunction pulse trains, STEELE computers, phase computers (conversion of digital data to or from non-denominational form H03M 5/00, H03M 7/00)}

Definition statement

This place covers:

For example, documents concerning

- "permutograph";
- a "Negationsnetz";

Fibonacci code representation.Further details of subgroups

G06F 7/602:

using difunction pulse trains (STEELE computers); phase computers (GAINES). e.g. Delta-Sigma sequences.

G06F 7/607:

number-of-ones counters, i.e. devices for counting the number of input lines set to ONE among a plurality of input lines, also called bit counters or parallel counters (for applications thereof, see the relevant places, e.g. G06F 7/49, G06F 7/5013, G06F 7/509, H03M 1/00, H03M 7/20)

e.g. number of ones counters (parallel counters), compressors, carry save adders 4-2, 7-3, etc, e.g. used in multipliers.

G06F 7/64:

Digital differential analysers, i.e. computing devices for differentiation, integration or solving differential or integral equations, using pulses representing increments; Other incremental computing devices for solving difference equations (G06F 7/70 takes precedence; differential analysers using hybrid computing techniques G06J 1/02) DDA application in numerical control G05B 19/18.Integration per se: G06F 17/10.

G06F 7/68:

Using pulse rate multipliers or dividers pulse rate multipliers or dividers per se (G06F 7/70 takes precedence) (frequency division in electronic watches G04G 3/02; frequency multiplication or division in oscillators H03B 19/00; frequency dividing counters per se H03K 23/00 - H03K 29/00)

e.g. phased locked loop (PLL) with digital divider (thus achieving pulse rate multiplication); PLLs in general are in H03L 7/06;

pulse rate doubling by adding delayed pulses and correcting the duty cycle are in H03K 5/1565; H03K 23/00 - H03K 29/00 mostly relate to analogue aspects.

References

Limiting references

This place does not cover:

Conversion of digital data to or from non-denominational form	H03M 5/00, H03M 7/00

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G06F 7/72

using residue arithmetic

Definition statement

This place covers:

A mod N, modulo addition, modulo subtraction

Further details of groups

G06F 7/721:

Covers for e.g. modular division; both with composite moduli and in prime number fields.

G06F 7/723:

This subgroup covers RSA [Rivest–Shamir–Adleman] cryptosystem in general.

G06F 7/724:

Covers mainly (binary) extension fields; prime number fields using modular arithmetic are covered in G06F 7/72 - G06F 7/723, G06F 7/727 and G06F 7/728.

For this type of arithmetic the term "Galois field" and symbols of the type GF(p^n) are characteristic, e.g. GF(2^4).

G06F 7/725:

Elliptic curve cryptography [ECC] is classified in this subgroup only if specific adaptations for elliptic curves are present.

G06F 7/726

This subgroup covers rational functions p(x)/q(x) for example and inversion in extension fields is covered in G06F 7/726.

G06F 7/728

Montgomery reduction involves adding of multiples of the modulo, followed by right shifting.

G06F 7/729

This subgroup covers the Chinese Remainder Theorem for non-RSA for example.

A residue number system (RNS) is a system in which a number is represented by a series of digits, each of which is the remainder of that number with respect to a different modulus m_i:

e.g.: moduli -> 5 3 2

26_{10} = 1 2 0

The maximum number representable is M = ($\prod_i m_i$) - 1

e.g.: (2 × 3 × 5) - 1 = 29 in the above case.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error detection/correction in computers	G06F 11/00
Optical residue arithmetic devices	G06E 1/065
Error detection/correction for coding in general	H03M 13/00
Error detection/correction in transmission	H04L 1/00
Secret communication	H04L 9/00

G06F 7/74

Selecting or encoding within a word the position of one or more bits having a specified value, e.g. most or least significant one or zero detection, priority encoders {(with shifting G06F 5/01)}

Definition statement

This place covers:

E.g. leading zero anticipation LZA, priority encoders.

With shifting (during/for detection) details: also in G06F 5/01.

References

Limiting references

This place does not cover:

with shifting	G06F 5/01

G06F 7/76

Arrangements for rearranging, permuting or selecting data according to predetermined rules, independently of the content of the data

Definition statement

This place covers:

For example, masking, shuffling

G06F 7/766 covers i.e. serial or parallel generation of all permutations.

G06F 7/768 covers e.g. endian conversion.

Relationships with other classification places

Boolean masking in block or stream ciphers is covered by H04L 2209/04.

Endian conversion by memory addressing is covered by G06F 12/04.

Bus coupling with endian conversion and endian conversion instruction are covered by G06F 13/4013.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for rearranging, permuting or selecting data according to the content of the data	G06F 7/06, G06F 7/22
Parallel / series conversion or vice versa	H03M 9/00

G06F 7/78

for changing the order of data flow, e.g. matrix transposition or LIFO buffers; Overflow or underflow handling therefor

Definition statement

This place covers:

LIFO [Last In, First Out], also called stack or pushdown store:

- Reversal of a train of data words.
- Reversal of a train of data bits.

Devices called FIFO [First In, First Out], but having possibilities to extract also other data items than the first one.

Matrix transportation devices.

Other devices with an output sequence different from the input sequence, but independent of the contents of the data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

FIFO-devices	G06F 5/06
Reordering based on contents of data, e.g. sort key	G06F 7/22
Cache-memories	G06F 12/08
FIFO with priority-controlled output	G06F 13/18

G06F 8/00

Arrangements for software engineering (testing or debugging G06F 11/36; administrative, planning or organisation aspects of software project management G06Q 10/06)

Definition statement

This place covers:

The engineering discipline of creating software and the assistance of computer tools (CASE tools) in exercising the task of software engineering.

The phases, covered by G06F 8/00, range from the initial requirements collection up to and including the delivery of software to the end user, its maintenance and management but exclude the phase of testing and debugging.

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Relationships with other classification places

Aspects of the particular application of the software being designed, e.g. commercial or financial software, are classified in the appropriate place.

References

Limiting references

This place does not cover:

Testing or debugging	G06F 11/36
Administrative, planning or organisation aspects of software project management	G06Q 10/06

Informative references

Attention is drawn to the following places, which may be of interest for search:

Execution of a stored program	G06F 9/06
Hardware/software co-design	G06F 30/00

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

CASE	Computer-Aided Software Engineering

G06F 8/10

Requirements analysis; Specification techniques

Definition statement

This place covers:

Capturing and formalising user requirements:

- Graph notations;
- Diagramming techniques, e.g. Dataflow diagrams;
- Requirements specifications;
- Use of modelling languages such as uml;
- Petri nets.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Circuit design	G06F 30/30
Specification of network protocols	H04L 69/03

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

UML	Unified Modeling Language

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G06F 8/20

Software design

Definition statement

This place covers:

Software design, including the determination of the main structure, the modules that will be created and the relationships between them.

The use of design patterns for object-oriented development.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Computer-aided design in general	G06F 30/00

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

MVC	Model-View-Controller

G06F 8/22

{Procedural}

Definition statement

This place covers:

The conventional design paradigm, where a design is defined in terms of a sequence of actions to be performed. An example is the Jackson Structured Programming method.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Declarative	G06F 8/313

G06F 8/24

{Object-oriented}

Definition statement

This place covers:

The process of planning a system in terms of interacting objects for the purpose of solving a software problem as defined by the (formalised) user requirements. Examples are the design patterns from the book "Design Patterns: Elements of Reusable Object-Oriented Software" by Gamma et al.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Object-oriented method resolution	G06F 9/449
Inheritance	G06F 9/4492
Object-oriented databases	G06F 16/289

G06F 8/30

Creation or generation of source code

Definition statement

This place covers:

The conceptual step of converting an abstract representation (design or specification) of a software system, into a more concrete representation in the form of program code.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specification techniques for generating programs	G06F 8/10
Compilation, i.e. the process of converting source code into binary code during the task of software engineering	G06F 8/41
Reverse engineering; Extracting design information from a source code	G06F 8/74
Porting source code to a different environment	G06F 8/76
Query generation in information retrieval	G06F 16/33, G06F 16/24

G06F 8/31

{Programming languages or programming paradigms}

Definition statement

This place covers:

Programming languages and paradigms that can be used by a programmer in order to create source code.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Processing or translation of natural language	G06F 40/40

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

HLL	High Level Language

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G06F 8/311

{Functional or applicative languages; Rewrite languages}

Definition statement

This place covers:

Languages designed for functional programming that treats computation as the evaluation of mathematical functions. Examples are Sasl, Miranda and Haskell.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Functional programming	software development model which expresses algorithms as functions, i.e. as stateless mappings of input values to output values
Declarative programming	programming paradigm that expresses a computation without describing its control flow

G06F 8/312

{List processing, e.g. LISP programming language}

Definition statement

This place covers:

List processing languages, e.g. Lisp and Scheme.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

CAR	Function that determines the first element of a list
CDR	Function that determines the list after its first element

G06F 8/313

{Logic programming, e.g. PROLOG programming language}

Definition statement

This place covers:

Programming languages expressing a program as a collection of logical statements.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Declarative programming	programming paradigm that expresses a computation without describing its control flow
Horn clause	logical statement

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G06F 8/3135

{Unification or backtracking}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Unification	finding an assignment that satisfies all clauses
Backtracking	done on partial unifications that cannot succeed, and to continue to find more possible unifications

G06F 8/314

{Parallel programming languages (G06F 8/313 takes precedence)}

Definition statement

This place covers:

Programming languages having constructs for expressing parallelism, e.g. Occam.

References

Limiting references

This place does not cover:

Parallel logic programming	G06F 8/313
Detecting and extracting parallelism from program code	G06F 8/456

G06F 8/315

{Object-oriented languages}

Definition statement

This place covers:

Programming languages expressing algorithms as interacting objects, where an object is an aggregation of data (attributes) and actions (methods).

Examples of object oriented languages are Smalltalk, Ruby, Eiffel, C++, C#, Java, Oberon, Modula.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Object-oriented design paradigms	G06F 8/24
Object-oriented systems	G06F 9/4488
Method invocation	G06F 9/449
Distributed object-oriented systems	G06F 9/465
Object-oriented databases	G06F 16/289

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Method	the action to be performed on (attributes of) an object

G06F 8/316

{Aspect-oriented programming techniques}

Definition statement

This place covers:

Programming paradigm allowing different, orthogonal, aspects of a program (business rules, security, fault tolerance, data consistency) to be designed independently and to be merged later to produce a final source code product.

Aspect-Oriented Software Development foresees a full and independent design for all the secondary aspects of an application like security, persistency, synchronization, logging, etc., carried out at the same time as the design of the core functionality of the application.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Aspect Weaving	the process of merging the different aspects
Join Points	the actual places in the program where the aspects are merged

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

AOSD	Aspect oriented software development

G06F 8/33

Intelligent editors

Definition statement

This place covers:

Intelligent editors that help a programmer to write programs, e.g. language-sensitive editors.

Examples:

- Proposing a closing bracket when an opening bracket is typed.
- Indenting of if-then-else statements.
- Verification of entered text (e.g. whether variables are already declared).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Text processing	G06F 40/10

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G06F 8/34

Graphical or visual programming

Definition statement

This place covers:

P programming techniques whereby a program is created by handling graphical programming objects representing programming constructs/statements rather than writing program text.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of icons for interaction	G06F 3/048
Intelligent editors	G06F 8/33
Development of GUIs, User Interface Management Systems (UIMS)	G06F 8/38
Web page development	G06F 16/95
Creating programs for controlling physical processes by graphically specifying the process to be controlled	G05B 19/0426
Creating relay ladder logic program for Programmable Logic controllers (PLC)	G05B 19/056
Multimedia authoring	G11B 27/031

G06F 8/35

model driven

Definition statement

This place covers:

Automatically generating program code (source code) from a specification/definition/model of what the program should do.

Typical examples: WO0108007, WO02086704, EP0737918, WO0177882.

Specific topics included:

- Generating a debugger from a formal specification: EP1071016;
- Generation of source code for web applications: WO0171566;
- Convert spreadsheet data into source code: US2003106040, US2004064470;
- Generate source code from XML: US2003167444;
- Generate a shader program from a graphics file: US2003179220;
- OMG's Model driven architecture (MDA).

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

MDSD	Model driven software development
MDA	Model driven architecture

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G06F 8/355

{Round-trip engineering}

Definition statement

This place covers:

Arrangement for keeping a model and the corresponding program code in sync when applying changes to any of them.

G06F 8/36

Software reuse

Definition statement

This place covers:

- Storing and retrieving reusable software modules into and from software repositories;
- Building, searching and maintaining software repositories containing reusable software parts;
- Managing repositories of software components, objects;
- Storing software components into a repository, thereby indicating additional information about the components, e.g. the function performed, what inputs are required, what outputs are generated;
- Querying the repository to retrieve components that satisfy the particular requirements, e.g. related to its function;
- Detecting program parts that are candidates for reuse;
- Design patterns.
- Using APIs and interfaces, e.g. for components, to make software reusable.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Exlining, i.e. finding similar sequences of code to replace them with a procedure invocation	G06F 8/4436
Version control using repositories	G06F 8/71
Code clone detection, i.e. detection of identical pieces of code for the purpose of maintenance	G06F 8/751
Plagiarism detection in program code	G06F 21/10

G06F 8/37

{Compiler construction; Parser generation}

Definition statement

This place covers:

- Automatically generating a compiler or parser based on a specification of a grammar/syntax, e.g. Lex and Yacc.
- Generation of lexical analyzers.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compilation per se	G06F 8/41

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Compiler Bootstrapping	creating a compiler using the language it is intended to compile

G06F 8/38

for implementing user interfaces

Definition statement

This place covers:

The development and generation of source code for user interfaces, in particular GUIs.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

User interaction with graphical user interfaces	G06F 3/048
Details relating to the actual functioning of (graphical) user interfaces	G06F 9/451

G06F 8/40

Transformation of program code

Definition statement

This place covers:

The transformation of program code from one form into another.

G06F 8/41

Compilation

Definition statement

This place covers:

The process of converting source code into binary code.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compiler generators	G06F 8/30
Runtime code conversion	G06F 9/455

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Binary code	a representation of a code understood by a machine

G06F 8/42

{Syntactic analysis}

Definition statement

This place covers:

Determining grammatical structure of the source code with respect to a given formal grammar.

G06F 8/423

{Preprocessors}

Definition statement

This place covers:

Processing language-external elements, e.g. compiler directives, macro definitions and macro expansions, and inclusion of library source files.

G06F 8/425

{Lexical analysis}

Definition statement

This place covers:

Converting sequences of characters into tokens, skipping comments.

G06F 8/427

{Parsing}

Definition statement

This place covers:

Checking for correct syntax and building a data structure, e.g. parse tree.

Multibox parsers.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Parser generators	G06F 8/37
Parsing markup language streams	G06F 40/221

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G06F 8/43

{Checking; Contextual analysis}

Definition statement

This place covers:

Checking context-senstive conditions, e.g. whether variables have been declared.

G06F 8/433

{Dependency analysis; Data or control flow analysis}

Definition statement

This place covers:

Determining the dependencies between different program parts (e.g. data dependencies, which variables/values are used in expressions, and control dependencies, which statements have influence on other statements), in particular to determine whether such program parts should be placed in a certain order.

G06F 8/434

{Pointers; Aliasing}

Definition statement

This place covers:

Determining whether references, e.g. pointers, reference variables and indexed array elements, actually refer to the same underlying memory element.

G06F 8/436

{Semantic checking}

Definition statement

This place covers:

Checking semantic conditions which can be determined without actual execution of the program, e.g. whether variables are initialized.

G06F 8/437

{Type checking}

Definition statement

This place covers:

Checking type compatibility of values, variables, parameters and expressions.

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G06F 8/44

{Encoding}

Definition statement

This place covers:

Generating an executable implementation of the program for the target machine architecture, usually via an internal form that is independent of the source programming language and that is also independent of the target machine architecture.

G06F 8/441

{Register allocation; Assignment of physical memory space to logical memory space}

Definition statement

This place covers:

Assigning logical registers to variables, assigning physical register to logical registers, coalescing, spilling.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Coalescing	removing useless copy instructions from a program. This needs information about assigned registers and therefore it is commonly performed as a subtask of register allocation besides spilling and register assignment.

G06F 8/443

{Optimisation}

Definition statement

This place covers:

Optimisation of the program code; the program code can take any form e.g. source code, assembly code, machine code.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Code refactoring	G06F 8/72

Special rules of classification

Whenever an optimisation concerns speed, size, etc, such documents should be classified in the corresponding subgroups. In this group should be classified only special optimision techniques not present in any of the subgroups.

Contains optimizations that do not involve a trade off between different factors (speed, size, energy consumption	G06F 8/443

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Involve a trade-off. They are specifically aimed to optimize one aspect, likely at the cost of another aspect.	G06F 8/4432, G06F 8/4434, G06F 8/4441

G06F 8/4432

{Reducing the energy consumption}

Definition statement

This place covers:

Optimisation methods specifically aimed at reducing the energy consumption of program code.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Means for Saving Power, Power Management strategies	G06F 1/3203

G06F 8/4434

{Reducing the memory space required by the program code}

Definition statement

This place covers:

Optimisation methods specifically aimed at reducing the size of the program code, e.g. by replacing sequences of recurring instructions with a new macro instruction/superinstruction. Requires that the target architecture/virtual machine recognize this new instruction; Cross jumping; Tail Merging.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Data compression (e.g. PKZIP)	H03M 7/30

Special rules of classification

Note that this group does not cover the compression of program code, which requires a decompression before it can be executed. Compression of program code in this sense does not result in the actual program being smaller; there is only a saving in the secondary storage or transmission via the network.

In contrast, the size-reduced code covered by this group is directly executable, so no decompression is needed before execution.

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G06F 8/4435

{Detection or removal of dead or redundant code}

Definition statement

This place covers:

Detecting and removing of dead or redundant code. Redundancy elimination optimizations avoid repeated computation of the same value by computing the value once, saving it in a temporary variable, and reusing the value from the temporary variable when it is needed again. Examples of redundancy elimination optimizations include common subexpression elimination, loop invariant code motion and partial redundancy elimination.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Dead code	code that is never executed or that is unreachable.
Redundant code	code that produces results that are never used or are irrelevant to the program execution or code that computes values that were already computed before.

G06F 8/4436

{Exlining; Procedural abstraction}

Definition statement

This place covers:

Detecting recurring sequences of instructions and replacing each of them with a call to a procedure/ function that contains those instructions.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reuse, i.e. identifying recurring pieces of code for purposes of reuse	G06F 8/36
Inlining	G06F 8/4443
Code clone detection, i.e. detection of identical pieces of code for the purpose of maintenance	G06F 8/751
Plagiarism detection in a source code	G06F 21/10

G06F 8/4441

{Reducing the execution time required by the program code}

Definition statement

This place covers:

Optimisation methods specifically aimed at improving the execution speed of the program.

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G06F 8/4442

{Reducing the number of cache misses; Data prefetching (cache prefetching G06F 12/0862)}

Definition statement

This place covers:

Avoiding cache misses at run-time. Cache can be instruction or data cache.

Splitting a program into frequently used and not frequently used parts (hot and cold parts) and keeping the hot parts in the cache.

Rearranging the individual instructions in order to have data/instructions present in the cache when they are needed.

References

Limiting references

This place does not cover:

Cache prefetching	G06F 12/0862

G06F 8/4443

{Inlining}

Definition statement

This place covers:

Replacing a procedure invocation with the instructions of the procedure, thus removing the cost of procedure invocation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Exlining	G06F 8/4436

G06F 8/445

{Exploiting fine grain parallelism, i.e. parallelism at instruction level (run-time instruction scheduling G06F 9/3836)}

Definition statement

This place covers:

Increasing the Instruction Level Parallelism (ILP) that can be exploited by the hardware at run-time (pipelines, superscalar processors executing multiple instruction streams). Typically this is done by reordering the instructions (scheduling).

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References

Limiting references

This place does not cover:

Exploiting coarse grain parallelism	G06F 8/45
Run-time scheduling or reordering of instructions by the hardware	G06F 9/3836
Process scheduling	G06F 9/4881

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Scheduling	reordering of instructions

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

ILP	Instruction Level Parallelism

G06F 8/4451

{Avoiding pipeline stalls}

Definition statement

This place covers:

Reducing or avoiding run-time pipeline stalls.

Pipeline stalls (or bubbles) are caused by control hazards – e.g. branches -, data hazards -one instruction depends on the result of another instruction and must wait for this instruction to finish- or resource hazards -there are not enough resources to serve all the instructions currently in flight - instructions must wait for resources to be freed in order to be fed to the pipeline.Control Hazards can handled by static branch-prediction, speculative execution or delayed branch. Data Hazards can be avoided by rearranging the instructions so that instructions that depend on each other's result are farther separated.

In a pipeline, there is only one instruction stream. So the parallelism consists in the overlapping of the instructions of the stream rather than executing the instructions of 2 streams simultaneously.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hardware aspects of pipelining	G06F 9/38

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G06F 8/4452

{Software pipelining}

Definition statement

This place covers:

Software pipelining, e.g. Modulo Scheduling, transforms a loop described in a high-level programming language, such as C or FORTRAN, in such a way that the execution of successive iterations of the loop are overlapped rather than sequential. This technique exposes the instruction level parallelism (ILP) available between successive loop iterations to the compiler and to the processor executing the transformed code.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hardware aspects of pipelining	G06F 9/38

G06F 8/447

{Target code generation}

Definition statement

This place covers:

Generation of executable code from the optimized compiler-internal representation of the source code, taking the target machine architecture into account.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Run-time compounding of instructions by the hardware	G06F 9/3853

G06F 8/45

{Exploiting coarse grain parallelism in compilation, i.e. parallelism between groups of instructions}

Definition statement

This place covers:

Speeding up the execution of a single task by subdividing the task into a plurality of subtasks and having the subtasks executed simultaneously on different processors. The subtasks are interdependent and they work together to achieve the same goal as the original task.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Exploiting fine grain parallelism	G06F 8/445

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G06F 8/451

{Code distribution (considering CPU load at run-time G06F 9/505; load rebalancing G06F 9/5083)}

Definition statement

This place covers:

Distributing the code of each of the subtasks to the available processors.

References

Limiting references

This place does not cover:

Considering CPU load at run-time	G06F 9/505
Load rebalancing	G06F 9/5083

G06F 8/452

{Loops}

Definition statement

This place covers:

Distributing iterations of parallelizable loops among the processors.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Software pipelining	G06F 8/4452
Allocation of resources to service a request	G06F 9/5005
Techniques for rebalancing the load in a distributed system at run-time	G06F 9/5083

G06F 8/453

{Data distribution}

Definition statement

This place covers:

Dividing the data used by the subtasks over the different processors.

G06F 8/454

{Consistency (cache consistency protocols in hierarchically structured memory systems G06F 12/0815)}

Definition statement

This place covers:

Ensuring data consistency between subtasks.

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References

Limiting references

This place does not cover:

Cache consistency protocols in hierarchically structured memory systems	G06F 12/0815

G06F 8/456

{Parallelism detection}

Definition statement

This place covers:

Detecting parallelism in sequential programs, e.g. by making use of control flow and data flow information.

In this group the burden to detect and extract parallelism is put on the compiler or another software tool. This contrasts with the G06F 8/314, where the burden of indicating parallelism is put on the programmer.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Techniques and language constructs to create parallel programs	G06F 8/314
Data flow analysis, control flow analysis	G06F 8/433

G06F 8/457

{Communication (intertask communication G06F 9/54)}

Definition statement

This place covers:

Communication between subtasks, allowing the generated tasks to interact with each other, for example to pass parameters or to return results.

References

Limiting references

This place does not cover:

Communication between independent tasks	G06F 9/54

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G06F 8/458

{Synchronisation, e.g. post-wait, barriers, locks (synchronisation among tasks G06F 9/52)}

Definition statement

This place covers:

Synchronisation between subtasks.

References

Limiting references

This place does not cover:

Synchronisation between independent tasks	G06F 9/52

G06F 8/47

{Retargetable compilers}

Definition statement

This place covers:

Compiler structure allowing for several source languages (multiple front ends) and/or several target machine architectures (multiple back ends). Some examples of techniques and compilers for this are:

- Architecture Neutral Data Format (ANDF);
- UCSD Pascal P-code;
- Universal Compiler Language (UNCOL);
- GCC - GNU Compiler Collection.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Generating code for just one computing platform	G06F 8/447

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Retargetable compiler	a compiler that can relatively easily be modified to generate code for different CPU architectures.

G06F 8/48

{Incremental compilation (software reuse G06F 8/36)}

Definition statement

This place covers:

Recompiling only those parts of source code that are affected by a modification.

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References

Limiting references

This place does not cover:

Software reuse	G06F 8/36

G06F 8/49

{Partial evaluation}

Definition statement

This place covers:

Specializing a program for some or all of its possible input values.

Different flavours are:

- "normal" PE (partial evaluation): specialize program for certain values of its inputs
- "predictive" PE: predict the run-time values of some inputs and specialize the program accordingly. At run-time, check if the prediction was correct. If yes, execute it. If no, recompile using the actual values.
- "multi-version" PE: generate multiple specialized versions of the program corresponding to different inputs. At run-time choose the appropriate version.
- "placeholder" PE: specialize the program for the known inputs. For the unknown inputs, provide placeholders, that will be filled in at run-time.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Optimizing a method invocation based on the type of the receiving object	G06F 9/4491

G06F 8/51

Source to source

Definition statement

This place covers:

Translating program code from a first high level programming language to a different second high-level programming language (e.g. from Java to C++). This transformation is independent of the target processor.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Source to binary translation	G06F 8/41
Preprocessors	G06F 8/423
Optimisation of source code	G06F 8/443
Binary to binary translation	G06F 8/52

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Porting; modifying the source code of the application in order to adapt it to new/changed requirements	G06F 8/76
Porting source code to a different environment	G06F 8/76

G06F 8/52

Binary to binary

Definition statement

This place covers:

Static translation (i.e. pre-run-time) of binary code from one architecture to a different architecture.

This group covers the following forms of static binary code translation:

- Binary to binary
- Intermediate bytecode to another intermediate bytecode (e.g. Java bytecode, p-code)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Source to source translation	G06F 8/51
Binary to source translation	G06F 8/53

G06F 8/53

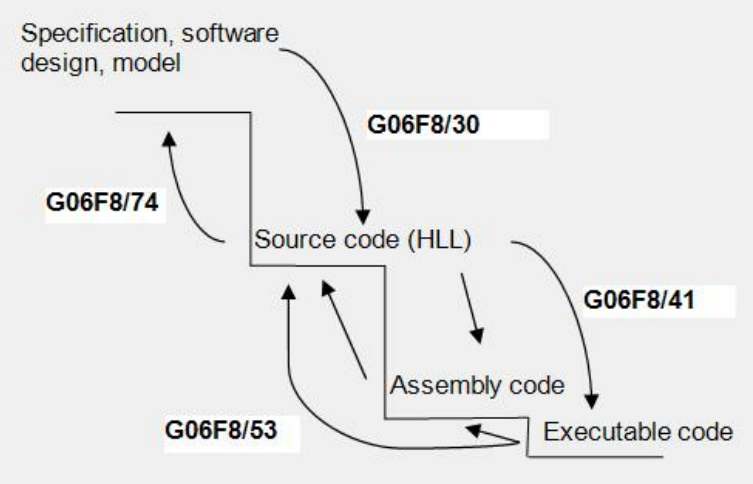
Decompilation; Disassembly

Definition statement

This place covers:

Transformation of executable code into source code or assembly code.

Relationships with other classification places



References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reverse engineering	G06F 8/74
Protecting software against software analysis or reverse engineering, e.g. by code obfuscation	G06F 21/12

G06F 8/54

Link editing before load time

Definition statement

This place covers:

Statically linking modules before load-time in order to create executable binary code.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dynamic linking, i.e. linking at or after load time, during run-time	G06F 9/44521

G06F 8/60

Software deployment

Definition statement

This place covers:

- Installation and updating of computer software
- Methods that make the installation/update of software program transparent, automatic and user-friendly, both to the end-user and the network administrator. Methods that automatically select which programs should be updated, when and how this should happen, and where old and new programs should be located

Updating or installing software based on physical location of the target device.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Installation and upgrade of device drivers	G06F 9/4411
Network booting	G06F 9/4416
Program loading or initiating	G06F 9/445
Fault tolerant update or installation. For example when an error occurs during software upgrade, the system is rebooted and restored to the state before installation.	G06F 11/1433
Secure aspects of licensing; Try and buy software	G06F 21/10

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Arrangements in connection with the implantation of stimulators; Changing the program; Upgrading firmware	A61N 1/37264
Downloading information (also software) into vehicles	G07C 5/008
Personalization of smart card applications	G07F 7/10
Download/install/upgrade software in mobile communication devices	H04M 1/72406
Multimedia set-top boxes under program control	H04N 21/42204

G06F 8/61

Installation

Definition statement

This place covers:

- First-time installation of software.
- Unattended installation, installation scripts (answer file).
- Installation packages (containing list of files, program image, files itself, install/update instructions).
- Network installation plans.
- Type of installations.
- Silent installation - no display of the progress of the installation.
- Unattended installation - installation performed without user interaction.
- Self installation - unattended installation without the need of initial launch of the process.
- Headless installation - installation performed without using a monitor connected to the destination computer.
- Clean installation - cleaning up a destination partition (formatting) before actual installation.
- Flat installation - first copying installation files from a media to a hard disk and then installing them from the hard drive.
- Network installation - installation of a program from a shared network drive.
- Virtual installation - performing a virtual installation to check for errors before committing the real installation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Loading of device drivers	G06F 9/4411

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Installation	setup, deployment

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G06F 8/62

{Uninstallation}

Definition statement

This place covers:

Removing software and all its related components.

Uninstallation of software i.e. removing software and all its related components, without interfering with the operation of other software;

Undoing installations/update.

Rollback, reverting to a previous installation/update status. Requires the use of some kind of log file.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Unloading program code from executable memory	G06F 9/445
Garbage collection	G06F 12/0253

G06F 8/63

{Image based installation; Cloning; Build to order}

Definition statement

This place covers:

Installation of whole systems by copying disk images to target systems,

Cloning installed systems.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Software billing	G06Q 30/00

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

BTO	Build to order
MTO	Make to order

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G06F 8/64

{Retargetable}

Definition statement

This place covers:

Installation or update explicitly taking into account hardware characteristics of the target.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Retargetable compilation	G06F 8/47
Retargetable program loading	G06F 9/44542

G06F 8/65

Updates (security arrangements therefor G06F 21/57)

Definition statement

This place covers:

- Updating of existing software, i.e. modifying already installed software to a desired version.
- Being informed of new software that has become available in order to update including installation for the update.
- Synchronization of software of disconnectable devices after their reconnection to the network automatically upgrading software to the correct version.
- Transparent update (e.g. after boot, after update becomes available, regular check for updates,…)
- User-initiated update.

References

Limiting references

This place does not cover:

Security arrangements therefor	G06F 21/57

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Scheduling of updates for software modules stored at the client	H04N 21/26291
For set top boxes	H04N 21/42204, H04N 21/4586

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error handling during software upgrade	G06F 11/1433
Synchronizing caches	G06F 12/00

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Replication of documents/files	G06F 16/184
Software upgrading/downloading on mobile terminals	H04M 1/72406

G06F 8/654

using techniques specially adapted for alterable solid state memories, e.g. for EEPROM or flash memories

Definition statement

This place covers:

- Updating software stored in non-volatile, alterable, solid-state storage, e.g. flash or EEPROM.
- In place updating

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Update program code stored in non-alterable ROM	G06F 8/66
Changing the capability of a processor by loading new microcode, e.g. representing a different instruction set	G06F 9/24
Secure firmware programming	G06F 21/572
Low level details of writing to solid-state storage	G11C 16/10

G06F 8/656

while running

Definition statement

This place covers:

- Updating software while it is executing or running

Specific topics included:

- Hot-plugging of new software into a running system
- Run-time adaptation of the functionality of executable code by relinking to new code modules

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Power plants, Industrial process controllers	G05B 19/042
Telecommunication systems	H04Q 3/545

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G06F 8/658

Incremental updates; Differential updates

Definition statement

This place covers:

Update methods explicitly demonstrating how a new version of software is created from an old version and update instructions and/or differential data. The simplest way to update a piece of software from a first version to a second version is to remove the first version in its entirety and replace it by the entire second version. This method, although conceptually simple, is highly inefficient, especially in the case where the second version differs only slightly from the first version:

- It is always necessary to provide the target with the entire second version; if a network is involved, this puts a high burden on the network
- It might take a long time to perform the update because the entire first version has to be deleted and the entire second version has to be written.

This group tackles this problem in that the update is performed by using the existing instance of the first version as a basis and to generate the instance of the second version therefrom. The scope of the group can thus be described as dealing with the details of how to modify an existing instance of the first version in order to arrive at the second version.

Typically, the second version is created by only changing those parts of the first version that actually change. This can be accomplished by creating a difference file (delta) that describes the differences of the second version with regards to the first version. The delta is provided to the target and applied to the first version thus yielding the second version. This delta can be passive - the delta is applied by an updater - or active -the delta contains instructions to actually perform the update.

Incremental update more generally refers to details of the steps involved to convert one piece of software into another. Differential update is more specific and explicitly uses differences between the two pieces of software.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Updating remote displays by only transmitting differences	G06F 3/1454
Comparing a list of software actually installed on a device and a list of software that should be installed on a device; identify software not installed that should be installed on install this software on the device	G06F 8/61
Delta for version control systems	G06F 8/71
Delta in the context of file systems	G06F 16/1767
Calculation of difference between files	G06F 40/194
Compression in general	H03M 7/30

G06F 8/66

{of program code stored in read-only memory [ROM]}

Definition statement

This place covers:

Updating software that is stored in non-alterable ROM.

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G06F 8/70

Software maintenance or management

Definition statement

This place covers:

- Adapting the code of a program in response to new requirements, changes to the environment, detection of bugs, etc.
- When new functionality is required, analysing the code in order to find the points to edit; generating new code, and incorporating it into the application

G06F 8/71

Version control (security arrangements therefor G06F 21/57); Configuration management

Definition statement

This place covers:

Version control, administering version numbers and releases. Deals with the problem of managing a modular software system: keeping track of the changes and the different version of the modules, the interrelation between the modules, the effects of the changes of one module on the other modules, the problem of multiple users editing different modules.

Includes in particular :

- Make, Build
- Analysing changes to/conflicts between sources
- SCCS-like tools
- Dependency analysis
- Comparing/obtaining dates of last changes of sources/intermediates/targets;
- CVS - Concurrent Version Control, SVN, GIT, ...

References

Limiting references

This place does not cover:

Security arrangements therefor	G06F 21/57

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dependency analysis in compilers	G06F 8/433
Dealing with different versions of software in the context of software updating	G06F 8/65, G06F 8/658
Configuration of peripheral devices	G06F 9/4411
Configuration in the sense of changing parameters	G06F 9/44505
Version control for text documents	G06F 40/197

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G06F 8/72

Code refactoring

Definition statement

This place covers:

Applying any change to a computer program's code which improves its readability or simplifies its structure without changing its results. In software engineering, "refactoring" a source code module often means modifying the module without changing its external behavior, and is sometimes informally referred to as "cleaning it up".

Code refactoring can be considered the design-time equivalent of code optimization (G06F 8/443). Code refactoring is concerned with improving the structure of the code in view of easier maintenance whereas code optimization is concerned to make the code better for a particular aspect (speed, size, energy).

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Code Refactoring	the process of changing software such that the changes do not alter the external behavior of the code, yet improve the internal code structure
Re-engineering	In contrast to reverse engineering

G06F 8/73

Program documentation

Definition statement

This place covers:

Augmenting program code with additional information in order to increase its understandability in view of easier maintenance.

Documenting program code, inserting comments in source code.

G06F 8/74

Reverse engineering; Extracting design information from source code

Definition statement

This place covers:

Reverse engineering of HLL source code to its underlying design, model.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

When the reverse engineering is performed in the context of binary to binary translation	G06F 8/52
Decompilation and dissassembly	G06F 8/53

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Protecting software against software analysis or reverse engineering, e.g. by code obfuscation	G06F 21/14

G06F 8/75

Structural analysis for program understanding

Definition statement

This place covers:

Static analysis of the structure of program code.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Analysing program code in order to identify reusable program parts	G06F 8/36
Monitoring program code execution	G06F 11/34

G06F 8/751

{Code clone detection}

Definition statement

This place covers:

Detecting code clones, e.g. introduced as a result of copy & paste by the programmer.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reuse, i.e. identifying recurring pieces of code for purposes of reuse	G06F 8/36
Exlining, i.e. finding similar sequences of code to replace them with a procedure invocation	G06F 8/4436
Plagiarism detection for source code	G06F 21/10

G06F 8/76

Adapting program code to run in a different environment; Porting

Definition statement

This place covers:

Adapting program code to run in a different environment, i.e. a different architecture or operating system.

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G06F 8/77

Software metrics

Definition statement

This place covers:

Measurement of software metrics related to a software development project, such as product metrics and process metrics.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring certain characteristics of a program in view of debugging	G06F 11/362

Special rules of classification

Not to be confused with G06F 11/362 , which deals with measuring certain characteristics of a program in view of debugging.

G06F 8/78

{Methods to solve the "Year 2000" [Y2K] problem}

Definition statement

This place covers:

The Year 2000 problem, i.e. adapting software so as to comply with a not-foreseen date format.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

Y2K	Year 2000

G06F 9/00

Arrangements for program control, e.g. control units (program control for peripheral devices G06F 13/10)

Definition statement

This place covers:

Program control for general purpose computers.

Runtime execution of programs.

References

Limiting references

This place does not cover:

Program control for peripheral devices	G06F 13/10

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for development of programs; Software engineering	G06F 8/00
Program control in regulating or control systems	G05B

Special rules of classification

Note for use of these definitions:

In the sub-groups of G06F 9/00 there are rules of classification which differ from the rules of the IPC, and are specified in this section.

The sub-groups mentioned under "Informative references"; "Limiting references" and "Relationship between large subject matter areas" are to be taken as indicators as to where the document to be classified may be forwarded or circulated for classifiying.

Specific combinations or conventions of classification are mentioned under "Special rules of classification".

G06F 9/02

using wired connections, e.g. plugboards

Special rules of classification

Not currently used, as old technology.

G06F 9/04

using record carriers containing only program instructions (G06F 9/06 takes precedence)

References

Limiting references

This place does not cover:

Arrangements for program control using storeddevelopment of programs; Software engineering	G06F 9/06

Special rules of classification

Not currently used, as old technology.

G06F 9/06

using stored programs, i.e. using an internal store of processing equipment to receive or retain programs

Definition statement

This place covers:

Programming arrangements for computers having a stored program. Covers execution of stored programs, and arrangements therefor.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program control for machine tools using a digital processor	G05B 19/042

G06F 9/22

Microcontrol or microprogram arrangements

Definition statement

This place covers:

Arrangements for executing microcode in general.

A next instruction of the program, when fetched from program store, is translated into lower level microinstructions, usually by using the instruction to index into a microprogram or control memory to fetch a series of microinstructions which are then decoded to obtain control signals to carry out the function of the machine instruction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Execution of machine instructions	G06F 9/30

Special rules of classification

Precedence and classification rules:

The classification rules for subgroups G06F 9/22 - G06F 9/28 is different from those used in G06F 9/30 and subgroups.

All aspects disclosed in a document which are deemed useful for search receive a class, not just the subject matter of the invention. Hence multiple subgroups are to be used.

There is no distinction made between invention and additional subject matter, and the classes for additional subject matter are not used.

A single lower level group is given if appropriate. A higher level group is given for documents having features belonging to multiple subgroups.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Microprogram	internal set of instructions used to translate a machine instruction of the stored program into a series of control signals. The microprogram is usually fixed at runtime, and defines the operations of the processor. Changing the microprogram changes the functionality of the processor, i.e. what type of operations it can carry out, and how these are carried out.
Nanoinstructions	instructions of a level lower than microinstructions i.e. multiple nanoinstructions are used to execute a microinstruction.

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Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "microprogram", "microcode", "firmware" and "microinstructions"

G06F 9/223

{Execution means for microinstructions irrespective of the microinstruction function, e.g. decoding of microinstructions and nanoinstructions; timing of microinstructions; programmable logic arrays; delays and fan-out problems}

Definition statement

This place covers:

Microinstruction execution aspects independent of the type of microinstruction, e.g. decoding of microinstructions; timing.

Includes PLAs used as sequencers for microcode.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "PLA" and "Programmable Logic Array"

G06F 9/226

{Microinstruction function, e.g. input/output microinstruction; diagnostic microinstruction; microinstruction format}

Definition statement

This place covers:

Specific types of microinstruction operations.

Microinstruction set, microinstruction format.

G06F 9/24

Loading of the microprogram

Definition statement

This place covers:

- Loading of microcode implying altering the processor functionality;
- Changing the processor operations by loading or modifying microcode in the control store, thereby altering the way in which instructions are implemented in microcode;
- Fetching control microcode from ROM into RAM for execution;
- Patching by loading new microcode. Usually implemented by substituting the microcode at a particular instruction address in the microstore by a correct version during instruction fetching.

Relationships with other classification places

Loading of operating system or application programs; loading of new versions of software G06F 9/445.

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G06F 9/26

Address formation of the next micro-instruction (G06F 9/28 takes precedence){; Microprogram storage or retrieval arrangements}

Definition statement

This place covers:

- microinstruction addressing arrangements;
- sequencers for microcode;
- microinstruction storage, and microinstruction retrieval or fetching.

References

Limiting references

This place does not cover:

Enhancement of operational speed, e.g. by using several microcontrol devices operating in parallel	G06F 9/28

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "microinstruction" and "microinstruction" or "microprogram" and "microprogram"

G06F 9/261

{Microinstruction address formation}

Definition statement

This place covers:

Formation of the microinstruction address e.g. using lookup table.

G06F 9/262

{Arrangements for next microinstruction selection}

Definition statement

This place covers:

Retrieval of the next microinstruction

G06F 9/264

{Microinstruction selection based on results of processing}

Definition statement

This place covers:

Address formation of the next microinstruction by selection according to the results of processing.

Next microaddress or microinstruction derived directly from the program flow, e.g. program counter, branch.

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G06F 9/265

{by address selection on input of storage}

Definition statement

This place covers:

Address formation of the next microinstruction by selection of address on input of storage.

Selecting at the input to the control store, which address to use, and therefore which microinstruction is retrieved.

G06F 9/267

{by instruction selection on output of storage}

Definition statement

This place covers:

Address formation of the next microinstruction by selection of microinstruction on output of storage.

Inputting several addresses into the control store, and selecting at the output of the control store which microinstruction to execute.

G06F 9/268

{Microinstruction selection not based on processing results, e.g. interrupt, patch, first cycle store, diagnostic programs}

Definition statement

This place covers:

Address formation of the next microinstruction by selection not based on the results of processing.

Selecting next microaddress or microinstruction not derived directly from the program flow, e.g. interrupt, patching.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Patching by microcode loading	G06F 9/24
Address formation of the next machine instruction for runtime patching	G06F 9/328

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Patching	repairing errors of microcode in read-only storage. Usually implemented by substituting the microcode at a particular address in the microstore by a correct version during fetching.
Interrupt	changing execution flow in response to an (external) event which must be handled with a higher priority.

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G06F 9/28

Enhancement of operational speed, e.g. by using several microcontrol devices operating in parallel

Definition statement

This place covers:

Means to improve speed of microcode execution e.g. dual control stores.

Parallel or concurrent execution of microinstructions.

Special rules of classification

Takes precedence over other sub-groups of G06F 9/22.

G06F 9/30

Arrangements for executing machine instructions, e.g. instruction decode (for executing microinstructions G06F 9/22)

Relationships with other classification places

- arrangements for executing specific programs G06F 9/44;
- arrangements for executing multiple programs G06F 9/46;
- arrangements for development of stored programs; Software engineering; CASE tools G06F 8/00.

References

Limiting references

This place does not cover:

Arrangements for executing microinstructions	G06F 9/22

Special rules of classification

These rules of classification apply to the group G06F 9/30 and subgroups:

All aspects disclosed in a document which are deemed useful for search are classified.

There is no distinction made between invention and additional subject matter.

Note that combinations of subgroups are possible from different hierarchy levels, or from the same level within the hierarchy.

The following IPC subclasses are not used in this classification scheme, but are covered by the subgroups listed here:

IPC group **G06F9/302** covered by CPC group G06F 9/3001;

IPC group **G06F9/305** covered by CPC group G06F 9/30029;

IPC group **G06F9/308** covered by CPC group G06F 9/30018;

IPC group **G06F9/312** covered by CPC group G06F 9/30043;

IPC group **G06F9/315** covered by CPC group G06F 9/30032;

IPC group **G06F9/318** covered by CPC group G06F 9/30181.

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Machine instructions	Executable instructions of the processor, which can be decoded to obtain control signals

G06F 9/30003

{Arrangements for executing specific machine instructions}

Definition statement

This place covers:

Execution of specific individual machine instructions with a specific opcode and/or instruction format.

Adaptation of hardware, and hardware control, to carry out the execution of a specific machine instruction with a specific opcode and/or instruction format.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiple parallel functional units executing instructions	G06F 9/3885

Special rules of classification

In the subgroups of G06F 9/30003, if the execution of the machine instruction includes special arrangements for the setting of a condition code or flag, then also use G06F 9/30094.

In the case of a single machine instruction which carries out a combination of operations, use a subgroup for each operation.

In the subgroups hereof, the terms in capitals which are used as examples, refer to well-known types of instructions characteristic to that subgroup.

G06F 9/30007

{to perform operations on data operands}

Definition statement

This place covers:

Specific instruction to perform operation between input data operands, usually returning an output data operand as the result.

Instructions for complex operations on data, e.g. checksum, hash, transforms, cryptography and random number generator instructions.

Relationships with other classification places

Adders G06F 7/50

Multipliers G06F 7/52

Arithmetic Logic Units G06F 7/57

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific instruction for operation on memory operands	G06F 9/3004

G06F 9/3001

{Arithmetic instructions}

Definition statement

This place covers:

Specific arithmetic instruction, e.g. add, multiply and multiply accumulate.

Includes how to select the specific operation to execute in an ALU.

Relationships with other classification places

Adders G06F 7/50.

Multipliers G06F 7/52.

Arithmetic Logic Units G06F 7/57.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

ALU	Arithmetic Logic Unit
MAC	Multiply-Accumulate
FMA	Fused Multiply Add/Accumulate

G06F 9/30014

{with variable precision}

Definition statement

This place covers:

Arithmetic operation where the bit width operated on may be variable precision; e.g. floating point with rounding to fit register; double precision arithmetic.

Bit-sliced arithmetic operation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiple arithmetic units executing an instruction in tandem or cascaded	G06F 9/3893

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G06F 9/30018

{Bit or string instructions}

Definition statement

This place covers:

Specific instruction for operation on a series of connected bits, bytes, or characters.

Examples include the EDIT instruction which alters a portion of a character string, or a Find-First-One instruction which detects the position of the first '1' in a string of bits.

Includes cyclic redundancy check instructions.

G06F 9/30021

{Compare instructions, e.g. Greater-Than, Equal-To, MINMAX}

Definition statement

This place covers:

Specific instruction for comparison between two operands.

Includes matching, greater/less than, minmax instruction.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

MINMAX	instruction to find the minimum of a series of input operands, alternatively to find the maximum of the same.

G06F 9/30025

{Format conversion instructions, e.g. Floating-Point to Integer, decimal conversion}

Definition statement

This place covers:

Specific instruction for conversion from one data format to another.

Includes Endian conversion; Conversion between integer and floating-point; Decimal conversion instructions.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Data re-arranging instruction, e.g. Shuffle, Permute	G06F 9/30032

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G06F 9/30029

{Logical and Boolean instructions, e.g. XOR, NOT}

Definition statement

This place covers:

Specific instruction for logical operation or combination, e.g. XOR, NOT.

G06F 9/30032

{Movement instructions, e.g. MOVE, SHIFT, ROTATE, SHUFFLE}

Definition statement

This place covers:

Specific instruction for moving, rearranging, or re-ordering data within a register.

Examples include: Move instruction which transfers data between registers; Permute/Shuffle instruction which changes the order of data in a register; Rotate or Shift instruction which moves bits or bytes within a register.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Instruction for operation on string operands	G06F 9/30018
Instructions for format conversion operations	G06F 9/30025
Instruction for operation on memory operands	G06F 9/3004

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Move	instructions to pass data between memory locations, or between registers, without operating on the data.
Shift	instructions to move data in a serial fashion from one location to another, where the distance moved is usually less than a word, e.g. shifting data within a register by a few bits.
Rotate	instructions which are shift instructions where the bits shifted serially out are inserted into the location at the opposite end.
Permute or Shuffle	instruction which intermingles parts of a datum to produce a new datum.

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G06F 9/30036

{Instructions to perform operations on packed data, e.g. vector, tile or matrix operations}

Definition statement

This place covers:

Specific instruction operating on multiple data stored in a single register, thereby effecting a SIMD operation.

Instructions operating on packed arrays of elements, e.g. vector, tile or matrix operations.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiple functional units executing an instruction in parallel	G06F 9/3885

Special rules of classification

This subgroup may be used in combination with other subgroups of G06F 9/30007, according to the operation performed.

G06F 9/30038

{using a mask}

Definition statement

This place covers:

Using a mask while operating on and/or generating packed data. A mask may contain one or more bits for each element of packed data and may be located in a mask register.

Generating a mask used for operating on and/or generating packed data.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- mask and predicate

G06F 9/3004

{to perform operations on memory}

Definition statement

This place covers:

Specific instruction for operation on memory operands in general.

Specific instruction for control operation on memory.

Memory to memory Move instruction.

Stack instructions POP, PUSH

Table lookup instructions.

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A combination of a memory operation and further operation e.g. atomic memory operations such as read-modify-write, test-and-set.

Register allocation instructions.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific instruction for data operation	G06F 9/30007

Special rules of classification

For atomic memory operations use in combination with serialisation control instructions G06F 9/30087, and possibly G06F 9/3834 for memory consistency.

G06F 9/30043

{LOAD or STORE instructions; Clear instruction}

Definition statement

This place covers:

Specific instruction to read or write data from a memory location, e.g. LOAD, STORE, Load Multiple.

Specific instruction to clear or reset a memory location, e.g. CLEAR.

Register reset or clear instructions.

Context saving or restoring instructions.

Special rules of classification

For Load Multiple when executed as an iterative instruction use also G06F 9/30065.

G06F 9/30047

{Prefetch instructions; cache control instructions}

Definition statement

This place covers:

Specific instructions for control data or instruction prefetching from memory, e.g. Hint instruction.

Specific instructions to control cache operation, e.g. Cache Flush.

Specific instructions to control a TLB or a page table, e.g. page table entry clearing instruction.

G06F 9/3005

{to perform operations for flow control}

Definition statement

This place covers:

- Specific instruction to control program flow in general.
- Execution of an instruction to select a next instruction other than the next sequential instruction, e.g. for branching.

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- Execution of an instruction for facilitating branching, e.g. Prepare-To-Branch instruction.

Specific instruction for monitoring or tracing program flow e.g. breakpoint instruction; flow signature instruction.

Special rules of classification

Only to be used when there is subject matter relating to special adaptations or details of handling of an unconditional branch instruction.

G06F 9/30054

{Unconditional branch instructions}

Definition statement

This place covers:

Special adaptations to execute a specific instruction which unconditionally branches to a target address independent of any condition.

Examples of unconditional branch instructions are CALL, GOTO and RETURN insofar as these are unconditional.

Special rules of classification

Only to be used when there is subject matter relating to special adaptations or details of handling of an unconditional branch instruction.

G06F 9/30058

{Conditional branch instructions}

Definition statement

This place covers:

Specific instruction which causes conditional branching to a target address dependent on a runtime condition, else continues execution with the next sequential instruction.

Includes IF-THEN-ELSE constructions.

Special rules of classification

Only to be used when there is subject matter relating to special adaptations or details of handling of a specific conditional branch instruction.

G06F 9/30061

{Multi-way branch instructions, e.g. CASE}

Definition statement

This place covers:

Specific instruction which causes a branching to one of several alternative target addresses depending on a runtime condition.

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G06F 9/30065

{Loop control instructions; iterative instructions, e.g. LOOP, REPEAT}

Definition statement

This place covers:

Specific instruction used for loop control, e.g. specific loop start or end instructions.

Specific instruction which is repeatedly executed, thereby forming a (short) loop, e.g. REPEAT.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Address formation for loops, loop detection	G06F 9/325
Loop buffering	G06F 9/381

G06F 9/30069

{Instruction skipping instructions, e.g. SKIP}

Definition statement

This place covers:

Specific instruction which causes a number of instructions to be skipped i.e. not executed, thus effecting a (short) forward branch, e.g. SKIP.

A skip of a single instruction is regarded as conditional instruction execution, not skipping.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Conditional branch instruction	G06F 9/30058
Single instruction skip as conditional execution.	G06F 9/30072

G06F 9/30072

{to perform conditional operations, e.g. using predicates or guards}

Definition statement

This place covers:

Specific instruction for conditional operation depending on a runtime condition, which is not for control of program flow, i.e. instruction that is not a branch.

The operation carried out depends on a runtime condition, for example ADD or SUBTRACT depending on the value of the sign bit. Another example is a MOVE which is executed or not depending on a runtime condition.

Includes instructions which are executed conditional on a predicate or guard.

Includes conditional instructions in a branch shadow.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Conditional branch instruction	G06F 9/30058
Multiple instruction skipping for forward branch.	G06F 9/30069
Instruction which executes differently according to a mode	G06F 9/30189

Special rules of classification

G06F 9/30058 has precedence.

May be used in combination with other sub-groups of the G06F 9/30003 according to the operation performed by the conditional instruction, e.g. conditional MOVE in combination with G06F 9/30032.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Conditional	dependent on a runtime condition or operational status.
Guard	a tag indicating a condition which is assigned to an instruction. According to the outcome of the condition evaluation, the instruction is executed or skipped. Often assigned by the compiler to avoid branches
Predicate	same meaning as 'guard'

G06F 9/30076

{to perform miscellaneous control operations, e.g. NOP}

Definition statement

This place covers:

Specific instructions for operation control in general.

Includes mode switching instructions.

Includes no-operation instructions [NOP].

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific instructions for program flow control	G06F 9/3005
Multi-cycle NOP used as a pipeline delay instruction	G06F 9/30079

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G06F 9/30079

{Pipeline control instructions, e.g. multicycle NOP}

Definition statement

This place covers:

Specific instruction to control an instruction pipeline, e.g. HALT, FLUSH

Instructions for variable delay of pipeline or execution, e.g. multicycle NOP.

G06F 9/30083

{Power or thermal control instructions}

Definition statement

This place covers:

Specific instruction to control power consumption or thermal aspects of the processor, e.g. SLEEP.

G06F 9/30087

{Synchronisation or serialisation instructions}

Definition statement

This place covers:

Specific instruction to control serialisation of instruction execution; to control synchronisation of instruction execution.

Includes specific instructions used to implement memory locks; barriers. Includes instructions to facilitate atomic execution.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program synchronisation ; Mutual exclusion	G06F 9/52

Special rules of classification

For atomic memory operations use also G06F 9/3004.

For barrier or fence instructions use also G06F 9/3834.

For synchronisation instruction which affects the execution of a thread use also G06F 9/3009.

G06F 9/3009

{Thread control instructions}

Definition statement

This place covers:

Specific instruction to control multi-threading; starting and stopping threads, e.g. FORK; JOIN.

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G06F 9/30094

{Condition code generation, e.g. Carry, Zero flag}

Definition statement

This place covers:

Special arrangements for the generation or storage of runtime conditions, e.g. flags (Carry, Zero flag, etc.); writing to status register.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Execution of instructions according to a runtime mode	G06F 9/30189

G06F 9/30098

{Register arrangements}

Definition statement

This place covers:

Groups of registers; register files.

Register file addressing; addressing partial registers.

Accessing register file e.g. contention.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Register address space extension	G06F 9/30138
Register renaming	G06F 9/384

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Register	set of one-bit storages, e.g. latches, accessed in parallel
Register file	set of registers. May be implemented in a single or in multiple memories

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

GPR	general purpose register

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G06F 9/30101

{Special purpose registers}

Definition statement

This place covers:

Special adaptation of the use of single or multiple registers for a dedicated purpose, not being general purpose registers. May not be part of the register file.

Examples include particular use of dedicated address register, control register, status register, condition code register, Top Of Stack register.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program counter registers	G06F 9/321

Special rules of classification

Only to be used when there is subject matter relating to special adaptations or details of use of a special purpose register.

G06F 9/30105

{Register structure}

Definition statement

This place covers:

Details of the structure of an individual register.

Registers having associated bits e.g. valid bits, tags, flags.

G06F 9/30109

{having multiple operands in a single register}

Definition statement

This place covers:

Registers which are logically partitioned into multiple operands, e.g. for packed data or parallel operations.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiple registers used for variable length operands	G06F 9/30112

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G06F 9/30112

{comprising data of variable length}

Definition statement

This place covers:

Register structure for variable length operands, i.e. variable length data can be stored, e.g. single register for storing an M-bit integer or an N-bit integer, or a single register for storing an X-bit integer or a Y-bit floating point value.

Use of partial registers for short data.

Combinations of registers for longer or higher-precision data, e.g. by concatenation.

Accessing of variable length registers.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

A single register for multiple operands	G06F 9/30109

G06F 9/30116

{Shadow registers, e.g. coupled registers, not forming part of the register space}

Definition statement

This place covers:

Registers which cannot be addressed by an instruction, and hence are invisible to the architecture, e.g. coupled registers, not forming part of the register space.

Register with an associated copy, e.g. for saving of architectural state.

Special rules of classification

Use in combination with G06F 9/30123 for shadow register set used for another context.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Register space	the address space used by registers i.e. the range of program addressable register locations.

G06F 9/3012

{Organisation of register space, e.g. banked or distributed register file}

Definition statement

This place covers:

The physical or logical organisation of the register space in general.

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Includes partitioned, distributed or banked register files, e.g. per execution unit.

Local and global register files.

Special rules of classification

Register banks for register space extension use G06F 9/30138.

Register banks for context data use G06F 9/30123.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Register space	logical address space for registers, i.e. the range of addresses defined by a register specifier

G06F 9/30123

{according to context, e.g. thread buffers}

Definition statement

This place covers:

Organisation of sets of registers used for storing the data of a particular context, e.g. local variables.

Includes thread buffers used to hold the context of a thread, and forming part of an instruction stream.

Special rules of classification

Use in combination with G06F 9/30116 for shadow register set used for another context.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Context data	operands and data representing the architectural state of a context, and which needs to be saved on a context switch

G06F 9/30127

{Register windows}

Definition statement

This place covers:

Organisation of sets of registers used to implement register windows.

May have a pointer to the first window location, which may be used as a base address. Used for example for fast context switching, by moving from a current window to a next window.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Register window	set of contiguous registers used to implement a window to hold context data

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G06F 9/3013

{according to data content, e.g. floating-point registers, address registers}

Definition statement

This place covers:

Organisation of sets of registers used to store different types of data.

Includes address registers, Boolean registers, floating point registers, parameter registers.

G06F 9/30134

{Register stacks; shift registers}

Definition statement

This place covers:

Register stacks are a series of register locations implementing a stack. The register stack is addressable generally using a register containing the Top-of Stack pointer. Writing to the TOS location implies adding an entry to the top of the stack, reading implies removing an entry from the top of the stack.

The implementation of stack read/write operation in a register stack may involve physically shifting the entries in the queue up or down using shift registers; or alternatively may involve incrementing or decrementing the TOS pointer to access the next or previous register.

Details of shift registers implementing a FIFO buffer are also found here.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Special purpose register for TOS pointer	G06F 9/30101

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Register stack	contiguous set of register locations used to implement a stack. May be implemented as a shift register
Shift register	register which shifts its contents in a bit-parallel fashion into an adjacent register.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

TOS	Top of Stack

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G06F 9/30138

{Extension of register space, e.g. register cache}

Definition statement

This place covers:

Increasing or decreasing the number of available addressable locations in register address space, e.g. more or less physical registers than logical registers, register cache.

Extension of register address length e.g. using indexing.

G06F 9/30141

{Implementation provisions of register files, e.g. ports}

Definition statement

This place covers:

Hardware implementation of register files.

Register file port architecture; address or data ports.

Internal bypass path of register files.

Adaptations of register file hardware for particular problems, e.g. for power saving; for fault tolerance.

Includes transposing register file being accessible vertically or horizontally.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Bypass path	direct connection between a register file input and output.

G06F 9/30145

{Instruction analysis, e.g. decoding, instruction word fields}

Definition statement

This place covers:

Decoding of instructions in general, of opcode in particular.

Instruction format, instruction encoding, instruction word fields.

Instruction set as a whole.

Relationships with other classification places

Decoding of microinstructions G06F 9/223.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Decoding of microinstructions	G06F 9/223

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Runtime instruction translation	G06F 9/3017

Special rules of classification

Runtime instruction translation using a decoder is classified under G06F 9/3017 and sub-groups, even if this involves decoding, since the purpose is translation.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

RISC	Reduced Instruction Set Computer. Architecture having set of simple instructions which are decoded into direct control signals, and which take a single cycle to execute.
CISC	Complex Instruction Set Computer. Architecture having set of complex instructions which are decoded into internal (native; microcode) instructions, and which may take multiple cycles to execute.

G06F 9/30149

{of variable length instructions}

Definition statement

This place covers:

Decoding of variable length instructions.

Includes instruction where the relative length of operation and operand part is variable.

Ensuring a whole instruction is decoded. Parsing variable length instructions (VLI).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Instruction pre-fetching when instruction length is variable, e.g. line-crossing fetch; alignment in instruction buffer	G06F 9/3816

G06F 9/30152

{Determining start or end of instruction; determining instruction length}

Definition statement

This place covers:

Arrangements for determining and/or marking the boundaries of a variable length instruction (VLI); Special arrangements for determining the length of a variable length instruction other than by decoding the length.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pre-decoding of instructions	G06F 9/382

G06F 9/30156

{Special purpose encoding of instructions, e.g. Gray coding}

Definition statement

This place covers:

Instruction encodings (e.g. Gray coding) to achieve a secondary effect, e.g. power saving, saving memory space, security, fault tolerance.

Relationships with other classification places

Computer-aided instruction set design G06F 30/00.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Runtime instruction translation for compressed or encrypted instructions	G06F 9/30178

Special rules of classification

Use in combination with G06F 9/30178 for decompression by translation, or with G06F 9/3822 for format field decoding for VLIW.

G06F 9/3016

{Decoding the operand specifier, e.g. specifier format}

Definition statement

This place covers:

Decoding operand fields of instructions; Format of operand fields of instructions, e.g. specifier format.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Decoding the opcode of instructions	G06F 9/30145

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G06F 9/30163

{with implied specifier, e.g. top of stack}

Definition statement

This place covers:

Instruction format which is shorter by having operand specifier field(s) missing but implied, e.g. Top of Stack, accumulator, dedicated register.

G06F 9/30167

{of immediate specifier, e.g. constants}

Definition statement

This place covers:

Decoding of immediate operand specifiers or constants; Concatenation of immediates; Buffering of immediates.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Immediate	data in an instruction to be used directly as an operand, e.g. without storing in a register
Constant	same meaning as 'immediate'

G06F 9/3017

{Runtime instruction translation, e.g. macros}

Definition statement

This place covers:

Runtime translation of an instruction by decoding an instruction which is non-native to produce an instruction or set of instructions that can be decoded by the processor. The decoding of machine instructions of the executing processor's instruction set, or decoding of lower level microcode is not meant to be included here.

Altering the format or encoding of the input instruction, e.g. length of fields.

Translating a single instruction, e.g. macro, into multiple executable instructions, or the reverse (macro formation).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Decoding of microinstructions	G06F 9/223
Decoding of instructions	G06F 9/30145
Instruction emulation or interpretation	G06F 9/455

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Macro	An opcode which is an alias for a series of instructions, i.e. a function.
Non-native instruction	An instruction which is not executable in the architecture of the processor.

G06F 9/30174

{for non-native instruction set, e.g. Javabyte, legacy code}

Definition statement

This place covers:

Runtime translation of a non-native instruction (e.g. Javabyte, legacy code) into an executable native instruction using hardware means, e.g. decoder, look-up table.

Runtime translation for the purpose of ISA emulation in hardware.

Relationships with other classification places

Instruction emulation or interpretation G06F 9/455.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Non-native instruction set	set of instructions intended to execute on a different architecture, which cannot run without translation or reformatting. Legacy code may be considered non-native.
Non-native instruction	an instruction which is not executable in the architecture of the processor.

G06F 9/30178

{of compressed or encrypted instructions}

Definition statement

This place covers:

Runtime translation of an encrypted or compressed instruction into an instruction which can be executed.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Special encoding of instructions for saving memory or power.	G06F 9/30156

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G06F 9/30181

{Instruction operation extension or modification}

Definition statement

This place covers:

Modification or extension of the execution of an instruction in general.

Modifications to the instruction itself, or to the architecture, which increase the number of operations available to the architecture.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Execution unit with adaptable datapath for complex operation	G06F 9/3897

G06F 9/30185

{according to one or more bits in the instruction, e.g. prefix, sub-opcode}

Definition statement

This place covers:

Modification of the operation of an instruction according to one or more bits encoded within, or appended to, the instruction, e.g. prefix, sub-opcode.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Modification of the operation of an instruction according to an execution mode	G06F 9/30189

G06F 9/30189

{according to execution mode, e.g. mode flag}

Definition statement

This place covers:

Modification of the operation of one or more instructions according to a mode of operation, e.g. mode flag in a mode register.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mode switching instruction	G06F 9/30076
Instruction operation extension or modification according to one or more bits in the instruction, e.g. prefix, sub-opcode	G06F 9/30185

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G06F 9/30192

{according to data descriptor, e.g. dynamic data typing}

Definition statement

This place covers:

Modification of the operation of an instruction according to a data type descriptor, e.g. dynamic data typing.

G06F 9/30196

{using decoder, e.g. decoder per instruction set, adaptable or programmable decoders}

Definition statement

This place covers:

Modification of the operation of an instruction by modifying the decoding of the instruction using more than one decoder, or a decoder which is adaptable or programmable.

Extension of the instruction set using multiple decoders for multiple instruction sets.

G06F 9/32

Address formation of the next instruction, e.g. by incrementing the instruction counter (G06F 9/38 takes precedence)

Definition statement

This place covers:

Selecting or calculating the next instruction address.

Sequencers for machine instructions.

References

Limiting references

This place does not cover:

Concurrent instruction execution, e.g. pipeline, look ahead	G06F 9/38

Informative references

Attention is drawn to the following places, which may be of interest for search:

Subprogram jump	G06F 9/4486

G06F 9/321

{Program or instruction counter, e.g. incrementing}

Definition statement

This place covers:

Incrementing/decrementing means for the program counter.

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Selection of next PC from pre-calculated constant values, e.g. +1, +2, 0, -1.

PC arrangements, e.g. multiple PCs.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Program counter	a dedicated register which holds the address of the current instruction in the program sequence

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

PC	Program counter

G06F 9/322

{for non-sequential address}

Definition statement

This place covers:

Address formation, or selection, for the next instruction, being a non-sequential address.

Address calculation or selection, for the execution of branch instructions in general, e.g. for multiple types of branch.

Selection of next instruction address from various alternatives, e.g. PC, a constant, branch target, branch fall-through.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

PC address formation	address calculation, i.e. address selection

G06F 9/323

{for indirect branch instructions}

Definition statement

This place covers:

Determination of program counter for an instruction that specifies where an address is located (rather than specifying the address itself) and branches using the address. The specification of the address location can be explicit (e.g. Branch R1) or implicit (e.g. RETURN). The address can be the target address or a base address used to calculate the target address.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Special adaptations or details of handling of a specific unconditional indirect branch instruction that are distinct from program counter determination	G06F 9/30054
Special adaptations or details of handling of a specific conditional indirect branch instruction that are distinct from program counter determination	G06F 9/30058

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- Indirect branch, computed branch, register-indirect branch and indirect jump.

G06F 9/324

{using program counter relative addressing}

Definition statement

This place covers:

Formation of the next instruction address using an offset from the program counter.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Address formation of the instruction operand or result using PC-relative addressing	G06F 9/3557

G06F 9/325

{for loops, e.g. loop detection or loop counter}

Definition statement

This place covers:

Formation of the next instruction address for a loop.

Loop formation; loop detection.

Loop counters.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific loop control instructions or iterative instructions	G06F 9/30065
Buffering of loop instructions	G06F 9/381

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G06F 9/327

{for interrupts}

Definition statement

This place covers:

Formation of the next instruction address for an interrupt, using hardware means e.g. look-up table.

G06F 9/328

{for runtime instruction patching}

Definition statement

This place covers:

Formation of the address of a next instruction for the purpose of patching an instruction.

Includes detection of program addresses or instructions to be patched.

Relationships with other classification places

Patching of software or loading of new version of software G06F 9/445.

Instruction emulation G06F 9/455.

Runtime patching of microcode in ROM G06F 9/268.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Patching	repairing errors in machine instructions in read-only storage at runtime. Usually implemented by substituting the instruction at a particular address in the memory by a correct version.

G06F 9/34

Addressing or accessing the instruction operand or the result {; Formation of operand address; Addressing modes (address translation G06F 12/00)}

Definition statement

This place covers:

- Addressing the instruction operand or the result.
- Operand addressing modes in general.
- Endian conversion.

Relationships with other classification places

Addressing of memories in general, address translation G06F 12/00.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Accessing an operand in a pipeline	G06F 9/3824

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Address translation	G06F 12/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Addressing mode	type of operand addressing e.g. indirect, indexed

G06F 9/342

{Extension of operand address space}

Definition statement

This place covers:

Increasing the size of the addressable operand memory space i.e. increasing the number of available addressable locations.

Extending the operand address space by increasing the bit length of addresses.

Extending the operand address space by use of multiple address spaces; bank pointer.

Relationships with other classification places

Address space extension in memory systems G06F 12/0615

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organisation of register space	G06F 9/3012

G06F 9/345

of multiple operands or results {(addressing multiple banks G06F 12/06)}

Definition statement

This place covers:

Address formation for a series or group of operands, e.g. for an array.

Address formation for pairs of operands at adjacent addresses i.e. addr;addr+1.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Prediction of operand addresses for operand prefetching	G06F 9/3832
Addressing multiple banks	G06F 12/06

Special rules of classification

May also be classified according to the addressing mode.

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G06F 9/3455

{using stride}

Definition statement

This place covers:

Address formation for a series of operands by adding a stride value to the previous address to form the next address.

May be used to predict the next operand address.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Stride	offset or displacement which may be a constant.

G06F 9/35

Indirect addressing

Definition statement

This place covers:

Address formation using a single address operand, e.g. using the contents of an address register or GPR.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Indirect addressing	the address is the value contained in the register specified in the instruction.
Direct addressing	the address is the value specified in the instruction.
GPR	general purpose register

G06F 9/355

Indexed addressing

Definition statement

This place covers:

Operand address formation using more than one address operand, e.g. using base + index/offset registers.

Indexed address formation or calculation details.

Uses at least two address operands which are added or concatenated. The resulting address may be longer than the base address, hence indexed addressing may be also used for address space extension.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Address space extension	G06F 9/342

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Indexed addressing	the address is the value contained in the base register specified in the instruction summed with the value contained in the index register specified in the instruction. The index part of the address usually consists of less bits than the base part of the address, and is therefore an offset from the base address

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- " index"," offset", "displacement" and "delta"

G06F 9/3552

{using wraparound, e.g. modulo or circular addressing}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Wraparound	incrementing the maximum address value, e.g. 11111111 leads to wraparound to the lowest address value, e.g. 00000000, so that addressing is continuous, avoiding an overflow error
Modulo or circular addressing	same meaning than Wraparound

G06F 9/3555

{using scaling, e.g. multiplication of index}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Scaling	indexed addressing where the index address is multiplied by a factor before adding to the base address

G06F 9/3557

{using program counter as base address}

Definition statement

This place covers:

- Address formation using the program counter as a base for indexed addressing;
- PC-relative addressing.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Next instruction addressing using an offset from the program counter.	G06F 9/324

G06F 9/38

Concurrent instruction execution, e.g. pipeline or look ahead

Definition statement

This place covers:

Simultaneous execution of instructions in general, in parallel or pipelined.

Special architectures where instruction execution is concurrent.

Includes stack machines.

Relationships with other classification places

Concurrent program execution: G06F 9/46.

G06F 9/3802

{Instruction prefetching}

Definition statement

This place covers:

Prefetching and fetching of instructions for execution, in general.

Instruction buffering; instruction caches

G06F 9/3804

{for branches, e.g. hedging, branch folding}

Definition statement

This place covers:

Prefetching of instructions for branch paths.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Hedging	Fetching both paths of an unresolved conditional branch
Branch folding	Removal of a branch instruction from the instruction stream, e.g. by including the branch condition in an instruction as a predicate

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G06F 9/3806

{using address prediction, e.g. return stack, branch history buffer}

Definition statement

This place covers:

Using a history of previous branch target addresses to predict the address to fetch from, e.g. branch target buffer, branch history buffer;

Address buffers for predicting next fetch address for a branch, e.g. return address stack.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dynamic prediction of branch direction	G06F 9/3844
Static prediction of branch direction	G06F 9/3846
Hybrid prediction of branch direction	G06F 9/3848

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

BTB	buffer indexed by an instruction fetch address or PC, which returns the predicted target address if the instruction is a taken branch.
BHT	buffer indexed by a branch instruction address, which returns a prediction of whether the branch is taken or not.
Return address stack	Stack to hold the program address to return to after a Call-type branch. The stack structure allows nesting of Calls.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

BTB	Branch Target Buffer
BHT	Branch History Table
BTAC	Branch Target Address Cache

G06F 9/3808

{for instruction reuse, e.g. trace cache, branch target cache}

Definition statement

This place covers:

Prefetching of instructions intended to be used more than once, thereby saving fetch time.

Buffering of instructions for reuse, e.g. trace cache.

Branch target caches for caching a branch target instruction.

The storing of addresses, e.g. branch target address caches (BTAC), is not meant to be stored here.

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Relationships with other classification places

Program tracing for monitoring G06F 11/3466.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Branch target cache	History buffer of first instruction at a branch target, which returns an instruction rather than an address, thus saving fetch time.
Trace cache	Cache storing a history of previously executed paths through the program, as sequences of instructions. Accessing the trace cache returns the next predicted instructions in the sequence.

G06F 9/381

{Loop buffering}

Definition statement

This place covers:

Prefetching of instructions intended to be used in a loop, thereby saving fetch time;

Buffering of instructions for loops.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific loop control instructions	G06F 9/30065
Formation of the next instruction address for a loop; detection of loops	G06F 9/325

G06F 9/3812

{with instruction modification, e.g. store into instruction stream}

Definition statement

This place covers:

Instruction prefetching in an architecture allowing instruction modification.

How to handle store-into-instruction-stream, wherein an instruction in memory is modified, e.g. by writing back a new operand value, hence the prefetched copy of the instruction is stale.

G06F 9/3814

{Implementation provisions of instruction buffers, e.g. prefetch buffer; banks}

Definition statement

This place covers:

- Special arrangements for buffering of prefetched instructions;
- Prefetch buffers;
- Banked or partitioned instruction buffers.

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Prefetch buffer	in this subclass, a buffer to hold a recently fetched set of instructions, usually between the instruction memory and the instruction decoder, e.g. cache line buffer.

Synonyms and Keywords

In patent documents, the following words/expressions are often used with the meaning indicated:

"cross-modifying code"	"instructions which can modify other instructions".
"self-modifying code"	"instructions which can modify themselves".

G06F 9/3816

{Instruction alignment, e.g. cache line crossing}

Definition statement

This place covers:

Arrangements for (correct) alignment of instructions in prefetch buffers.

Instruction prefetching which crosses a line in memory or cache, for example for variable length instructions.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Variable length instructions	G06F 9/30149
Predecoding instructions for alignment information	G06F 9/382

G06F 9/3818

{Decoding for concurrent execution}

Definition statement

This place covers:

Decoding for enabling the concurrent execution of instructions.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Decoding of a single instruction	G06F 9/30145

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G06F 9/382

{Pipelined decoding, e.g. using predecoding}

Definition statement

This place covers:

Decoding for enabling the pipelined execution of instructions.

Predecoding stage in a pipeline.

Partitioned decoding stage.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Instruction alignment using predecode information	G06F 9/3816

G06F 9/3822

{Parallel decoding, e.g. parallel decode units}

Definition statement

This place covers:

Decoding for enabling the parallel execution of instructions, e.g. parallel decode units.

Special details of decoding multiple instructions in parallel, e.g. decoding of Very Long Instruction Word format field.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compressed VLIW instructions	G06F 9/30156

G06F 9/3824

{Operand accessing}

Definition statement

This place covers:

Retrieving operands for instructions, from memory, registers, other pipeline stages or execution units.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Load, Store instructions	G06F 9/30043
Register file accessing in general	G06F 9/30098

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Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "input operand" and "source"
- "output operand", "result" and "destination"

G06F 9/3826

{Bypassing or forwarding of data results, e.g. locally between pipeline stages or within a pipeline stage}

Definition statement

This place covers:

Arrangements for the transfer of an instruction result to a dependent instruction, without first storing in the architected state, e.g. bypassing the register file;

Transfer of operand data from the output of a functional unit to the input of another functional unit, without waiting for the completion of the data producing instruction, or without waiting for the data to be stored in the register file, e.g. locally between pipeline stages, within a pipeline stage.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transfer of data between Store and Load instructions for memory consistency	G06F 9/3834

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "bypassing" and "forwarding"

G06F 9/3828

{with global bypass, e.g. between pipelines, between clusters}

Definition statement

This place covers:

Bypass of an instruction result to a dependent instruction in another pipeline, or group of execution units, e.g. between pipelines, between clusters;

Bypass arrangements for global data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Parallel execution units organised in clusters	G06F 9/3891

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Cluster	Group of execution units and register resources

G06F 9/383

{Operand prefetching (cache prefetching G06F 12/0862)}

Definition statement

This place covers:

Prefetching of data operands;

Software data prefetching;

Prefetching from a data cache reduces cache misses during execution of the instruction using the data.

Relationships with other classification places

Prefetching between higher level memories: G06F 12/0862.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific instruction to prefetch data from memory	G06F 9/30047
Instruction prefetching	G06F 9/3802
Speculative load instructions	G06F 9/3842
Prefetching between higher level memories	G06F 12/0862

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Operand prefetching	Look-ahead fetching of an operand before the execution of the instruction which will use the operand

G06F 9/3832

{Value prediction for operands; operand history buffers}

Definition statement

This place covers:

Reuse or prediction of the value of an operand;

Operand value prediction using a history of the value of an operand;

Operand value buffering for reuse;

Prediction of the address of an operand.

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Relationships with other classification places

Data caches in general:G06F 12/08.

G06F 9/3834

{Maintaining memory consistency}

Definition statement

This place covers:

How to maintain memory consistency during operand accessing for instruction execution.

Avoiding errors caused by loads and/or stores to the same memory address being executed out of order or concurrently.

Ensuring stored operands and fetched operands are consistent, e.g. memory disambiguation.

Ensuring out-of-order loads receive the latest store information by forwarding.

Relationships with other classification places

Cache consistency protocols: G06F 12/0815.

Multiprogramming arrangements for transaction processing: G06F 9/466.

Multiprogramming arrangements for program synchronisation: G06F 9/52.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific atomic or synchronisation instructions, e.g. Read-Modify-Write	G06F 9/30087, G06F 9/3004
Operand bypassing between Load and Store instructions	G06F 9/3826
Consistency of architectural state	G06F 9/3854
Cache consistency protocols	G06F 12/0815

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Memory consistency	Keeping data in the memory up-to-date. Read data should not be stale; written data should not be overwritten by older data, which may occur in out-of-order execution.
Memory disambiguation	Checking stores against earlier executed out-of-order loads, and re-issuing the loads if their data is stale.

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G06F 9/3836

{Instruction issuing, e.g. dynamic instruction scheduling or out of order instruction execution}

Definition statement

This place covers:

Runtime scheduling or issuing of instructions, e.g. dynamic instruction scheduling, out of order instruction execution.

Issuing policies or mechanisms for instructions. Instruction dispatching to execution units or execution buffers.

Concurrent execution of instructions.

Synchronisation of instruction execution.

Relationships with other classification places

Runtime scheduling of tasks: G06F 9/4806

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Accessing of operands for issue	G06F 9/3824
Re-issuing of faulting instructions	G06F 9/3861

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Issuing	Runtime selection or scheduling of the instructions to execute.
Superscalar	Architecture where more than one instruction is selected to be executed in parallel in one cycle.
VLIW	Very Long Instruction Word being a compound instruction word formed by the compiler, containing multiple sub-instructions to be issued and completed together in one cycle

G06F 9/3838

{Dependency mechanisms, e.g. register scoreboarding}

Definition statement

This place covers:

Special arrangements to detect or record data dependencies between instruction operands at issue time, e.g. register scoreboarding.

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Data dependency	When a first instruction specifies an operand which is also specified in a following second instruction, the second instruction is dependent on the first, and cannot be executed until the dependency is resolved, or the operand is available.
Register scoreboard	Table of indicators of which instructions use which registers. May be used for dependency checking by detecting two instructions having a matching indicator.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "Pseudo data dependency" , "false data dependency" , "anti-dependency" , "write-after-write dependency" and "output dependency"

G06F 9/384

{Register renaming}

Definition statement

This place covers:

Special arrangements to carry out register renaming, e.g. as a means of avoiding pseudo dependencies;

Rename tables and buffer, which may form part of a reorder buffer.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reorder buffers	G06F 9/3856

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Register renaming	Associating a logical register specified in an instruction to a unique physical register. Allows multiple physical registers to be assigned to hold data for multiple instances of a logical register, thus avoiding false dependencies.Relies on the set of physical registers being larger than the set of logical registers.
RAW, read-after-write dependency	Occurs when a read to the same location occurs after a write to the same location. If the instructions are not in program order, this may lead to wrong execution.
WAW, write-after-write dependency	It occurs when a write to the same location occurs after another write to the same location. If the instructions are not in program order, this may lead to wrong execution.
Pseudo data dependency, false dependency, anti-dependency, output dependency	Dependency which may be resolved without wrong execution, e.g. a write followed in program order by another write; a read followed in program order by a write.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "RAW" and "read-after-write dependency"
- "WAW" and "write-after-write dependency"
- "pseudo data dependency", "false dependency", "anti-dependency", "output dependency"

G06F 9/3842

{Speculative instruction execution}

Definition statement

This place covers:

Execution of instructions ahead of program order, with the presumption that execution will prove to be correct, e.g. speculative loads, boosting.

Speculative instructions which are executed, e.g. alternative paths of a branch.

Execution of instructions dependent on a branch before its outcome is known.

Execution of instructions in a low-level transaction, e.g. machine instructions between a start transactional execution machine instruction and an end transactional execution machine instruction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Conditional instruction execution, e.g. predication	G06F 9/30072
Result nullification for executed instructions	G06F 9/38585
Recovery after mis-speculation	G06F 9/3861

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Speculative instructions	Executed instructions which may not be on the actual path taken through the program, and therefore may require recovery after execution if mis-speculation occurs.
Speculative loads	Look-ahead or early execution of load instructions, where recovery would be needed in the case of mis-speculation.
Transaction	A sequence of instructions executed as an atomic group. A transaction either commits (its updates take effect), or aborts and is rolled back (its updates are discarded).

G06F 9/3844

{using dynamic branch prediction, e.g. using branch history tables}

Definition statement

This place covers:

Speculative execution of instructions using dynamic branch prediction;

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Using runtime conditions, and the previous behaviour of branches, to predict the outcome of a branch, without having to wait for its execution, e.g. branch history table;

Early generation of branch results.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Prediction of a branch address/target	G06F 9/3806
Using hybrid branch prediction	G06F 9/3848

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Dynamic prediction	Branch prediction based on runtime conditions, as opposed to compile-time branch prediction.
Branch history table	Branch prediction based on runtime conditions, as opposed to compile-time branch prediction.
Branch Target Buffer	Buffer indexed by an instruction fetch address or PC, which returns the predicted target address if the instruction is a taken branch.
Branch History Table	Buffer indexed by a branch instruction address, which returns a prediction of whether the branch is taken or not.
Branch Prediction Counter	saturating counter used to obtain a weighting for a branch prediction based on several branch executions.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

BTB	Branch Target Buffer
BHT	Branch History Table
BTAC	Branch Target Address Cache

G06F 9/3846

{using static prediction, e.g. branch taken strategy}

Definition statement

This place covers:

Speculative execution of instructions using static branch prediction, e.g. branch taken strategy;

Branch prediction performed by compiler, and not dependent on runtime conditions, e.g. hint bits.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Prediction of a branch address/target	G06F 9/3806

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Using hybrid branch prediction	G06F 9/3848

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Static prediction	Branch direction is predicted based on compile-time branch prediction.
Hint bit	Bit in branch instruction inserted by compiler to give an indication whether branch predicted taken or not.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "hint bit" and "static bit"

G06F 9/3848

{using hybrid branch prediction, e.g. selection between prediction techniques}

Definition statement

This place covers:

Prediction schemes involving more than one type of predictor, e.g. selection between prediction techniques;

Static and dynamic prediction used alternately;

Local and global prediction mechanisms;

Two-level branch prediction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Prediction of a branch address/target	G06F 9/3806
Using dynamic prediction, e.g. branch history table	G06F 9/3844
Using static prediction, e.g. branch taken strategy	G06F 9/3846

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Two-level branch prediction	Two-dimensional prediction where the output of one method is used as an index into another method to provide a prediction (e.g. branch history's output as an index into a pattern history table).

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G06F 9/3851

{from multiple instruction streams, e.g. multistreaming}

Definition statement

This place covers:

- Issuing instructions from multiple threads each having a context, including at least a program counter, and possibly registers and execution resources;
- Includes multiple streams for different threads, or from both directions of a branch;
- Interleaved execution of threads in a single or in multiple streams;
- Stream selection.

Relationships with other classification places

Thread scheduling or multithreading at OS or application level G06F 9/46.

References

Limiting references

This place does not cover:

Dispatching of multiple tasks or threads	G06F 9/48

Informative references

Attention is drawn to the following places, which may be of interest for search:

Context registers for multiple streams	G06F 9/30123
Execution units or pipeline architectures for executing multiple streams	G06F 9/3889

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Instruction stream	Architectural aspects, e.g. resources and context, used to execute a thread or series of instructions. Includes at least a program counter, and possibly including dedicated instruction buffers, registers, status register, execution units.

G06F 9/3853

{of compound instructions}

Definition statement

This place covers:

Issuing of compound instructions;

Compounding single instructions into a group;

Issuing a group of instructions, that must complete in the same cycle;

Dispatching aspects of compound instructions, e.g. variable format VLIW instructions.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Decoding of VLIW format field	G06F 9/3822

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Compound instruction	Consisting of sub-instructions, i.e. contains multiple opcodes, e.g. VLIW instructions.

G06F 9/3854

{Instruction completion, e.g. retiring, committing or graduating}

Definition statement

This place covers:

Post-execution stages

G06F 9/3856

{Reordering of instructions, e.g. using queues or age tags}

Definition statement

This place covers:

Special arrangements for reordering of instructions issued out-of-order;

Queue arrangements include reorder buffers;

Age tags include marking the instructions with the original program order.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Reordering	Restoring the program order after instruction execution, ensuring that the instructions complete in the correct order.
Age tag	An indicator associated with an instruction to indicate its original program order, e.g. in the case of instructions executed out-of-order.

G06F 9/3858

{Result writeback, i.e. updating the architectural state or memory}

Definition statement

This place covers:

Special arrangements to write back results to the architectural state or memory, which may be for ensuring correctness of the architectural state;

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Special arrangements to write back multiple results from a low-level atomic or transactional block, e.g. machine instructions between a start transactional execution machine instruction and an end transactional execution machine instruction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific machine instruction to store data to memory	G06F 9/30043
Maintaining memory consistency	G06F 9/3834
Recovery of architectural state after an exception	G06F 9/3861

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Architectural state	Runtime data in the pipeline resources, including program counter, instruction queue, status register, condition codes, general purpose and special purpose registers, rename data, pipeline registers, etc. The state is updated when one of these resources is written to.

G06F 9/38585

{with result invalidation, e.g. nullification}

Definition statement

This place covers:

Ensuring correctness of the architectural state by nullifying the results of wrongly executed instructions.

Nullifying may use, for example, preventing writeback; tagging the result as invalid; clearing of result.

Arrangements for nullifying the result of a predicted instruction where the predicate resolves to false.

Nullifying multiple results from a low-level atomic or transactional block, e.g. machine instructions between a start transactional execution machine instruction and an end transactional execution machine instruction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Instructions which execute conditionally	G06F 9/30072
Recovery from exceptions	G06F 9/3861

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Nullification	Invalidation of an instruction result. The instruction has already executed, but the results are invalid, and must not update the architectural state.

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G06F 9/3861

{Recovery, e.g. branch miss-prediction, exception handling (error detection or correction G06F 11/00)}

Definition statement

This place covers:

Recovery of correct instruction execution after an exception or fault;

Restoring the correct architectural state after an exception, e.g. after branch mis-prediction, arithmetic overflow.

May require nullifying wrong results; flushing the instructions in the pipeline; restarting the pipeline from the point of exception.

Relationships with other classification places

Error detection or correction: G06F 11/00.

Exception handling in genera: G06F 11/0793.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Instruction result nullification	G06F 9/38585

Special rules of classification

The group is only to be used for the handling of exceptions caused by instruction execution.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Architectural state	The runtime data in the pipeline resources, including program counter, instruction queue, status register, condition codes, general purpose and special purpose registers, rename data, pipeline registers etc.
Exception, fault	Error caused by the execution of an instruction, e.g. floating point overflow; page fault; mis-speculation.

G06F 9/3863

{using multiple copies of the architectural state, e.g. shadow registers}

Definition statement

This place covers:

Recovery using multiple copies of architectural state;

Restoring the architectural state to that previous to an exception using a previous version of the state, e.g. checkpoint, future file, shadow registers. Also known as rollback.

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Relationships with other classification places

Software debugging: G06F 11/362.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Shadow register structure	G06F 9/30116

Special rules of classification

The subgroup is only to be used for the handling of exceptions caused by instruction execution. In particular, checkpointing for software debugging is not meant.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Architectural state	the runtime data in the pipeline resources, including program counter, instruction queue, status register, condition codes, general purpose and special purpose registers, rename data, pipeline registers etc.

G06F 9/3865

{using deferred exception handling, e.g. exception flags}

Definition statement

This place covers:

Handling or nullification of an instruction exception, e.g. using exception flags, which does not occur in the cycle in which the exception is detected, but later, e.g. at writeback stage.

G06F 9/3867

{using instruction pipelines}

Definition statement

This place covers:

Concurrent execution using instruction pipelines;

Control of instructions moving through a pipeline of functional stages. A typical pipeline consists of these stages: Instruction fetch; Instruction decode; Operand fetching; Instruction issue; Instruction execution; Instruction completion/Result writeback;

Pipeline control, e.g. flushing, halting;

Pipeline stages, e.g. type of stage, number of stages;

Variable length pipeline, e.g. elastic pipeline;

Counterflow pipeline;

Cascaded pipelines.

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Relationships with other classification places

Data-driven systems, e.g. tokens: G06F 9/4494.

Computer architectures for data-driven systems: G06F 15/82.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific instructions for pipeline control	G06F 9/30079
Asynchronous pipeline control, e.g. using handshaking	G06F 9/3871

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Pipeline	Series of linearly sequential execution stages for executing instructions. The stages have buffers between them for output data which is input into the next stage. The buffers may be clocked so that data from one stage moves into the next stage on a clock signal. All stages move at once, else an asynchronous pipeline.
Counterflow pipeline	Pipeline in which instructions travel down pipeline, but data travels up pipeline.
Cascaded pipeline	Parallel pipelines where a group of instructions are issued in successive cycles to produce a staggered execution of the group.

G06F 9/3869

{Implementation aspects, e.g. pipeline latches; pipeline synchronisation and clocking}

Definition statement

This place covers:

Instruction pipeline synchronisation;

Timing aspects of instruction pipelines, e.g. clock cycle, derating;

Clocking of pipeline stages; clock domains;

Clock skew problems;

Clock gating in pipelines, e.g. for power saving;

Latches and buffers between pipelines stages.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific instructions for pipeline control.	G06F 9/30079

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Clock skew	lack of synchronicity between instances of a clock signal caused, e.g. by differing clock wire lengths.

G06F 9/3871

{Asynchronous instruction pipeline, e.g. using handshake signals between stages}

Definition statement

This place covers:

Asynchronous pipeline, e.g. using handshake signals between stages, e.g. ACK, DONE signals.

Pipelines where the stages do not all move at the same time.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Asynchronous pipeline	Pipeline where not all stages move at once, e.g. execution in a stage starts when a signal is received from previous stage, and ends by sending a done signal to next stage.
Handshake signals	Exchange of signals between stages, e.g. to inform a next stage when data is available to process, and to inform a previous stage when data may be forwarded.

G06F 9/3873

{Variable length pipelines, e.g. elastic pipeline}

Definition statement

This place covers:

Pipeline with dynamically varying length, e.g. elastic pipeline.

Multiple pipelines having different lengths.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Pipeline length	The number of pipeline stages.

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G06F 9/3875

{Pipelining a single stage, e.g. superpipelining}

Definition statement

This place covers:

Pipeline architecture where a single stage is split into sub-stages (e.g. superpipelining) using pipeline buffer, with higher clocking rate implied for that stage, e.g. pipelined execution unit; pipelined decode unit.

Pipeline architecture having multiple stages for the same function, e.g. two execution stages, without higher clock rate.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pipelined decoding	G06F 9/382

G06F 9/3877

{using a secondary processor, e.g. coprocessor (peripheral processor G06F 13/12)}

Definition statement

This place covers:

- Concurrent instruction execution using secondary processor or coprocessor which controls its own execution, i.e. has a decode unit or sequencer;
- Means and protocol to transfer instructions and data to a secondary processor, and to receive results in return;
- Detection of presence or absence of a secondary processor;
- Reconfigurable coprocessors, i.e. not special purpose.

Relationships with other classification places

Vector processors: G06F, G06F 15/8053.

Cryptographic processors: G06F 21/123.

I/O or DMA processors: G06F 13/12.

Image or graphics processors: G06T 1/20.

Digital data processing: G06F 17/00, G06F.

References

Limiting references

This place does not cover:

Peripheral processor	G06F 13/12

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Execution units executing under control of a primary decoder	G06F 9/3885
Vector processor	G06F 15/8053

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

host	primary processor to which the coprocessor is a secondary processor

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "COP" and "coprocessor"

G06F 9/3879

{for non-native instruction execution, e.g. executing a command; for Java instruction set}

Definition statement

This place covers:

Secondary processors which receive and decode instructions which are not explicit in the instruction set of the host, e.g. commands; function calls; using an escape code; using memory-mapped commands;

Secondary processors which are adapted to execute a non-native instruction set, e.g. Java coprocessor.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Non-native instruction set	Instructions which cannot be executed on the primary processor

G06F 9/3881

{Arrangements for communication of instructions and data}

Definition statement

This place covers:

Special arrangements or protocols for transfer of instructions or commands, and for exchange of data with a secondary processor which executes non-native instructions.

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G06F 9/3885

{using a plurality of independent parallel functional units}

Definition statement

This place covers:

Special arrangements for concurrent instruction execution using parallel functional units, implying the concurrent execution of multiple instructions, one in each of the functional units;

Parallel execution pipelines.

Relationships with other classification places

Arrays of processors G06F 15/78, G06F 15/80, G06F 15/16.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Parallel decode units	G06F 9/3822
Concurrent execution using a secondary processor	G06F 9/3877

Special rules of classification

This group is only to be used for special architectural arrangements to enable the concurrent execution of instructions, not for the mere presence of parallel functional units.

Parallel functional units does not usually mean parallel processors. Multicore architectures may be found here only if they carry out concurrent execution of instructions from the same program.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Functional unit	Unit within the processor which carries out part of the execution of an instruction.

G06F 9/3887

{controlled by a single instruction for multiple data lanes [SIMD]}

Definition statement

This place covers:

Multiple parallel functional units controlled by a single instruction, e.g. SIMD.

For SIMD execution, this class contains details relevant to the execution aspects, e.g. executing a global instruction according to local conditions.

Relationships with other classification places

SIMD architectures: G06F 15/80.

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

SIMD	Acronym for "single instruction multiple data" being an architecture having a set of homogenous execution units which execute the same instruction in any given cycle, but which each have their own operand data, e.g. vector data.

G06F 9/38873

{Iterative single instructions for multiple data lanes [SIMD]}

Definition statement

This place covers:

Special arrangements at runtime for performing multiple iterations of a loop in parallel using SIMD lanes.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Reducing the execution time required by program code via optimisations performed during compilation	G06F 8/4441
Software pipelining using a compiler	G06F 8/4452
Distributing iterations of parallelizable loops among processors using a compiler	G06F 8/452
Parallelism detection by a compiler	G06F 8/456

G06F 9/38875

{for adaptable or variable architectural vector length}

Definition statement

This place covers:

Runtime determination of a vector length used for performing multiple iterations of a loop in parallel.

Using a vector length variable stored in a vector length register for performing multiple iterations of a loop in parallel.

G06F 9/3888

{controlled by a single instruction for multiple threads [SIMT] in parallel}

Definition statement

This place covers:

An execution model where multiple independent threads execute a same instruction in parallel, typically on different data elements (SIMT), where conditional instructions may cause different threads to follow divergent execution paths through a program, which may result in individual threads being inactive at times, and each thread may have its own instruction address counter and register state.

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References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Processor architectures or configurations for image data processing	G06T 1/20

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific instructions to control multi-threading, e.g. FORK or JOIN instructions	G06F 9/3009

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Warp	A warp is a set of parallel threads that execute the same instruction together.
Thread Block	A thread block is a set of concurrent threads that can cooperate among themselves through barrier synchronization and shared access to a memory space private to the thread block. Once a thread block is assigned to a streaming multiprocessor, it is further partitioned into warps.
Grid	A grid is a set of thread blocks that may each be executed independently and thus may execute in parallel.
Streaming multiprocessor	A streaming multiprocessor executes warps and comprises multiple stream processors.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

SIMT	Single Instruction Multiple Thread
CTA	Cooperative Thread Array
GPGPU	General-Purpose Computing on Graphics Processing Units
SM	Streaming Multiprocessor
SP	Streaming Processor
CUDA	Compute Unified Device Architecture
OpenCL	Open Computing Language

In patent documents, the following words/expressions are often used as synonyms:

- "CUDA", "OpenCL" and "GPGPU"
- "thread block", "work group" and "cooperative thread array"
- "thread" and "work item"
- "warp", "wavefront" and "thread group"
- "streaming multi-processor" and "compute unit"

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G06F 9/38885

{Divergence aspects}

Definition statement

This place covers:

Special arrangements, in a SIMT architecture, to handle different threads following divergent execution paths (e.g., control flow paths) through a program due to a conditional instruction.

Reconvergence of threads in a SIMT architecture.

G06F 9/3889

{controlled by multiple instructions, e.g. MIMD, decoupled access or execute}

Definition statement

This place covers:

Multiple parallel functional units controlled collectively by multiple instructions.

Includes special techniques of parallel functional unit control in a superscalar or VLIW architecture.

Hardware streams.

Relationships with other classification places

MIMD architectures: G06F 15/16.

Special rules of classification

This group is only to be used for special architectural arrangements to enable the concurrent execution of instructions, not for the mere presence of parallel functional units executing multiple instructions.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

MIMD	Acronym for "multiple instruction multiple data" being an architecture having a set of homogenous execution units which execute different instructions in any given cycle, and which each have their own operand data.
VLIW	Acronym for "very long instruction word" being an architecture having a compound instruction word formed by the compiler, containing multiple sub-instructions to be issued and completed together in one cycle, and having no interdependencies.
Hardware stream	Hardware resources used for the context and execution of a stream or thread of instructions.

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G06F 9/3891

{organised in groups of units sharing resources, e.g. clusters}

Definition statement

This place covers:

Control of parallel execution by groups of functional units, such as multiple execution units sharing local memory, e.g. clusters;

Partitioned architectures, e.g. for hardware multistreaming.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Cluster	Group of execution units with shared register resources.
Hardware stream	Hardware resources used for the context and execution of a stream or thread of instructions.

G06F 9/3893

{controlled in tandem, e.g. multiplier-accumulator}

Definition statement

This place covers:

Multiple functional units which are controlled in tandem or cascade to carry out an instruction.

Multiple functional units controlled by the same instruction but not in the same cycle, e.g. multiplier-accumulator.

Relationships with other classification places

Hierarchical adders: G06F 7/50.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

MAC	Multiplier-accumulator unit
FMA	Fused multiplier-accumulator unit

G06F 9/3895

{for complex operations, e.g. multidimensional or interleaved address generators, macros}

Definition statement

This place covers:

Multiple functional units which are controlled in tandem or cascade to carry out an instruction which is a complex operation, possibly over multiple cycles.

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G06F 9/3897

{with adaptable data path}

Definition statement

This place covers:

Parallel functional units controlled in tandem to execute complex operations using adaptable datapath.

Relationships with other classification places

Reconfigurable computer architectures: G06F 15/7867.

G06F 9/44

Arrangements for executing specific programs

Definition statement

This place covers:

Execution of a single program.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program initiating or program switching in the context of multiprogramming	G06F 9/48

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

High level language	refers to what is commonly known in the art, i.e. a language containing human readable constructs intended to be used by a human programmer and to be translated to binary code for execution.The fact that it is theoretically possible to read, understand and directly program binary code does not qualify this type of code as HLL.
Low-level language	language that provides little or no abstraction from a computer's instruction set architecture

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

HLL	High level language

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G06F 9/4401

Bootstrapping (security arrangements therefor G06F 21/57)

Definition statement

This place covers:

Starting up or shutting down a computer system and loading of the operating system.

References

Limiting references

This place does not cover:

Security arrangements for bootstrapping	G06F 21/57

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

For set top boxes	H04N 21/443

Informative references

Attention is drawn to the following places, which may be of interest for search:

Low level details of resetting means	G06F 1/24
Compiler bootstrapping	G06F 8/37
Installation of computer software	G06F 8/61
Fault tolerant booting	G06F 11/1417
Details of Power-On Self Test (POST)	G06F 11/2284

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Bootstrap	a simple program that begins initialisation of the computer's operating system

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

IPL	Initial program load

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G06F 9/4403

{Processor initialisation}

Definition statement

This place covers:

Initialisation of the processor and the processor's direct environment immediately after the initial reset signal.

This group deals with local issues - there is no network involved.

Includes:

- Initial microcode loading;
- Selecting the very first instructions to be executed after a hardware reset;
- Processor address boot facilities;
- I/O channel initialisation;
- Making BIOS ROM invisible after booting;
- Means to shadow BIOS from ROM to (faster) RAM.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Loading microcode per se	G06F 9/24
Configuring of multiprocessors	G06F 15/177

G06F 9/4405

{Initialisation of multiprocessor systems}

Definition statement

This place covers:

Initialisation of processors in a multiprocessor system immediately after the initial reset signal.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Configuring of multiprocessors	G06F 15/177

G06F 9/4406

{Loading of operating system}

Definition statement

This place covers:

Loading of the operating system and the preparatory steps for loading the OS.

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Also includes the launching of application programs once the OS has been loaded, and OS formats on storage devices.

G06F 9/4408

{Boot device selection}

Definition statement

This place covers:

Searching and selecting a bootable boot device.

G06F 9/441

{Multiboot arrangements, i.e. selecting an operating system to be loaded}

Definition statement

This place covers:

Computer systems having more than one bootable OS

- Choosing one of the available bootable OSs and booting from that OS (dual-boot or multi-boot);
- Providing mechanical means to switch between the OSs (see US2006107029);
- When a computer is switched on for the first time, the user is required to choose one of the OSs available on the computer. Once an OS is chosen, the other OSs are made unavailable. The next time the computer is started, it will boot only the selected OS (see EP0794484).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Emulating one OS using another	G06F 9/45504
Two active OSs, where one OS (the guest OS) is running as an application in the other OS (the host OS)	G06F 9/45545
Multiple OSs running simultaneously in the context of a VMM	G06F 9/45558
When one of this plurality of OSs serves as a backup OS in case of failure, recovery OS	G06F 11/00

G06F 9/4411

{Configuring for operating with peripheral devices; Loading of device drivers}

Definition statement

This place covers:

Initialisation and configuration of peripheral devices, insofar as this configuration is related to the interaction with the operating system.

Also deals with the configuration of the operating system in order to be able to interact with peripheral devices.

A peripheral device in this class should be understood as a passive entity, i.e. whose functioning is controlled by the host computer to which it is attached. Systems involving a host computer with attached devices that have processing capabilities of their own should be treated as a multiprocessor or a networked distributed system.

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This initialisation/configuration does not have to occur during booting (although it typically does) - it can also take place e.g. when a device is hot-inserted (plug and play).

This group deals with local issues - there is no network involved.

- Assigning IRQ lines, I/O addresses;
- Configuring registers on the peripheral;
- Device discovery: detecting which devices are present; building device trees;
- Adapting OS for device configuration;
- Device initialisation;
- Config.sys peripheral device facilities.

Loading or installation of device drivers. This does not necessarily have to occur at boot time.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Configuration of printer parameters	G06F 3/1297
Updating of firmware in peripheral devices	G06F 8/65
Configuring software or OS when this configuration is not related to interacting with the peripheral device	G06F 9/44505
Program control for peripheral devices - the inner workings of a device driver, i.e. how the driver performs its job of interfacing between OS & device, how the driver is structured, etc.	G06F 13/102
Electrical details of hot-plugging, plug and play	G06F 13/4081
Peripherals with a processor and software running thereon together with the computer's processor can be considered a multiprocessor system. A distinction has to be made between the device driver - i.e. the software that runs on the host to interface with the peripheral - and the software running on the peripheral.	G06F 15/177
Reconfiguration of FPGAs, PLDs	G06F 30/34
HAVi networks	H04L 12/2803
Configuration of network elements	H04L 41/0803
Management of devices over a network	H04L 67/125, H04L 67/025

Special rules of classification

A device driver is understood to be software used by a computer to control/operate a peripheral device. A peripheral is any kind of device that can be attached to/inserted into a computer in order to expand its functionality (modem, sound card, disk drives). A device driver- i.e. the piece of software that is loaded on a host computer and that enables the host computer to control the operation of an attached peripheral - differs from the peripheral's operating software - i.e. the piece of software that resides on the peripheral itself and executed by the peripheral's processor that allows the peripheral to operate as an independent unit.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Peripheral Internal	an expansion card that is plugged into one of the ISA/PCI slots

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Peripheral External	an external device connected through the serial/parallel port a PC card

G06F 9/4413

{Plug-and-play [PnP]}

Definition statement

This place covers:

Arrangements for automating the process of device driver loading or configuration of a peripheral device or the operating environment of the computing element hosting the peripheral device in in response to dynamic changes in the peripheral constitution of the computing element (addition or removal of peripheral devices).

Plug-and-play in the context of this class occurs either during boot time or during run-time (live addition or removal).

G06F 9/4415

{Self describing peripheral devices}

Definition statement

This place covers:

The peripheral device itself contains all the information (or a reference to a place where the information is stored) required for its configuration and the configuration of the operating environment. In other words, it is the peripheral device and not the operating environment that is burdened with the task of providing configuration information or device drivers.

G06F 9/4416

{Network booting; Remote initial program loading [RIPL]}

Definition statement

This place covers:

Booting of client computers, processors or devices that do not have the necessary boot code locally available but retrieve the boot code from a remote source, e.g. a boot server in a network environment.

Specific topics included:

- Booting of diskless computers ("net" computers);
- "Push" booting: a server computer boots a client computer by sending a boot program to the client computer;
- PXE (Preboot Execution Environment)

The Preboot Execution Environment (PXE) is an industry standard client/server interface that allows networked computers that are not yet loaded with an operating system to be configured and booted remotely by an administrator. The PXE process consists of the client notifying the server that it uses PXE. If the server uses PXE, it sends the client a list of boot servers that contain the operating systems available. The client finds the boot server it needs and receives the name of the file to download. The client then downloads the file using Trivial File Transfer Protocol and executes it, which loads the operating system.

- Booting a thin client in a "client device/data center" environment (see US2006/161765);
- Network booting;

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- Booting diskless workstations;
- Booting thin clients.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Booting of multiprocessor systems, e.g. where one processor (the primary processor) sends the boot or initialisation code to the other processors (secondary processors)	G06F 15/177
Wake-on-LAN (WoL)	H04L 12/12
BOOTP, DHCP protocol	H04L 61/5014
Network protocols involving booting	H04L 67/34

Special rules of classification

Remote booting in the context of a first-time and one-off installation of an OS is also classifed in the G06F 8/61.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

RIPL	Remote Initial Program Load
PXE	Preboot Execution Environment

G06F 9/4418

{Suspend and resume; Hibernate and awake}

Definition statement

This place covers:

Suspend/Resume and Hibernate/Wake Up refer to techniques to put a system in a low power, non-operating mode, thereby preserving the system state that existed at the time of going into Suspend or Hibernate. The next time the computer is started, operation continues at the point where it left off, rather than starting from scratch.

- Speeding up the boot process by restoring persisted data from previous executions rather than going to the whole boot process.
- Hibernating a system to persistent storage on a first computer, transporting the storage to a second computer and resuming the execution there. Please note that this is not process migration.
- Multiple removable storage devices, each having a different hibernated system image stored thereon; resuming the different system images on one computer by switching the storage devices.
- Quickly bringing a computer into an operational state by copying a memory image from persistent storage to RAM, thereby bypassing the lengthy conventional boot process.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Low-level, electrical details of suspend and resume	G06F 1/32
Power Management	G06F 1/3203

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Normal Shutdown (without saving state information - the next boot starts from scratch)	G06F 9/4401
Suspending a running process and resuming its execution later in the context of process scheduling	G06F 9/461, G06F 9/4881
Booting a computer system when an error/ fault is involved. Includes Dealing with errors that occur during the boot process itself (e.g. when encountering a corrupt BIOS); * Rebooting the system after a previous irregular shutdown (e.g. due to a power failure), thereby restoring as much as possible the system state that existed before the irregular shutdown occurred. In absence of an emergency power supply, a power failure will cause the computer system to be simply powered down, inevitably resulting in the loss of system state. The next time the computer is booted, the system state will be restored as much as possible.	G06F 11/1417
Graceful shutdown: When a power failure is detected, an emergency power supply (e.g. UPS) is activated giving the system enough time to do a proper shutdown (when shutting down a computer system, no state information is saved). Graceful hibernation:When a power failure is detected, an emergency power supply (e.g. UPS) is activated giving the system enough time to do a proper hibernation (thereby saving the system state) before eventually powering down. Dealing with power failures that occur when the system is in suspend mode, i.e. when the RAM is still powered; In battery-powered systems, suspending or hibernating the system when the battery level drops below a predetermined level	G06F 11/1441
Wake-on-LAN	H04L 12/12

Special rules of classification

The techniques of Suspension and Hibernation differ from each other in the degree of persistency of saving the system state.

With Hibernation, the system state is stored on a non-volatile memory device, e.g. HDD, while in the case of Suspension, the system state is stored in volatile memory (e.g. RAM).

In the G06F 9/4418 we only deal with situations where the reason or the system to suspend or hibernate is controlled/intentional e.g. after user presses power off button, after a preset period of inactivity for power saving purposes. When the reason to suspend or hibernate is the occurrence of a power failure, low battery voltage or another anomaly (e.g. system hang), then the document should be classified in G06F 11/1441 (see Related Fields). The subsequent restart of the system is classified in G06F 11/1417.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Hibernation	also known as Suspend-to-Disk (S2D) and is defined as sleeping mode S4 in the ACPI specification.
Suspension	also known as Suspend-to-RAM (STR) and is defined as sleeping mode S3 in the ACPI specification.

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G06F 9/442

{Shutdown}

Definition statement

This place covers:

Shutting down the computer, the opposite operation of bootstrapping (G06F 9/442).

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Suspend and resume	G06F 9/4418
Graceful shutdown in case of power failure, e.g. using an uninterruptible power supply (UPS)	G06F 11/1441

G06F 9/445

Program loading or initiating (bootstrapping G06F 9/4401; security arrangements for program loading or initiating G06F 21/57)

Definition statement

This place covers:

Preparing a program for execution including the actual launching of the program.

References

Limiting references

This place does not cover:

Bootstrapping	G06F 9/4401
Security arrangements for program loading or initiating	G06F 21/57

Informative references

Attention is drawn to the following places, which may be of interest for search:

Updating of computer software	G06F 8/65
Loading of microcode	G06F 9/24
Process Migration	G06F 9/4856, G06F 9/5088
Protocols for network applications involving the movement of software and/or configuration parameters, e.g. applets	H04L 67/34

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G06F 9/44505

{Configuring for program initiating, e.g. using registry, configuration files}

Definition statement

This place covers:

Run-time configuration of software and computer applications, for example:

Configuring the Windows registry;

User profiles: roaming (i.e. restoring the user's settings at a different computer), multiple users (i.e. each user has a different profile).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Configuration management in the context of software development	G06F 8/71
Configuration of peripheral devices	G06F 9/4411
Configuration of FPGA, PLA	G06F 30/00
Gaming configure	G07F
Personalization of smart cards	G07F 7/10
Configuration of parameters specifically aimed at networking/ communication	H04L 41/08
Protocols for network applications involving terminal/user profiles	H04L 67/306
Differentially changing configuration parameters	H04L 67/34

Special rules of classification

Configuration wizards that assist a user in configuring a software application, are also classified in G06F 9/453 (Help systems).

G06F 9/4451

{User profiles; Roaming}

Definition statement

This place covers:

Roaming user profiles; migrating configuration settings between computers.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Network-specific arrangements/protocols involving user profiles	H04L 67/306

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G06F 9/44521

{Dynamic linking or loading; Link editing at or after load time, e.g. Java class loading}

Definition statement

This place covers:

Ways to load program code whereby, rather than first loading the entire program code before starting execution, the program code is loaded only when needed.

Also includes:

- Saving memory space and preventing unnecessary processing by only loading the program parts that are actually used; Parts that are never executed are never loaded;
- Starting execution once certain parts are loaded: no need to wait for the whole program to be loaded;
- Executing instructions as they are loaded: the idea of streaming;
- Java constant pool resolution
- Dynamic linking/loading is also known as: incremental, partial, run-time, lazy; on-demand linking/ loading.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

DLLs	Dynamic Link Library

G06F 9/44526

{Plug-ins; Add-ons}

Definition statement

This place covers:

Dynamically loading special software components to exisitng applications in order to extend their functionality, e.g. Adobe Flash-Player.

G06F 9/44536

{Selecting among different versions}

Definition statement

This place covers:

Determining the right version of a software component to be loaded.

G06F 9/44542

{Retargetable}

Definition statement

This place covers:

Program loading explicitly taking into account hardware characteristics of the target.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Retargetable program installation/update	G06F 8/64

G06F 9/44547

{Fat binaries}

Definition statement

This place covers:

Computer programs containing code native to multiple instruction sets (processor architectures).

G06F 9/44552

{Conflict resolution, i.e. enabling coexistence of conflicting executables}

Definition statement

This place covers:

Mechanisms to allow e.g. different versions of conflicting libraries to be used simultaneously; for example the Windows "DLL Hell".

G06F 9/44557

{Code layout in executable memory}

Definition statement

This place covers:

How software components should be placed in a RAM, e.g. occupying neigbouring sections.

G06F 9/44563

{Sharing}

Definition statement

This place covers:

- Sharing program code/data between different applications in order to reduce the memory footprint;
- Solutions to problems that arise when program code/data is shared (e.g. sharing of global variables and Java static fields), often resulting in the duplication of program code/data.

G06F 9/44568

{Immediately runnable code}

Definition statement

This place covers:

Running programs without having to install or load them beforehand. Execute-in-place refers to running without loading (i.e. without copying to RAM), while portable applications more refer to running without installing.

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G06F 9/44573

{Execute-in-place [XIP]}

Definition statement

This place covers:

Skipping or reducing the step of loading and initialization of program code.

Techniques used:

- XIP: eXecute-In-Place: execute programs from where they are persistenly stored. There is no program loading.
- Pre-initialise modules: program code may be loaded, but it is already partially or totally initialised
- Romization of program code

XIP (Execute In Place) refers to the execution program code directly from the memory where it is stored, without first loading the program code to volatile executable memory (RAM).

Where the G06F 9/445 relates to the preparatory process of making program code ready for execution - loading, i.e. transferring the code to executable memory; linking, i.e. resolving references; initializing data structures - XIP relates to methods where the program code can be directly executed without having to go through this preparatory process.

One definition of XIP, taken from US2002/069342: "A XIP architecture is defined by a system's ability to execute one or more bytes of code while still resident within non-volatile memory (e.g., read-only memory (ROM)), without first transferring the code to volatile memory (e.g., random access memory (RAM)."

Another definition of XIP, taken from US2004/193864: "A called execute-in-place (XIP) technology refers to a specific function provided with a storage device, which data or command codes stored in the storage device can be directly accessed by a central processing unit (CPU) in a computer system, without pass through a random access memory (RAM), thus reducing power consumption and data loss, and increasing executing speed."

For program code to be directly executable from the memory where it is stored, it is required that the memory is suitable to directly execute code (read US2002/138702, [0004]-[0008]), and that the code is in such a form that it can be directly executed.

Examples of XIP:

- In normal computer systems, directly executing program code from an externally connected memory device;
- In embedded systems, executing the software directly from the non-volatile memory where it is stored.

Also included:

- Romization, romizer: processes and tools to generate a directly-executable program image.
- Semi-directly-executable code: the code is partially prepared for execution, the rest takes place at load time.

Special rules of classification

The U3 technology does not fall under the XIP technology, because the program code is not executed directly from the USB stick.

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G06F 9/44578

{Preparing or optimising for loading}

Definition statement

This place covers:

Specific techniques to make code immediately runnable, e.g. making address adjustments (relocation) to enable immediate execution, or prebinding (Mac OS). General aspects of pre-runtime link editing are however classified in G06F 8/54.

G06F 9/44584

{Portable applications, i.e. making applications self-contained, e.g. U3 standard}

Definition statement

This place covers:

Executing applications without installing them before, for example according to the U3 standard, or portable application packages ("Portable App") started directly from a USB stick.

G06F 9/44589

{Program code verification, e.g. Java bytecode verification, proof-carrying code (high-level semantic checks G06F 8/43; prevention of errors by analysis, debugging or testing of software G06F 11/36)}

Definition statement

This place covers:

Verification of program code, for example:

Java bytecode verification.

Proof carrying code.

inter instruction consistency checks.

References

Limiting references

This place does not cover:

High-level semantic checks	G06F 8/43
Prevention of errors by analysis, debugging or testing of software	G06F 11/36

Special rules of classification

- In G06F 11/36 group, the question is: does the program do what it is expected to do? In other words, for a given input, does the program produce the expected output? The program is considered as a black box, only the external behaviour is studied. The tests that are performed do not take into account the implementation or the language that is used to write the program. We are here on the level of users/developers/specifications.

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- In G06F 9/44589, a test is performed to see whether the (compiled) program code does not do anything that is not allowed by the rules of the target machine. In other words, the question is: does the program comply with code specific requirements?

The two groups are on a different level. It is possible for a program to respect all code specific requirements and thus to pass G06F 9/44589 tests, but not to produce the expected output and thus not to pass the G06F 11/36 test

- In the G06F 8/43 (Compile-time checking), source code is checked. In most cases, this is done by the compiler but it can also be performed by a separate program. In contrast, the G06F 9/44589 tests already compiled code. In the G06F 8/43, the verification is performed based on source code specific aspects, whereas in the G06F 9/44589 this is done on the basis of target machine related aspects

G06F 9/44594

{Unloading}

Definition statement

This place covers:

- Unloading program components from memory or terminating applications, e.g. when they are not needed anymore.
- Java class unloading: removing Java classes from memory when they are not used anymore, e.g. because the class has become "unreachable".

Class unloading is not the same as Garbage Collection: in class unloading, what is removed is program code in executable memory (classes), whereas in Garbage Collection it is data (objects, i.e. class instances) that are removed.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Uninstallation	G06F 8/62
Garbage collection	G06F 12/0253

G06F 9/448

Execution paradigms, e.g. implementations of programming paradigms

Definition statement

This place covers:

Implementations of specific programming paradigms to execute computer programs, the programming paradigms being e.g. object-orientated, procedural, data driven or finite state machine

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

OO	Object-oriented

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G06F 9/4482

{Procedural}

Definition statement

This place covers:

Relates to procedural execution, i.e. imperative programming where the program is built from one or more procedures (subroutines).

G06F 9/4484

{Executing subprograms}

Definition statement

This place covers:

Invocation and execution of subroutines, for example:

- Implementation of a call stack: creating and deleting activation records, reserving space on the stack to store local variables and to pass the arguments
- Argument passing
- Locating variables at higher level in the invocation chain
- Co-routines
- Re-entrant functions
- Function or method overloading: considering the type of all actual arguments/return type of a function to select a proper function instance to execute Calling functions in another programming language

Also covered are other combinations of several instructions, for example combinations of instructions to perform (counted) loops.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hardware implementation of instructions that change the program flow to another address (jumps, branches, goto)	G06F 9/30
Remote procedure calls (RPC)	G06F 9/547
Stack caching	G06F 12/0875

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- Subprograms,subroutines, functions, procedures, object oriented methods

G06F 9/4486

{Formation of subprogram jump address}

Definition statement

This place covers:

Finding the entry address of a subroutine and how to preserve the return address

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Static linking, i.e. before load-time	G06F 8/54
Hardware implementation of instructions specifically designed to keep the return address (e.g. branch-and-link, jsr)	G06F 9/30
Branch prediction in a pipelined system	G06F 9/3844, G06F 9/3846
Dynamic linking, i.e. at or after load-time	G06F 9/44521

G06F 9/4488

{Object-oriented}

Definition statement

This place covers:

Execution aspects of object-oriented programs

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

OO	Object-oriented

G06F 9/449

{Object-oriented method invocation or resolution}

Definition statement

This place covers:

- Object-oriented method resolution, i.e. given a method invocation on a reference (pointer) to an object, how to locate the correct code that implements this method. Typically this is done using virtual function tables.
- Only deals with the resolution of an object-oriented method.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Remote method invocation (RMI)	G06F 9/548

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G06F 9/4491

{Optimising based on receiver type}

Definition statement

This place covers:

- Speeding up the run-time object-oriented method resolution by predicting the type of the referenced object

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

PIC	Polymorphic inline cache

G06F 9/4492

{Inheritance}

Definition statement

This place covers:

Object oriented class hierarchies including run-time addition of classes to a hierarchy virtual inheritance and/or polymorphism.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Object-oriented method resolution	G06F 9/449

Special rules of classification

Documents in G06F 9/449 deal with Object-oriented method invocation and will inevitably talk about class hierarchies, which is the subject of G06F 9/4492. However, this alone does not justify classification in G06F 9/4492: only when the document discloses specific details about class hierarchies, the symbol G06F 9/4492 is justified.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Method overriding	subclass provides a specific implementation of a method that is already provided by one of its superclasses
Polymorphism	creating a variable, a method or an object that has more than one form

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G06F 9/4493

{Object persistence}

Definition statement

This place covers:

- Making objects persistent and restoring objects from persisted form.

Includes:

- Pointer swizzling
- Flattening objects

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Serialization in the context of RPC, RMI	G06F 9/547, G06F 9/548
OO databases	G06F 16/30

G06F 9/4494

{data driven}

Definition statement

This place covers:

- Software aspects of data driven systems, i.e. systems where the action is dictated by the presence or availability of data at the inputs of the logical circuits, rather than by sequential instruction execution under supervision of a central clock

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specification techniques, e.g. Petri nets	G06F 8/10
Data flow analysis during compilation	G06F 8/433
Architectures for data or demand driven systems	G06F 15/82

G06F 9/4496

{Unification in logic programming}

Definition statement

This place covers:

Unification is one of the main ideas behind logic programming, best known through the language Prolog. It represents the mechanism of binding the contents of variables and can be viewed as a kind of one-time assignment.

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G06F 9/4498

{Finite state machines}

Definition statement

This place covers:

Program execution implemented by a Finite State Machine. There must be enough technical details about the FSM implementation to allocate the subgroup.

G06F 9/451

Execution arrangements for user interfaces

Definition statement

This place covers:

- The inner working of user interfaces, in particular graphical user interfaces (GUIs), including:
- Interaction of the GUI with applications and OSs
- The structure and interaction of software components of GUIs
- Implementation of GUI concepts typically used in operating systems, e.g. desktop metaphors, widgets or windowing mechanisms
- Implementation of GUI automation mechanisms, e.g. record/replay of user interactions on the GUI

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

User interfaces for testing or debugging software	G06F 11/36
User interface for databases, visualization of query results	G06F 16/248, G06F 16/338, G06F 16/34
User interfaces to web services	G06F 16/954, G06F 16/9577
User interfaces for the field of automation	G05B 19/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Methods for a user to interact with the GUI, e.g. scrolling, drag and drop, menus	G06F 3/048
Digital output to a display device	G06F 3/14
Development and generation of source code for user interfaces	G06F 8/38
User interfaces for portable communication terminals, e.g. mobile phones	H04M 1/724

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

User interface	is the space where interaction between humans and machine occurs

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Synonyms and Keywords

In patent documents, the following abbreviations are often used:

HCI	Human-computer interaction
MMI	Man-machine interaction
CHI	Computer-human interaction
GUI	Graphical user interface

G06F 9/452

{Remote windowing, e.g. X-Window System, desktop virtualisation (protocols for virtual reality H04L 67/131)}

Definition statement

This place covers:

Methods to execute and interact with an application, whereby the application's program code runs on the server, and the GUI runs on the client (terminal). The user interacts with the remotely running application through the local GUI. GUI events/commands run back and forth between client and server. All processing is done at the server.

References

Limiting references

This place does not cover:

Protocols for virtual reality	H04L 67/131

Informative references

Attention is drawn to the following places, which may be of interest for search:

Communication between two running processes	G06F 9/54
Terminal emulation	G06F 13/107

G06F 9/453

{Help systems}

Definition statement

This place covers:

- Customizing the help according to the user's previous actions
- Getting help by pressing f1
- Wizards, application assistants, visual cues
- Online tutorials

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Intelligent code editors	G06F 8/33

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Teaching appliances; GUIs specially adapted for deaf, mute or blind persons	G09B

G06F 9/454

{Multi-language systems; Localisation; Internationalisation}

Definition statement

This place covers:

- User interfaces in multiple human languages, adapting user interfaces to suit a foreign culture
- Game localisation

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pseudo-localisation	G06F 11/00
Processing or translation of natural language	G06F 40/40

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Language localisation	internationalisation (i18n), globalisation

G06F 9/455

Emulation; Interpretation; Software simulation, e.g. virtualisation or emulation of application or operating system execution engines

Definition statement

This place covers:

The emulation of entities, e.g. operating systems, processors, classified under G06F 9/00.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

In-circuit emulation	G06F 11/36
Dynamic binary instrumentation may use techniques similar to emulators and binary optimizers	G06F 11/3644
Virtual memory	G06F 12/00
Terminal emulation	G06F 13/105
Computer simulation, in which a model of a system under investigation is beng simulated	G06F 30/00

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Emulation	In computing, emulation refers to the duplication and imitation of the functions of one computer system/program by another computer system/program, different from the first one, so that the emulated behaviour fully or closely resembles the behaviour of the original system/program.

G06F 9/45504

{Abstract machines for programme code execution, e.g. Java virtual machine [JVM], interpreters, emulators}

Definition statement

This place covers:

Software implementation of a machine (computer) that executes programs like a physical machine:

- Java Virtual Machine (JVM);
- Microsoft .NET common language runtime (CLR);
- Smalltalk virtual machines.

References

Limiting references

This place does not cover:

Compile time binary to binary translation	G06F 8/52
Run-time interpretation of high level language programs	**G06F9/4551**
Run-time binary to binary translation	G06F 9/45516

G06F 9/45508

{Runtime interpretation or emulation, e g. emulator loops, bytecode interpretation}

Definition statement

This place covers:

Interpretation of high-level language code, e.g. BASIC.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Handling natural language data	G06F 40/00

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G06F 9/45512

{Command shells}

Definition statement

This place covers:

Giving commands to a computer (OS) by means of a (graphical) user interface.

These commands can be given via the command line or by performing actions on GUI objects.The commands are typically interpreted by a command interpreter.

- Scripts, recording and executing GUI command scripts.

G06F 9/45516

{Runtime code conversion or optimisation}

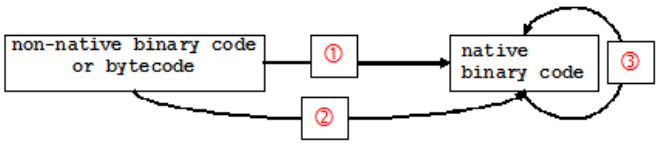
Definition statement

This place covers:

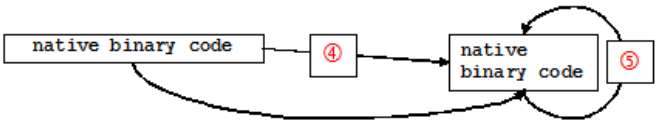
The execution of binary code/bytecode that is not native to the current run-time execution environment by translating the non-native binary code/bytecode into native code just before execution and subsequently executing the native code .

Subsequently, execution can be optimised as follows:

- By performing a retranslation of the non-native binary code/bytecode yielding more optimal native binary code e.g. by taking into account run-time information;
- By directly transforming the native binary code yielding more optimal native binary code .



The G06F 9/45516 also deals with the initial and subsequent run-time transformation of native binary code into more optimal native binary code.



For the purpose of completeness, the G06F 9/45516 also deals with the translation of intermediate bytecode to a different intermediate bytecode (e.g. Java bytecode to UCSD P-code). This however, is a more theoretic possibility and will not occur frequently.

The majority of the documents in this class deal with the translation of intermediate bytecode to native binary code and more specifically with the dynamic compilation of Java bytecodes into native code (JIT compilation).

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Relationships with other classification places

- The G06F 9/45516 is the dynamic counterpart of the G06F 8/52

Both classes have the same goal (i.e. translation from one binary format into another) but the point in time when this translation is performed is different: at run-time, just before or during execution (G06F 9/45516) and statically, pre-run-time (G06F 8/52).

- Because the translation in the G06F 9/45516 takes place just before execution, there is less time available
- Difference between G06F 9/45516 and G06F 9/3017

Both G06F 9/45516 and G06F 9/3017 deal with run-time translation of binary code. However, in the **G06F8/455B4** the translation relates to a program as a whole and is realised by a software translator, whereas in the G06F 9/3017 the translation relates to individual instructions that are about to be executed and is performed by the processor's internal hardware and.

In G06F 9/45516, the processor is fed with the translated, native instructions; it doesn't know anything about the translation that took place. However, in G06F 9/3017 the processor is fed with the non-native instructions; translation into native code takes place on-the-fly (i.e. at the moment the instruction is actually executed by the internal hardware of the processor).

- Difference between G06F 9/45516 and G06F 9/45508
- The G06F 9/45508 is also related to the execution of binary, non-native code. However, the non-native code is emulated rather than translated: an emulator acts as an virtual machine and interprets the non-native code.

References

Limiting references

This place does not cover:

Run-time instruction translation	G06F 9/3017
Profiling per se	G06F 11/34

G06F 9/4552

{Involving translation to a different instruction set architecture, e.g. just-in-time translation in a JVM}

Definition statement

This place covers:

Translation of code at runtime prior to executing it natively, e.g. bytecode into native machine code. Dynamic compilation.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Translation of one binary program to another before the program is ever executed. Static binary translation.	G06F 8/52

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G06F 9/45525

{Optimisation or modification within the same instruction set architecture, e.g. HP Dynamo}

Definition statement

This place covers:

Optimisations carried out at runtime without changing the instruction set architecture.

G06F 9/45529

{Embedded in an application, e.g. JavaScript in a Web browser}

Definition statement

This place covers:

Conversions or optimisations, e.g. done by JavaScript engines or similar plugin technologies built into another execution environment.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dynamic loading of plugins/add-ons	G06F 9/44526

G06F 9/45533

{Hypervisors; Virtual machine monitors}

Definition statement

This place covers:

- Simultaneously executing multiple operating systems using a Virtual Machine Monitor (VMM). The following passage, taken from US2004230794, provides a good definiton of a VMM: 'A VMM enables plural operating systems to run on a single machine by "virtualizing" the entire machine. Conventionally, an operating system controls the use of the physical hardware resources of a machine (e.g., the memory, the processor, etc.), and thus the actual hardware of the machine is exposed to the operating system. When a VMM is used, however, the machine's hardware (e.g., devices) are only exposed to the VMM. The VMM, then, exposes "virtual" machine components to the operating systems'.In G06F 9/45545, plural operating systems execute simultaneously as guest and host (without a VMM)..
- Process switching for virtual machines;
- Handling of non-implemented instructions;
- Address trapping for emulating other memory architectures;
- Host/guest and mode switching instructions;
- Switching between endian modes (endian conversion on a bus G06F 13/40).

References

Limiting references

This place does not cover:

Loading of microprogram	G06F 9/24

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Mode switching during interrupts per se	G06F 9/4812

G06F 9/45537

{Provision of facilities of other operating environments, e.g. WINE (I/O emulation G06F 13/105)}

Definition statement

This place covers:

Emulation of one OS by another OS

- Simultaneously executing first and second operating systems by executing the second OS as a guest OS on top of the first OS (the host OS). No virtual machine monitor (VMM) is needed. The use of guest and host OSs is described in the following passage, taken from US2004230794: ' Certain techniques allow operating systems to exist side-by-side on the same machine without the use of a virtual machine monitor. One such technique is to have one operating system act as a "host" for the other operating system. (The operating system that the "host" is hosting is sometimes called a "guest.") In this case, the host operating system provides the guest with resources such as memory and processor time '
- Interrupt handling of other OS
- Non I/O services of other OS, e.g. facilities for emulation of virtual memory
- Memory mapping and address trapping for emulating I/O

Relationships with other classification places

Associated address trapping is in G06F 9/45533.

References

Limiting references

This place does not cover:

I/O emulation	G06F 13/105

G06F 9/45541

{Bare-metal, i.e. hypervisor runs directly on hardware}

Definition statement

This place covers:

A bare-metal hypervisor runs directly on the host's hardware to control the hardware and to manage guest operating systems, e.g. Citrix XenServer, VMware ESX, Microsoft Hyper-V..

G06F 9/45545

{Guest-host, i.e. hypervisor is an application program itself, e.g. VirtualBox}

Definition statement

This place covers:

Hypervisor runs within a conventional operating system environment.

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G06F 9/4555

{Para-virtualisation, i.e. guest operating system has to be modified}

Definition statement

This place covers:

Para-virtualisation is a virtualization technique that presents a software interface to virtual machines that is similar but not identical to that of the underlying hardware.

G06F 9/45554

{Instruction set architectures of guest OS and hypervisor or native processor differ, e.g. Bochs or VirtualPC on PowerPC MacOS}

Definition statement

This place covers:

Mechanisms to adapt the instruction set of a guest system to the instruction set offered by the underlying hypervisor and/or native processor.

G06F 9/45558

{Hypervisor-specific management and integration aspects}

Definition statement

This place covers:

- Management and integration aspects of hypervisors.
- Functions needed to manage virtual machines or to integrate them into the execution environment that are specific to a hypervised system, e.g. handling of virtual machine instances, creating, cloning, deleting instances, starting and stopping virtual machines, distributing and migrating instances, managing I/O and storage access, isolating virtual machines for security reasons, managing memory of instances.

Special rules of classification

The following CPC breakdown codes are used for refined classification. Please also consider classification in the main trunk symbols referenced by the breakdown codes.

G06F 2009/45562

{Creating, deleting, cloning virtual machine instances}

Definition statement

This place covers:

Handling single instantations of virtual machines, e.g. creation from template or copy of another instance.

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G06F 2009/45566

{Nested virtual machines}

Definition statement

This place covers:

Virtual machines running within other virtual machines.

G06F 2009/4557

{Distribution of virtual machine instances; Migration and load balancing}

Definition statement

This place covers:

Managing the placement of virtual machine instances.

G06F 2009/45575

{Starting, stopping, suspending or resuming virtual machine instances}

Definition statement

This place covers:

Specifics about start/stop in the context of virtual machines.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program initiating	G06F 9/445
Task life-cycle in general	G06F 9/485

G06F 2009/45579

{I/O management, e.g. providing access to device drivers or storage}

Definition statement

This place covers:

Specifics about input/output within virtual machines, e.g. accessing storage, or external devices, using specific drivers.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Loading of device drivers	G06F 9/4411
Internal functioning of device drivers	G06F 13/102

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G06F 2009/45583

{Memory management, e.g. access or allocation}

Definition statement

This place covers:

Specifics about memory management within virtual machines, e.g. accessing and allocating memory.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Allocation of memory to service a request	G06F 9/5016
Memory management in general	G06F 12/00

G06F 2009/45587

{Isolation or security of virtual machine instances}

Definition statement

This place covers:

Mechanisms to isolate virtual machine instances from other instances; protection of virtual machines.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Security arrangements in general	G06F 21/00

G06F 2009/45591

{Monitoring or debugging support}

Definition statement

This place covers:

Specifics to enable monitoring or debugging within virtual machines.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Monitoring and debugging in general	G06F 11/30, G06F 11/36

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G06F 2009/45595

{Network integration; Enabling network access in virtual machine instances}

Definition statement

This place covers:

Specifics to enable network access of virtual machines.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Network virtualisation	H04L 12/4641
Network-specific arrangements for supporting networked applications	H04L 67/00

G06F 9/46

Multiprogramming arrangements

Definition statement

This place covers:

aspects of multiprogramming, i.e. where more than one process / task is present and this presence is essential for identifying the problem and / or the solution; a process / task is defined here as a program in execution.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Object-oriented software design	G06F 8/24
Multi-threading at the hardware level	G06F 9/3851
Saving and restoring the state of a system, i.e. hibernation	G06F 9/4418
Batch processing	G06F 9/4843
Suspend and resume task / process / thread execution without details on context saving and restoring	G06F 9/485
Saving and restoring the state of a mobile agent together with additional details on the mobile agent itself	G06F 9/4862
Saving and restoring program state during debugging	G06F 11/3636
Access rights for memory resources, e.g. access to memory according to privilege rings	G06F 12/14
Access rights associated to human beings or documents where the final aim is to enforce protection at the user level without giving technically relevant details on the multiprogramming implementation	G06F 21/30
Documents just mentioning a multiprocessing / distributed object-oriented systems and which focus on a specific use / application (e.g. e-commerce, monitoring, information retrieval, security)	G06Q 30/00 , G06F 11/00, G06F 16/00, G06F 21/00

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Documents mentioning a transaction but dealing, in fact, with nothing more than techniques involving a request for a service, without any detail on the ACID (Atomicity, Consistency, Isolation, Durability) properties; e.g. e-commerce transactions	G06Q 30/00
Cryptographic protocols	H04L 9/00
Network security protocols	H04L 63/00
Protocols for real-time services in data packet switching networks	H04L 65/00
Network protocols for data switching network services	H04L 67/00
Aspects already covered by G06F 9/48, G06F 9/50, G06F 9/52, G06F 9/54	See special rules of classification of the corresponding classes

Special rules of classification

Rule 1

When a document qualifies for one of the groups in the table of rule 2 below, the group G06F 9/46 should not be assigned.

Rule 2

The following table specifies the group to be assigned:

Technical details on	Group to be assigned
Saving or restoring of program or task context	G06F 9/461
Saving or restoring of program or task context with multiple register sets. This group takes precedence over G06F 9/461	G06F 9/462
Program control block organisation. This group takes precedence over G06F 9/461	G06F 9/463
Structure and arrangements for distributed object oriented systems, e.g. CORBA, Jini, DCOM	G06F 9/465
Transaction processing, namely transactions involving the ACID (Atomicity, Consistency, Isolation, Durability) properties	G06F 9/466
Transactional memory, i.e. transparent support for the definition of regions of code that are considered a transaction, the support being provided either in hardware, software or with hybrid-solutions. This group takes precedence over G06F 9/466. For speculative lock acquisition, G06F 9/528 takes precedence	G06F 9/467
Specific access rights for resources, e.g. using capability register	G06F 9/468

Rule 3

The following text specifies the groups which could be assigned in addition to the groups of rule 2 above, to cover further technical details; the group(s) identified as context information should also be checked and assigned, if relevant:

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Further technical details on:

The structure of bridges between different distributed object-oriented systems
- Context information: G06F 9/465

The lookup of interfaces and/or the structure of lookup servers / repositories
- Context information: G06F 9/465

The handling of references to remote objects / namespace implementation details within the context of distributed object-oriented systems
- Context information: G06F 9/465

G06F 9/48

Program initiating; Program switching, e.g. by interrupt

Definition statement

This place covers:

transfer, initiation or dispatching of tasks, i.e. programs in execution, either locally or within a distributed system

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific details on power distribution and power saving	G06F 1/3203
Scheduling of printer jobs	G06F 3/1296
Instruction streams within a processor (e.g. hardware threads) and instruction level details	G06F 9/3836
Suspension and resumption at system level (i.e. involving the bootstrapping)	G06F 9/4418
Mere loading of code linked to the initiation	G06F 9/445
Details on the task context structure as well as on its saving and restoring	G06F 9/461
Scheduling in terms of space	See special rules of classification for G06F 9/50
Process migration in the context of load (re-)balancing, without any technically relevant detail on the migration itself	G06F 9/5088
Mere starting of a backup application at a certain date/time	G06F 11/1461
Low level (bus-related) details of interrupt handling and interrupt controllers	G06F 13/24
Mere starting of an antivirus application at a certain date/time	G06F 21/56
Scheduling of human resources	G06Q 10/00

Special rules of classification

Rule 1

When a document qualifies for one of the groups in the table of rule 2 below, the group G06F 9/48 should not be assigned.

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Rule 2

The following table specifies the group to be assigned:

Technical details on	group to be assigned
Initiation of a task by means of an interrupt, i.e. the aspects of handling/servicing an interrupt	G06F 9/4812
InterruptI interrupt priority mechanisms. This group takes precedence over G06F 9/4812	G06F 9/4818
InitiationI of a task by means of an timer related interrupt. This group takes precedence over G06F 9/4812	G06F 9/4825
InitiationI of a task by means of an interrupt with variable priority. This group takes precedence over G06F 9/4812	G06F 9/4831
Initiation of a task by means of an interrupt with variable priority, said priority being time dependent. This group takes precedence over G06F 9/4812 and G06F 9/4831	G06F 9/4837
Initiation, transfer and dispatch of a task, i.e. a program in execution, by another program; creation, e.g. fork() system call, and initiation, e.g. exec() system call, of a task / process / thread, virtual machine in the same or different machine	G06F 9/4843
Task life-cycle, e.g. stopping, restarting, resuming execution. This group takes precedence over G06F 9/4843. For scheduling algorithms and internal operation of a scheduler, G06F 9/4881 takes precedence	G06F 9/485
Resuming the execution of a task on a different machine, i.e. migration. This group takes precedence over G06F 9/4843. This group takes precedence over G06F 9/485. For migration for load balancing purposes, G06F 9/5088 takes precedence	G06F 9/4856
Mobile agents, i.e. tasks specifically designed to migrate. This group takes precedence over G06F 9/4843. This group takes precedence over G06F 9/485. This group takes precedence over G06F 9/4856. For cloning and replication of mobile agents, only G06F 9/4868 should be assigned. For migration policy, e.g. auction, contract negotiation, of mobile agents, only G06F 9/4875 should be assigned.	G06F 9/4862
Scheduling strategies for dispatcher, e.g. round robin, multilevel priority queues; internal operation of a scheduler	G06F 9/4881
Algorithms for real-time scheduling of processes, i.e. scheduling taking into account the deadlines of the applications being executed. This group takes precedence over G06F 9/4843. This group takes precedence over G06F 9/4881.	G06F 9/4887

Power and heat aware scheduling of tasks. This group takes precedence over G06F 9/4843. This group takes precedence over G06F 9/4881	G06F 9/4893

Rule 3

The following text specifies the groups which could be assigned in addition to the groups of rule 2 above, to cover further technical details; the group(s) identified as context information should also be checked and assigned, if relevant:

Further technical details on:

Exception handling
- Context information: G06F 9/4812

Application starting, stopping, resuming
- Context information: G06F 9/485

Scheduling of tasks on multiprocessor systems
- Context information: G06F 9/4881, G06F 9/4887, G06F 9/4893

Scheduling of a set of tasks by taking into account precedence and dependency constraints, or time and/or occurrence of events
- Context information: G06F 9/4881, G06F 9/4887, G06F 9/4893

Scheduling of a set of tasks by taking into account constraints on resources, resource based scheduling of tasks
- Context information: G06F 9/4881, G06F 9/4887, G06F 9/4893

Internals of a task scheduler
- Context information: G06F 9/4881, G06F 9/4887, G06F 9/4893

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

[scheduling in terms of time]	[with the acceptation of task scheduling, i.e. when to assign a task to a computing unit]
[scheduling in terms of space]	[with the acceptation of resource scheduling, i.e. which resource(s) to allocate and how to partition them]

It is the first interpretation, the one which can be found in the context of the G06F 9/48

G06F 9/50

Allocation of resources, e.g. of the central processing unit [CPU]

Definition statement

This place covers:

selection, allocation and de-allocation of hardware and/or software resources, like servers, processes, threads, CPUs, memory; combination and/or partitioning of resources, e.g. cloud computing, hypervisors and logical partitions; mapping of tasks onto parallel / distributed machines; load balancing and re-balancing of resources in distributed systems.

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References

Limiting references

This place does not cover:

Specific details on power distribution and power saving	G06F 1/3203
Allocation of disk resources and storage resources in general not being RAM	G06F 3/0604
Scheduling of printer jobs	G06F 3/1296
Specific details on emulation and internal functioning of a virtual machine	G06F 9/455
Mapping of tasks onto multi-processor systems carried out at compile-time	**G06F9/45M1**
Pure scheduling aspects, i.e. scheduling in terms of time, without considering resource allocation	G06F 9/4881, G06F 9/4887, G06F 9/4893
Garbage collection techniques	G06F 12/023
Allocation of human resources	G06Q 10/00
Cryptographic protocols	H04L 9/00
Network security protocols	H04L 63/00
Protocols for real-time services in data packet switching networks	H04L 65/00
Network protocols for data switching network services	H04L 67/00
Allocation of resources within a printer / multifunctional peripheral	H04N 1/00

Special rules of classification

Rule 1

When a document qualifies for one of the classes in the table of rule 2 below, the class G06F 9/50 should not be assigned.

Rule 2

The following table specifies the class to be assigned:

Technical details on:	Class to be assigned:
Allocation of resources to service a request	G06F 9/5005
Allocation of resources to service a request, the resources being hardware resources other than CPUs, Servers and Terminals This class takes precedence over G06F 9/5005	G06F 9/5011
Allocation of memory resources to service a request This class takes precedence over G06F 9/5005 This class takes precedence over G06F 9/5011 for documents detailing both the allocation and release of memory resources, the class G06F 9/5022 should also be assigned	G06F 9/5016
Release of resourcesThis class takes precedence over G06F 9/5005 This class takes precedence over G06F 9/5011 For documents detailing both the allocation and release of memory resources, the class G06F 9/5016 should also be assigned	G06F 9/5022
Allocation of processing resources, e.g. CPUs, Servers, Terminals, processes, threads, virtual machines	G06F 9/5027

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A llocation of processing resources by considering data affinity This class takes precedence over G06F 9/5005 This class takes precedence over G06F 9/5027	G06F 9/5033
A llocation of processing resources by considering the execution order of a plurality of tasks, e.g. taking priority or time dependency constraints into consideration. Candidates for this group are documents dealing with requests for composite (web) services, where the various components should execute in a certain order and resources for said execution should be assigned accordingly. Also included are documents dealing with "workflow" like systems, where a request to "execute" a project definition, comprising a set of interrelated actions, is sent to a server This class takes precedence over G06F 9/5005 This class takes precedence over G06F 9/5027	G06F 9/5038
A llocation of processing resources by considering hardware capabilities This class takes precedence over G06F 9/5005 this class takes precedence over G06F 9/5027	G06F 9/5044
Allocation of processing resources by considering the load This class takes precedence over G06F 9/5005 This class takes precedence over G06F 9/5027	G06F 9/505
Allocation of processing resources by considering software capabilities, namely software resources associated or available to the machine, e.g. Web services offered by a specific machine This class takes precedence over G06F 9/5005 This class takes precedence over G06F 9/5027	G06F 9/5055
Partitioning or combining of resources This class should contain also documents dealing with cluster membership, i.e. assignment of a server to a certain group based on some criteria (see exemplary documents WO0156785, EP0805393).	G06F 9/5061
Algorithms for mapping a plurality of inter-dependent sub-tasks onto a plurality of physical CPUs This class takes precedence over G06F 9/5061	G06F 9/5066
Grid computing, cloud computing With the expression grid / cloud computing it is meant an environment where multiple services are offered by the various members of the grid (often making use of idle periods), said members being usually located over a large scale network. Candidate documents should have at least one of the following concepts: i) set up of a grid, e.g. registering a new member, re-organizing the grid; ii) usage of a service in the grid, e.g. locating the member, servicing a request. This class takes precedence over G06F 9/5061	G06F 9/5072
Logical partitioning of resources; management and configuration of virtualized resources This group deals with the creation and management (e.g. allocation) of logical partitions and resulting virtual machines in multiprocessor systems; it also deals with the concept of virtualization in general, namely the mere management (e.g. creation, deletion) of an abstract, logical representation of a resource and its configuration (e.g. re-definition of its behaviour). This class takes precedence over G06F 9/5061 For documents detailing the migration of a virtual machine to a different node, the class G06F 9/4856 should also be assigned	G06F 9/5077
Techniques for balancing or rebalancing the load in a distributed system by taking into account the load of the whole system	G06F 9/5083

Techniques for balancing or rebalancing the load in a distributed system by migrating tasks / jobs / virtual machines This class takes precedence over G06F 9/5083 For documents detailing the migration of a task/job/virtual machine to a different node, the class G06F 9/4856 should also be assigned	G06F 9/5088
Allocation of resources based on power and heat considerations	G06F 9/5094

Rule 3

The following table specifies the classes which could be assigned in addition to the classes of rule 2 above, to cover further technical details; the class(es) identified as Context information should also be checked and assigned, if relevant:

Further details on:

Allocation based on performance criteria
- Class to be assigned: **S06F209/5001**
- Context information: G06F 9/5027, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

Allocation based on proximity
- Class to be asigned: **S06F209/5002**
- Context information: G06F 9/5027, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

Indication of availability of resources
- Class to be assigned: **S06F209/5003**
- Context information: All groups belonging to G06F 9/50

Enforcing and/or taking into account lower and/or upper ceilings on resource usage in the context of resource allocation
- Class to be assigned: **S06F209/5004**
- Context information: All groups belonging to G06F 9/50

Cluster membership
- Class to be assigned: **S06F209/5005**
- Context information: G06F 9/5061

Dependency or time-specific aspects which are taken into account during the allocation
- Class to be assigned: **S06F209/5006**
- Context information: G06F 9/5038

Allocation of low-level processor resources, e.g. logical units, registers, cache lines, decoding stages
- Class to be assigned: **S06F209/5007**
- Context information: G06F 9/5011, G06F 9/5016, G06F 9/5022

Monitoring techniques used in conjunction with the CPU / thread allocation
- Class to be assigned: **S06F209/5008**
- Context information: All groups belonging to G06F 9/50

Offloading computations (e.g. because lacking some of the necessary capabilities)
- Class to be assigned: **S06F209/5009**
- Context information: G06F 9/5027, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

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Allocation based on priority
- Class to be assigned: G06F 2209/5011
- Context information: G06F 9/5027, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

Creation, use, management of pool of resources
- Class to be assigned: **S06F209/5010**
- Context information: All groups belonging to G06F 9/50

Controlling aspects of an already submitted request, e.g. polling for a status, deleting / modifying the request
- Class to be assigned: G06F 2209/5013
- Context information: G06F 9/5027, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

Reservation of resources so as to have them ready at the time of the actual allocation
- Class to be assigned: G06F 2209/5014
- Context information: All groups belonging to G06F 9/50

Selection, by a broker, based on the submitted request, of an appropriate server via a registry or a yellow pages server
- Class to be assigned: G06F 2209/5015
- Context information: G06F 9/5027, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

Session management
- Class to be assigned: G06F 2209/5016
- Context information: G06F 9/5027, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

Task decomposition
- Class to be assigned: G06F 2209/5017
- Context information:**G06F9/50A6**, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

Selection of a thread / process within a multithreaded / multiprocessing machine, said selection being aimed to service a request
- Class to be assigned: G06F 2209/5018
- Context information: G06F 9/5027, G06F 9/5033, G06F 9/5038, G06F 9/5044, G06F 9/505, G06F 9/5055

Workload prediction within the context of CPU / process allocation and load rebalancing
- Class to be assigned: G06F 2209/5019
- Context information: G06F 9/5083, G06F 9/5088

Workload threshold within the context of CPU / process allocation and load rebalancing
- Class to be assigned: G06F 2209/5019
- Context information: G06F 9/5083, G06F 9/5088

remote execution techniques whereby program code is executed remotely from the client that initiated the execution and the client provides the code to the remote machine
- Class to be assigned: **S06F209/5409**
- Context information: All groups belonging to G06F 9/50

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Synonyms and Keywords

The expression "scheduling", in the patent- and non patent-documentation, can have two distinct meanings when referring to task and resources:

1) scheduling in terms of time, with the acceptation of task scheduling, i.e. when to assign a task to a computing unit,

2) scheduling in terms of space, with the acceptation of resource scheduling, i.e. which resource(s) to allocate and how to partition them.

It is the second interpretation, the one which can be found in the context of G06F 9/50.

G06F 9/52

Program synchronisation; Mutual exclusion, e.g. by means of semaphores

Definition statement

This place covers:

Arbitrating access from tasks to shared resources (e.g. mutual exclusion), synchronising the execution of tasks with respect to each others (e.g. producer - consumer) ; a task is defined here as a program in execution.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Speculative instruction issuing and/or data consistency	G06F 9/3842, G06F 9/3834
Transaction processing	G06F 9/466
Arbitration of access on a bus	G06F 13/14
Concurrency management in a database	G06F 16/2308

Special rules of classification

Rule 1

When a document qualifies for one of the groups in the table of rule 2 below, the group G06F 9/52 should not be assigned

Rule 2

The following table specifies the group to be assigned:

Technical details on	Group to be assigned
Barrier synchronisation	G06F 9/522
Algorithms to detect and / or avoid deadlocks when tasks interact with each other	G06F 9/524
Mutual exclusion algorithms, specific implementations of locks and other means to ensure a "correct" (from the concurrency point of view) access to a shared resource	G06F 9/526

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Speculative execution beyond synchronisation primitives (e.g. busy lock). This group takes precedence over G06F 9/526; e.g. if a document discloses a mutual exclusion algorithm involving speculative execution beyond busy locks, then it should be classified only in the G06F 9/528 and not also in the G06F 9/526	G06F 9/528

Rule 3

The following text specifies the groups which could be assigned in addition to the groups of rule 2 above, to cover further technical details:

Further technical details on:

Low level features of atomic instructions (e.g. test & set) used to implement locks / mutual exclusion primitives

- Context information: G06F 9/526, G06F 9/528

Tokens (e.g. cooperative locking), token managers and lock managers

- Context information: G06F 9/526, G06F 9/528

Multi-mode locks, i.e. with locks specifying also a mode (e.g. read-write)

- Context information: G06F 9/526, G06F 9/528

G06F 9/54

Interprogram communication

Definition statement

This place covers:

Communication between tasks, i.e. programs, processes, threads in execution, either on the same machine or on different ones, where the multiprogramming aspect is relevant, e.g. Inter-Process-Communication.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Communication between a device and a CPU without any technically relevant detail on multiprogramming concepts or with device specific details	G06F 3/00, G06F 13/00, G06F 13/102 (for device drivers)
Interaction of the user with the system, i.e. the GUI, and not between the Processes / applications subsequent to the user interaction	G06F 3/048
Communication which does not involve multiprogramming concepts, e.g. invocation of a subroutine	G06F 9/44
Pattern-adapters	G06F 9/44
Non-remote method invocation between objects	G06F 9/449
Architectural details, e.g. interface repositories, object adapters, on distributed object-oriented systems, e.g. CORBA, DCOM Communication-specific details of the remote method invocation should (also) be classified in G06F 9/548	G06F 9/465

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Allocation of a remote service to a client	G06F 9/50
Communication between tasks but predominant aspect peculiar of another field, e.g. monitoring, information retrieval on the web, software download and installation	G06F 11/30, G06F 16/95, G06F 8/65
Addressing memory	G06F 12/02
Hardware mechanisms for inter-CPU communication	G06F 15/163
Collaborative editing on a file without any technically relevant details on the event handling aspect	G06F 40/10, G06Q 10/10
Cryptographic protocols	H04L 9/00
Event management relating to network management, e.g. alarms produced by network devices, and no technically relevant details on the multiprocessing aspect is present	H04L 41/06
Messages being distributed over a network, i.e. e-mails, instant messaging	H04L 51/00, G06Q 10/107
Network security protocols	H04L 63/00
Protocols for real-time services in data packet switching networks	H04L 65/00
Network protocols for data switching network services	H04L 67/00

Special rules of classification

Rule 1

When a document qualifies for one of the groups in the table of rule 2 below, the group G06F 9/54 should not be assigned.

Rule 2

The following table specifies the group to be assigned:

Technical details on	Group to be assigned
Adapter mechanisms e.g. between incompatible applications	G06F 9/541
Communication between tasks, either on the same machine or on different ones, by subscribing to events and issuing event notifications when certain events happen, e.g. Event Management Systems, Unix alarms; communication aspects related to the broadcasting of the notifications	G06F 9/542
User-generated data transfer from the process / application point of view, e.g. clipboards, dynamic data exchange (DDE), object linking and embedding (OLE)	G06F 9/543
Communication of processes via buffers, shared memory, pipes, sockets and the like	G06F 9/544
Communication between tasks residing in different layers e.g. user- and kernel-space	G06F 9/545

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Communication of processes via a message passing system, i.e. messaging middleware, and the inherent technicalities, e.g. message structure or queue handling; delivery of messages according to preferences of the recipients (which have to be processes)	G06F 9/546
Implementation of Remote Procedure Calls, e.g. stubs, (un-)marshalling of parameters, namely invocation of a procedure at a remote location; lightweight RPC, i.e. procedure call between protection domains / different address spaces on a single machine	G06F 9/547
Implementation of Remote Method Invocations, i.e. details which are peculiar to RPC between (mainly Java and COM) objects, e.g. object serialization, stub / proxy download. This group takes precedence over G06F 9/547.	G06F 9/548

Rule 3

The following text specifies the groups which could be assigned in addition to the groups of rule 2 above, to cover further technical details:

Further technical details on:

Communication aspects related to task execution in a client-server system
- Context information: All groups belonging to G06F 9/54

Interception of communications between tasks / layers
- Context information: All groups belonging to G06F 9/54

Handling of events within a single system, e.g. Unix alarms
- Context information: G06F 9/542

Distributed event management systems or handling of events produced in a distributed system
- Context information: G06F 9/542

Event handling related to the execution of a GUI and as long as the event handling aspect is technically relevant
- Context information: G06F 9/542

Broadcasting / multicasting and sequence related problems of event related messages and as long as the network aspect, if any, is not predominant
- Context information: G06F 9/542

Exchange of messages between processes by using a Message Oriented Middleware, e.g. Java Messaging Services
- Context information: G06F 9/546

Particular techniques for handling message queues (or similar structures)
- Context information: G06F 9/546

Remote execution techniques whereby program code is executed remotely from the client that initiated the execution and the client provides the code to the remote machine
- Context information: All groups belonging to G06F 9/54

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G06F 11/00

Error detection; Error correction; Monitoring (error detection, correction or monitoring in information storage based on relative movement between record carrier and transducer G11B 20/18; monitoring, i.e. supervising the progress of recording or reproducing G11B 27/36; in static stores G11C 29/00)

Definition statement

This place covers:

- Error avoidance (G06F 11/004);
- Identification related to error detection/correction or monitoring (G06F 11/006);
- Reliability and availability analysis of computing systems (G06F 11/008);
- Error detection and/or correction (G06F 11/07);
- Detection or location of defective computer hardware by testing at a time outside of "normal operating mode", e.g. during standby, idle time or at power on (G06F 11/22);
- Checking the correct order of processing (G06F 11/28);
- Monitoring on computing systems (G06F 11/30);
- Prevention of errors by analysing, debugging or testing of software (G06F 11/36).

References

Limiting references

This place does not cover:

Error detection, correction or testing in information storage based on relative movement between record carrier and transducer	G11B 20/18
Monitoring, i.e. supervising the progress of recording or reproducing	G11B 27/36
Checking stores for correct operation; Testing stores during standby or offline operation	G11C 29/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Testing of electronic circuits	G01R 31/28
Testing or monitoring of control systems or parts thereof	G05B 23/00
Methods or arrangements for verifying the correctness of marking on a record carrier	G06K 5/00
Monitoring patterns of pulse trains	H03K 5/19
Coding, decoding or code conversion, for error detection or error correction; Coding theory basic assumptions; Coding bounds; Error probability evaluation methods; Channel models; Simulation or testing of codes	H03M 13/00
Arrangements for detecting or preventing errors in the information received	H04L 1/00
Arrangements for monitoring or testing data switching networks	H04L 43/00
Network arrangements, protocols or services for recovering from a failure of a protocol instance or entity	H04L 69/40

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Special rules of classification

The error detection or correction process in neural networks is also covered (G06F 11/1476).

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

fault	physical defect, imperfection or flaw that occurs within some hardware component, or logical defect of a piece of software. Essentially, the definition of a fault, as used in the fault tolerance community, agrees with the definition found in the dictionary. Faults may be permanent, transient or intermittent.
error	the logical manifestation of a fault, observable in terms of incorrect instructions of or corrupted data in a (computer) system. For example, a fault in a DRAM cell will never be observed if the memory location is never accessed. Specifically, an error is a deviation from accuracy or correctness.
failure	the incorrect functioning of a system as perceivable by a user or the system's environment as a consequence of an error. A failure is the non-performance, the untimely performance or the performance in a subnormal quantity or quality of some action that is due or expected.
redundant hardware	additional hardware for performing the same function as another hardware part, provided that in faultless operation you could renounce on either hardware parts of the system without losing functionality.
data representation	a physical or logical encoding (scheme) for data, which allows the latter to be processed, stored or transmitted by a machine.
redundancy in data representation	a representation of data using more resources than strictly necessary to encode the desired information such that in the error free situation one could renounce some of said resources without losing information.
redundancy in operation	performing (a set of) operations more than once, performing sequentially different implementations of a particular function or performing additional operations which (allow to) restore a system in a state from which its correct operation can be resumed after a failure.
time diversity	the concept to have a redundant system in which one of the redundant components operates with a delay with respect to the other in order to avoid common mode failures that would affect both redundant components in the same way at the same time, thereby not being detectable/correctable.

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primary-checker setup	a redundant configuration in which a primary CPU drives the system. The checker CPU is synchronized (often at clock level) with the primary. It processes the input data stream as the primary (and often also the very same program). Whenever the primary drives an output signal, the checker compares its own value with the data written by the primary. A mismatch triggers an error signal. The primary-checker mode is supported in many modern microprocessors by a comparator integrated into the pin driver circuitry, thus reducing the external logic to a few chips for interfacing the error signals. The primary-checker system generally gives more accurate answers by ensuring that the answer is correct before passing it on to the application requesting the algorithm being completed. It also allows for error handling if the results are inconsistent. Depending on the merit of a correct answer, a checker-CPU may or may not be warranted. In order to alleviate some of the cost in these situations, the checker-CPU may be used to calculate something else in the same algorithm, increasing the speed and processing output of the CPU system. There are two possible configurations: Primary-Listener and Cross-Coupled. The Primary-Listener lock step configuration pairs two processors, with one as a complete Primary and the other as a complete Listener, the latter having disabled output drivers. In the Cross-Coupled configuration, one of the processors, the SI-Primary, drives the system interface bus, while the other processor, the SC-Primary, drives the secondary cache bus. The SI-Primary has disabled output drivers for the secondary cache interface bus while the SC-Primary has disabled output drivers for the system interface bus.
normal operating mode	the operation of a system or software once it is deployed and provides the desired service as opposed to its development, maintenance, test or idle time.
fault masking	hiding the presence of a fault to the user or the environment of a (computer system by means of some sort of redundancy such that the perceived system functionality is not affected.
active fault masking	taking particular actions (e.g. reconfiguration or failover) not performed in the error free situation to mask a fault.
passive fault masking	when a system operates such that no particular action is necessary to mask a fault because all necessary operations are constantly performed independently of the presence of a fault (e.g. majority voting).
interconnection	physical media and may be of point-to-point type or of bus type. Two interconnections are only considered redundant if: they both physically connect the same nodes, wherein nodes are the source producing or the final destination consuming the data to be transmitted, and are configured to perform the same data transmissions.
monitoring	observing and/or measuring parameters or status of a running system.
mirrored data	two copies of the data where it is supposed that both copies contain the same data at any moment.
backed up data	the second copy of the data reflects the data of the first copy at a particular moment.

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G06F 11/002

{protecting against parasitic influences, e.g. noise, temperatures}

Special rules of classification

In this group the use of the Indexing Codes G06F 2201/00 and lower is mandatory.

G06F 11/004

{Error avoidance (G06F 11/07 and subgroups take precedence)}

Definition statement

This place covers:

All measures taken to prevent an error from happening. This can either be by preventing the fault from being present or by ensuring that the presence of the fault will not lead to an error.

References

Limiting references

This place does not cover:

Measures in response to the occurence of a fault, e.g. measures designed to limit the impact of the error	G06F 11/07

Special rules of classification

In this group the use of the Indexing Codes G06F 2201/00 and lower is mandatory.

This subgroup is only to be used for subject-matter for which no other technique (like fault-masking based on redundancy) to respond to the occurrence of a fault applies. If techniques corresponding to G06F 11/07 and subgroups apply, the subject-matter must be classified there instead.

G06F 11/006

{Identification (G06F 11/2289 takes precedence)}

Special rules of classification

In this group the use of the Indexing Codes G06F 2201/00 and lower is mandatory.

G06F 11/008

{Reliability or availability analysis}

Definition statement

This place covers:

Reliability theory describes the probability of a system completing its expected function during an interval of time. In reliability theory availability is the degree to which a system is in a specified functioning condition. In the literature various definitions can be found. One well established defines availability as "the probability that a system is operating at a specified time t", Barlow and Proschan: Mathematical Theory of Reliability (1975). A simple representation of availability is a ratio of the expected value of the uptime of a system to the aggregate of the expected values of up and down time. For example in the case of systems having a MTBF (Mean Time Between Failure) and MTTR (Mean Time to Recovery), availability = MTBF/(MTBF + MTTR). Typical terminology that the group

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contains: error prediction, failure rate, predictive maintenance, longevity, etc. A lot of documents deal with pure theory and propose new formula for better assessing a system in terms of reliability.

References

Limiting references

This place does not cover:

Forecasting, planning	G06Q 10/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Reliability	The term refers to the ability of a system or component to perform its required functions under stated conditions for a specified period of time.
Availability	The ratio of the total time a functional unit is capable of being used during a given interval to the length of the interval.
Downtime	The term downtime is used to refer to periods when a system is unavailable.
Uptime	Part of active time during which an equipment, machine, or system is either fully operational or is ready to perform its intended function.
MTBF	Mean Time Between failure is the predicted elapsed time between inherent failures of a system during operation.
MTTF	Mean Time to Failure is the time taken for a part or system to fail for the first time.
MTTR	Mean Time To Repair is a basic measure of the maintainability of repairable items. It represents the average time required to repair a failed component or device.
MTTR	Mean Time To Recovery is the average time that a device will take to recover from any failure.

G06F 11/07

Responding to the occurrence of a fault, e.g. fault tolerance

Definition statement

This place covers:

- Error detection/correction on computing systems using redundancy in data representation (also includes RAID systems involving parity) (G06F 11/08 and subgroups).
- Error detection/correction on computing systems using redundancy in operations (G06F 11/14 and subgroups).
- Error detection/correction on computing systems using redundancy in hardware (G06F 11/16 and subgroups).
- Error or fault processing without redundancy (G06F 11/0703 and subgroups).
- Safety measures (G06F 11/0796)

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Fault	Physical defect, imperfection, or flaw that occurs within some hardware component, or logical defect of a piece of software. Essentially, the definition of a fault, as used in the fault tolerance community, agrees with the definition found in the dictionary. Faults may be permanent, transient or intermittent.
Error	The logical manifestation of a fault, observable in terms of incorrect instructions of or corrupted data in a (computer) system. E.g. a fault in a DRAM cell will never be observed if the memory location is never accessed. Specifically, an error is a deviation from accuracy or correctness.
Failure	The incorrect functioning of a system as perceivable by a user or the system's environment as a consequence of an error. A failure is the non-performance, the untimely performance or the performance in a subnormal quantity or quality of some action that is due or expected.
Redundant hardware	Additional hardware for performing the same function as another hardware part, provided that in faultless operation you could renounce on either hardware parts of the system without loosing functionality.
Data representation	A physical or logical encoding (scheme) for data, which allows the latter to be processed, stored or transmitted by a machine.
Redundancy in data representation	A representation of data using more resources than strictly necessary to encode the desired information such that in the error free situation one could renounce to some of said resources without loosing information.
Redundancy in operation	Performing (a set of) operations more than once, or performing sequentially different implementations of a particular function, or performing additional operations which (allow to) restore a system in a state from which its correct operation can be resumed after a failure.
Normal operating mode	The operation of a system or software once it is deployed and provides the desired service as opposed to its development, maintenance, test or idle time.
Fault masking	Hiding the presence of an fault to the user or the environment of a (computer system by means of some sort of redundancy such that the perceived system functionality is not affected.
Active fault masking	Taking particular actions (e.g. reconfiguration, failover) not performed in the error free situation to mask a fault.
Passive fault masking	When a system operates such that no particular action is necessary to mask a fault because all necessary operations are constantly performed independently of the presence of a fault (e.g. majority voting).
Mirrored data	Two copies of the data where it is supposed that both copies contain the same data at any moment.
Backed up data	The second copy of the data reflects the data of the first copy at a particular moment.

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G06F 11/0703

{Error or fault processing not based on redundancy, i.e. by taking additional measures to deal with the error or fault not making use of redundancy in operation, in hardware, or in data representation}

Definition statement

This place covers:

The methods for error/fault processing on computing systems in normal operating mode that do not imply the use of any redundancy techniques. The error/fault processing, as it is defined in the subgroup, comprises one or more of the following steps:

- the error detection step (G06F 11/0751 and subgroups)
- the error/fault reporting/storing step (G06F 11/0766 and subgroups)
- the root cause analysis step of the error/fault (G06F 11/079)
- the remedying step (G06F 11/0793), wherein:
- the error/fault reporting/storing refers to collecting/storing of information related to the error/fault (e.g. a performing a memory dump after detecting an error).
- the root cause analysis of an error aims at identifying the initial cause of an error/fault.
- the remedying step refers to the actions taken on the computing system in order to overcome an error/fault.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Monitoring power failures	G06F 1/28
Responding to power failures	G06F 1/30
Error/fault processing in manufacturing/control systems/environment	G05B 23/02
Error detection, correction or monitoring in information storage based on relative movement between record carrier and transducer	G11B 20/18, G11B 27/36
Error in transmission systems (error detection/correction in data transmission)	H04L 1/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Exception handling during concurrent execution	G06F 9/3861
Error detection or correction of the data by redundancy in operations	G06F 11/14
Error/fault detection by checking the correct order of processing of a system or a program	G06F 11/28
Monitoring per se, reporting or storing of non-error data	G06F 11/30, G06F 11/34
Protection against unauthorized use of memory	G06F 12/14
Computer security, e.g. detection of attacks, malware, unauthorised accesses	G06F 21/00
Fault management in networks wherein the error/fault is related to the data exchange protocols or to the network equipments (e.g. routers or switches)	H04L 41/06

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Monitoring of traffic in a network or of network components (e.g. routers or switches)	H04L 43/00
Network security detection/protection against malicious traffic	H04L 63/14
Monitoring testing in wireless networks	H04W 24/00

Special rules of classification

A document classified in G06F 11/0703 - G06F 11/0793 must receive at least one classification for the "functional aspect" and at least one classification for the "architectural context" according to the two following actions.

Action 1 – Classifying the functional aspect (see groups G06F 11/0751 - G06F 11/0793):

- Classifying the document in a subgroup corresponding to the most relevant functional aspect of the error/fault processing described in the document;
- G06F 11/0751 and its subgroups for the function of error/fault detection, e.g. comparing data to an error threshold;
- G06F 11/0766 and its subgroups for the function of error/fault reporting/storing, e.g. performing a memory dump after detecting an error;
- G06F 11/079 for the function of root cause analysis, e.g. determining the first error event causing the others;
- G06F 11/0793 for the function of error/fault remedying, e.g. executing a specific interrupt handler to clear the error/fault;
- A document can be classified in more than one group of the list defined above based on details of different functional aspects disclosed in the document.

Action 2 – Classifying the architectural context (see groups G06F 11/0706 - G06F 11/0748):

- Classifying the document in a subgroup) corresponding to the most relevant architectural context described in the document;
- A document can be classified in more than one group under G06F 11/0706 based on details of different architectural contexts disclosed in the document;
- In case the document does not disclose any specific architectural context details or only refers to a general computer, the generic head group, G06F 11/0706, should be used.

G06F 11/0727

{in a storage system, e.g. in a DASD or network based storage system (drivers for digital recording or reproducing units G06F 3/06; circuits for error detection or correction within digital recording or reproducing units G11B 20/18; for distributed storage of data in networks, e.g. transport arrangements for network file system [NFS], storage area networks [SAN] or network attached storage [NAS], H04L 67/1097)}

References

Limiting references

This place does not cover:

Drivers for digital recording or reproducing units	G06F 3/06
Circuits for error detection or correction within digital recording or reproducing units	G11B 20/18

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For distributed storage of data in networks, e.g. transport arrangements for network file system [NFS], storage area networks [SAN] or network attached storage [NAS]	H04L 67/1097

G06F 11/0766

{Error or fault reporting or storing}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Monitoring per se, reporting or storing of non-error data	G06F 11/30, G06F 11/34

G06F 11/0793

{Remedial or corrective actions (recovery from an exception in an instruction pipeline G06F 9/3861; by retry G06F 11/1402; for recovering from a failure of a protocol instance or entity H04L 69/40)}

References

Limiting references

This place does not cover:

Recovery from an exception in an instruction pipeline	G06F 9/3861
By retry	G06F 11/1402
For recovering from a failure of a protocol instance or entity	H04L 69/40

G06F 11/0796

{Safety measures, i.e. ensuring safe condition in the event of error, e.g. for controlling element}

Definition statement

This place covers:

A safe computer system protects its user(s) and/or environment from hazards whether its intended function is performed correctly or not. This group deals with measures taken to ensure that a computer-based system stays safe (i.e. does not present a danger to persons or its environment) when it is no longer able to provide its normal functionality due to the presence of an error. This requirement typically occurs in many real-time control systems. The subject-matter of is group is different from fault-masking since the latter attempts to maintain the desired functionality of a system in the presence of faults whereas this group relates to ensuring a safe condition when faults cannot be masked, thereby degrading the desired system functionality.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

If such a system continues to operate albeit with degraded hardware or software functionality, additional classification symbols in the appropriate subgroups may be necessary.	G06F 11/142

Special rules of classification

In this group the use of the Indexing Codes G06F 2201/00 and lower is mandatory.

G06F 11/08

Error detection or correction by redundancy in data representation, e.g. by using checking codes

Definition statement

This place covers:

Documents where the error detection/correction in a computer system is done by redundancy in the representation of the data.

Most often this redundancy arises from the fact that more bits are used to represent the data than strictly necessary. However, these groups cover as well cases where the data is stored twice, but in different formats (e.g. the second time using inverse logic).

However, subject-matter where 2 (or more) identical copies of the data are stored, is not treated here (see informative references)

References

Limiting references

This place does not cover:

Data with redundancy of data representation stored on storage with movable components	G11B 20/18
Error detection or correction codes per se	H03M 13/00
Transmission of data using redundancy of data representation	H04L 1/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Redundant storage of data	G06F 11/1666, G06F 11/2053

Special rules of classification

Generally only 1 class is given. Only invention information is classified.

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G06F 11/10

Adding special bits or symbols to the coded information, e.g. parity check, casting out 9's or 11's

Definition statement

This place covers:

Subject matter where more bits are used to represent the data than strictly necessary, however without representing the data twice (or more often).

Subject-matter dealing with host-to-memory or host-to-host transfers is classified in this group per se, except when the protection is on the level of blocks of data (which is in G06F 11/1004).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protecting a block of data words	G06F 11/1004

Special rules of classification

As soon as the redundant representation is stored on storage, the subject-matter should be classified in G06F 11/1076 and subgroups and not in other subgroups. This is independent of how the redundant representation is determined or what representation is used. Group is not used for classification.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Memory	solid state devices used as main memory which are either directly addressable by the associated CPU (meaning that they are located on the high speed bus), or are not addressable internal memories (such as registers and buffers). As such, memory is different from storage.
Storage	media from which data needs first to be loaded before it can be used for computing.

G06F 11/1004

{to protect a block of data words, e.g. CRC or checksum (G06F 11/1076 takes precedence; security arrangements for protecting computers or computer systems against unauthorized activity G06F 21/00)}

Definition statement

This place covers:

The use of checking codes on bigger units of data than a single word to detect the presence of errors in the data.

This group does not cover correction of data.

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In this group, it is irrelevant for what purpose the checking is being used (e.g. for storing the data in memory, for transmission of the data to another component in the computing system, ...) as long as it is related to error detection.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Security arrangements for protecting computers or computer systems against unauthorized activity	G06F 21/00
Computer virus detection or handling	G06F 21/00
Using checking codes for detecting unauthorised modifications	G06F 21/00
Using checking codes in data communication	H04L 1/00

G06F 11/1008

{in individual solid state devices (G06F 11/1004 takes precedence)}

Definition statement

This place covers:

That subject-matter where the error detection and/or correction is done on data stored in a single solid state device (i.e. the detection/correction is done when reading data from or writing data into the memory). It is independent of what function the solid state device has in the system. The relevant criterium is the type of component on which the data is stored (i.e. solid state devices in contrast to disks, tapes or other storage devices with moving components).

References

Limiting references

This place does not cover:

To protect a block of data words	G06F 11/1004

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protection of blocks of data being transferred (from memory to memory or between host and memory)	G06F 11/10
Parity RAID in storage	G06F 11/1076

Special rules of classification

G06F 11/1004 takes precedence.

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G06F 11/1012

{using codes or arrangements adapted for a specific type of error (G06F 11/1048 takes precedence)}

Definition statement

This place covers:

This group and its subgroups cover specific code arrangements, i.e. documents describing how the ECC codes to be applied to the data are determined. As an example, documents describing row and column parity are classified here

Special rules of classification

G06F 11/1048 takes precedence.

G06F 11/1016

{Error in accessing a memory location, i.e. addressing error}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protection against unauthorized access to memory	G06F 12/14

G06F 11/1024

{Identification of the type of error}

Special rules of classification

Not used for classification.

G06F 11/1032

{Simple parity}

Special rules of classification

Not used for classification

G06F 11/1036

{Unidirectional errors}

Special rules of classification

Not used for classification.

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G06F 11/1044

{with specific ECC/EDC distribution}

Definition statement

This place covers:

ECC codes where different bits of a data word are stored in different memory modules. Documents classified here, do not deal with calcualtion of ECC/EDC but only on where the data with the corresponding code is stored in the device (e.g. on different modules of the same device).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Parity distribution in a Redundant Array of Independent storage devices	G06F 11/108

Special rules of classification

Only classify here when no other group applies.

G06F 11/1012 (code arrangements) takes precedence.

G06F 11/1048 (hardware arrangements) takes precedence.

G06F 11/1048

{using arrangements adapted for a specific error detection or correction feature}

Definition statement

This place covers:

This group and its subgroups cover coding where the hardware plays a role, e.g. to make the error correction or detection faster, to reduce the power consumption for detecting/correcting errors, ...

The hardware involved must be described.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Parity in RAID systems	G06F 11/1076

G06F 11/1052

{Bypassing or disabling error detection or correction}

Definition statement

This place covers:

This group covers documents in which no error detection/correction by redundant coding is performed at all in the normal situation.

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Relationships with other classification places

Subject-matter covering circuits where ECC/EDC codes are calculated in parallel during operation are to be classified in G06F 11/1048.

G06F 11/1056

{Updating check bits on partial write, i.e. read/modify/write}

Special rules of classification

Not used for classification.

G06F 11/106

{Correcting systematically all correctable errors, i.e. scrubbing}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Memory refresh tehniques	G11C

G06F 11/1064

{in cache or content addressable memories}

Definition statement

This place covers:

This group covers ECC when it concerns a feature which is specific to caches or content addressable memories.

For instance if an additional ECC is used for the cache with respect to the memory.

G06F 11/1068

{in sector programmable memories, e.g. flash disk (G06F 11/1072 takes precedence)}

References

Limiting references

This place does not cover:

G06F 11/1072 takes precedence

Special rules of classification

G06F 11/1072 takes precedence

Documents classified in this group should be sent to G11C 29/00 as well.

G06F 11/1072

{in multilevel memories}

Definition statement

This place covers:

Covers all subject-matter related to memories of which the cells can store more than 2 values.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Architectural details of multilevel memories	G11C

Special rules of classification

Documents classified in this group should be sent to G11C 29/00 as well.

G06F 11/1076

{Parity data used in redundant arrays of independent storages, e.g. in RAID systems}

Definition statement

This place covers:

Redundancy using parity calculation and stripping in redundant arrays of storage devices such as :

- Hard Drives (e.g. RAID)
- Semiconductor memories (e.g. RAID of SSD/Flash disks)
- Optical Drives (e.g. RAID in ODD archives)
- Tape (e.g. RAIT)

Relationships with other classification places

Mirroring in RAID: G06F 11/2053

Use of parity in memories which do not constitute a redundant array and are close to the processor (e.g. ECC or arithmetic code in a semiconductor memory on the high speed bus): G06F 11/1008

References

Limiting references

This place does not cover:

Control as such of RAID system	G06F 3/0604
Mirroring	G06F 11/2053
Redundancy on a disk used for reproduction	G11B 20/1833

Special rules of classification

If the document can be classified in a subgroup of the G06F 11/1076, then it should not appear in the head subgroup. Only those documents which cannot be classified in one or several subgroups (e.g. G06F 11/108, G06F 11/1084 etc) have to be classified in the head subgroup.

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It is important to evaluate whether the parity calculation aspect is present and if specifics about fault recovery / rebuilding are present in the document. If such topic is not present of if the document talks about general parity aspects mixed with other topics, the Indexing Code groups should be used.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

RAID	Redundant Array of Independent Disks is a technique for implementing fault tolerance in storage devices.
Rebuild	Action of regenerating lost data from redundant data present in available drives / memories.
JBOD	Just a Bunch Of Disks represent a group of disks without particular redundant scheme implemented.

G06F 11/1084

{Degraded mode, e.g. caused by single or multiple storage removals or disk failures}

Definition statement

This place covers:

Using the parity to reconstruct data which would otherwise have been lost when a storage device is failing or is removed.

When the reconstruction takes place once a new disk is available, G06F 11/1092 subgroup is used.

When the reconstruction takes place on a spare disk that was available, G06F 11/1088 subgroup is used.

References

Limiting references

This place does not cover:

Actual replacement of a failing disk	G06F 11/16

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

RAID	Redundant Array of Independent Disks is a technique for implementing fault tolerance in storage devices.

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G06F 11/14

Error detection or correction of the data by redundancy in operations (error detection or correction of the data by redundancy in hardware G06F 11/16)

Definition statement

This place covers:

Prophylactic additional saving-related measures like check-pointing, backing-up or state copying, which are performed before the occurrence of a fault in order to be able to recover or restore (at least partially) in case a fault occurs in the future, and which do not rely on hardware redundancy.

Corresponding reverse operations of restoring and/or recovering and/or rolling back, since these are performed after the occurrence of a fault. The same holds for any type of redoing. All these activities are considered particular cases of error correction.

Retrying an operation may be part of an error detection mechanism when used in conjunction with a counting or time-out scheme. It may constitute an error correction when it is used to overcome a transient error. In both cases it is a mechanism used after the occurrence of a fault.

References

Limiting references

This place does not cover:

Error detection or correction of the data by redundancy in hardware	G06F 11/16

Special rules of classification

In this group the use of the Indexing Codes G06F 2201/00 and lower is mandatory.

G06F 11/1402

{Saving, restoring, recovering or retrying}

Definition statement

This place covers:

The techniques covered by G06F 11/1402 imply at least an attempt to correct an error. They do not cover the detection as such, which may be found in G06F 11/1497 or G06F 11/1479.

Special rules of classification

Classification of documents relating to snapshots is done as follows :

- documents describing the use or creation of snapshots to deal with the detection or correction of errors are classified in G06F 11/00, and normally in subgroups of G06F 11/1402.
- documents describing other uses of snapshots (or creation of snapshots for such purposes) are not classified in G06F 11/00. They are classified in G06F 16/00 or G06F 3/06 unless the specific use is provided for in another classification place.
- General-purpose treatment of snapshots (e.g. management of valid snapshots, determining not needed snapshots, storage optimisation, ...) is dealt with in G06F 16/00 if the snapshots are on file level. If the snapshots are volume-based snapshots, they are dealt with in G06F 3/00 since they concern the management of storage space in this case.

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Persistent data	Data which are still relevant after a normal power off/ power on cycle or a logoff/logon procedure. Typically, the user determines when such data should be modified or destroyed (since they are not relevant anymore).Thus, persistent data is not equivalent to data that is stored in a non-volatile manner, the latter merely giving an indication of the type of memory/storage used to save the data. Non-volatile data does not need to be persistent, but persistent data is always non-volatile.

G06F 11/1405

{at machine instruction level}

Definition statement

This place covers:

Measures taken inside the processor or relating to individual processor instructions. To implement these measures, additional hardware (such as registers) can be used. A necessary condition to classify here, is that the operating system is unaware of the measures taken.

G06F 11/1415

{at system level}

Definition statement

This place covers:

The solution of a specific problem related to the functioning of the computer system(s) as a whole in contrast to a particular application functionality. It is intended to cover firmware level (e.g. BIOS), OS level, file system level and/or utilities.

Relationships with other classification places

This group is NOT intended to include database specific techniques. Note that if the solutions in these groups involve the use of particular software techniques covered in G06F 11/1479, the documents should be classified there as well. See e.g. the comment under G06F 11/1438 relating to additional classification in G06F 11/1479.

G06F 11/1417

{Boot up procedures}

Definition statement

This place covers:

Restricted to correction (attempt) of errors during or using the boot process.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Booting in general	G06F 9/4401

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Reboot as part of upgrading to verify the successful upgrade	G06F 11/1433

G06F 11/142

{Reconfiguring to eliminate the error (group management mechanisms in a peer-to-peer network H04L 67/1044)}

Definition statement

This place covers:

Reconfiguration meaning that the system undergoes modification of the components that make up the system or their arrangement in response to an error being detected. The components can be either hardware or software components.

Example:

- The system switches to a minimal video driver in case the normally used video driver does not give any image anymore.

Counterexamples:

- redistributing the load on individual processors of a multiprocessor system in an overload condition
- masking faults by reconfiguring redundant hardware (e.g. making a standby component primary, changing the role of disks in a mirrored pair, ...)

References

Limiting references

This place does not cover:

Software update in general	G06F 8/65
Checking for a new version of software when a failure occurs with the current version	G06F 11/0793

G06F 11/1423

{by reconfiguration of paths}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Isolating or reconfiguring faulty entities in data switching networks	H04L 41/0659

G06F 11/1433

{during software upgrading}

Definition statement

This place covers:

Potential to recover from errors during or after software update or upgrade or installation processes. Also applies when this process is performed by a specific update/install software or even by the application itself.

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G06F 11/1435

{using file system or storage system metadata}

Definition statement

This place covers:

There is redundancy in the metadata used to access a given stored data item.

Examples are :

- File systems having redundant FATs or redundant tuples
- Redundant CMOS/BIOS data defining the disk layout

Counterexamples are :

- Retry a read from a disk sector by the disk controller when the read fails. This should be classified G11B 20/00
- Retrying the disk I/O request by the CPU. This should be classified in
- G06F 11/1443.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File management in general	G06F 16/14

G06F 11/1438

{Restarting or rejuvenating}

Definition statement

This place covers:

The act of restarting a software module (e.g. an application, but not the complete OS, because this would imply a boot process which is covered in G06F 11/1417) either to recover from an error or in order to prevent an error (the latter being rejuvenation). The restarting or rejuvenating may be based on a previous state saving of the software module. Usually, this is based on a previously saved dynamic state of the software module. The dynamic state of a software application or process or task includes at least some of stack, heap, open files, etc. information, from which the application can later continue processing. Continuing from a previously saved state without full application restart is also covered by this group.

Special rules of classification

If the application restart or rejuvenation mechanism is implemented in an OS or middleware layer outside the application, this aspect is to be additionally classified in G06F 11/1482.

G06F 11/1441

{Resetting or repowering}

Definition statement

This place covers:

Measures taken out of a normal operating mode (after boot) but before abnormal termination of the system to enable a machine to continue processing from a defined state after a re-initialisation (reset

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or re-powering) of the machine. Example: power is monitored, when voltage drop is detected, the RAM is saved to disk. After power restore, RAM is reloaded from disk. Or, battery used to temporarily backup the RAM during a (short) power outage.

Without error see G06F 1/3203.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Means for saving power	G06F 1/3203

Special rules of classification

If a spare power supply is used, additionally G06F 11/2015 must be given (either as additional or invention, depending on the circumstances)

G06F 11/1443

{Transmit or communication errors}

Definition statement

This place covers:

Examples :

- printer or disk I/O retry by the Operating System.
- Repeated requests by a client to the server

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Detecting errors in the information received	H04L 1/00
Error detection mechanisms part of a communication protocol	H04L 12/00, H04L 69/00

Special rules of classification

Documents should only be classified here when they concern transmit or communication errors and where the mechanisms used are not part of a communication protocol and no other group of G06F 11/14 and subgroups or G06F 11/16 and subgroups applies.

G06F 11/1446

Point-in-time backing up or restoration of persistent data

Definition statement

This place covers:

Backup done either on file or data block level. Covers, backing up of any type of file, independent of the data it contains.

Note: Due to considerable overlap in technology, backups and data backup systems frequently are confused with archives and fault-tolerant systems. However:

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- Backups differ from archives in the sense that archives are the primary copy of data whereas backups are a secondary copy of data.
- Data backup systems differ from fault-tolerant systems in the sense that data backup systems assume that a fault will cause a data loss event, whereas fault-tolerant systems do not.

The scope of this group also covers ensuring that the data to be saved (as backup copy) is consistent (i.e. represents a meaningful state), especially if the copy is made of data within a distributed system.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Data re-synchronization of a redundant component, or initial sync of replacement, additional or spare unit	G06F 11/1658
Mirroring	G06F 11/2056
Redundant storage or storage space	G06F 11/2094
Maintaining the standby controller/processing unit updated for active fault-masking	G06F 11/2097
Data archiving in file systems	G06F 16/113
Replicated file systems	G06F 16/184
Replication in distributed database systems	G06F 16/27

G06F 11/1448

{Management of the data involved in backup or backup restore}

Definition statement

This place covers:

All operations related to data management which are used for the backup data.

Examples of management of the data that is backed up :

- managing versions of backups
- formatting for compatibility with different systems
- consolidation of backed up data

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File management in general	G06F 16/14

Special rules of classification

Documents relating to authorisation control or data security of the backups should also be sent to G06F 21/00 for classification

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G06F 11/1451

{by selection of backup contents}

Definition statement

This place covers:

- any determination of what data should be subjected to backup (e.g. what type of data, which origin of data, according to criticality of the data, ...)
- determining the necessity to include particular data (e.g. based on whether the data has changed)
- in what form the data should be backed up (e.g. incremental backup, full backup, differential backup, ...)

G06F 11/1453

{using de-duplication of the data}

Definition statement

This place covers:

all techniques that are used to detect multiple copies of data items (e.g. files, data blocks, strings of data, ...) and to use this knowledge to optimize the backup (e.g. by not retransmitting the detected item, by not storing the detected item twice,...).

This is irrespective of whether the multiple copies are between (backups of) data at different times or between (backups of) different data items having a part in common or between (backups from) different hosts.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Redundancy elimination in general	G06F 16/174

G06F 11/1456

{Hardware arrangements for backup}

Definition statement

This place covers:

subject-matter where the hardware arrangement is affected by its use as backup system or where a particular system arrangement is proposed for backup. However, this does not imply that a particular hardware component must be physically modified for backup purposes

The following are some examples :

- additional (temporary) memory or storage is used to enable efficient writing on the backup medium
- storage which is configured to automatically perform a backup, when connected to a system to be backed up.
- A specific type of hardware being used for backup

A distributed architecture where some processing nodes are dedicated to particular backup functions

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G06F 11/1458

{Management of the backup or restore process}

Definition statement

This place covers:

All operations related to the management of the backup process.

Examples are :

management of backup process :

- how to make the backup process faster
- avoiding data restoration by unauthorized persons

Special rules of classification

In this group the use of the Indexing Codes G06F 2201/00 and lower is mandatory.

Documents relating to authorisation control or data security of the backups should also be sent to G06F 21/00 for classification

G06F 11/1464

{for networked environments}

Definition statement

This place covers:

Everything relating to arrangements in which the distributed architecture is of importance for the backup. Examples: Optimizing bandwidth, selecting machines (source or target) for backup, time multiplexed scheduling of backup clients, hierarchical distribution of backup control functionality to different networked machines.

G06F 11/1466

{to make the backup process non-disruptive}

Definition statement

This place covers:

All subject-matter dealing with techniques of limiting the impact of the backup process on normal operations, e.g. by minimizing the backup window.

G06F 11/1469

{Backup restoration techniques}

Definition statement

This place covers:

Problems relating to restoring data from a backup using a backup/restore application (in contrast to data movement services of an OS). Examples: Finding and ordering the necessary tapes, handling a target format that is no longer the same as the original one, target system configuration has changed and new locations must be determined, improving restore efficiency.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Horizontal data movement in storage systems, i.e. moving data in between storage devices or systems	G06F 3/0646
Migration of file systems	G06F 16/119
Hierarchical storage management systems	G06F 16/185
Database migration support	G06F 16/214

G06F 11/1471

involving logging of persistent data for recovery

Definition statement

This place covers:

Logging techniques or the usage thereof for the purpose of attempting to recover from errors.

Ensuring that a log contains all necessary data to enable a restore.

Maintenance of the logged data (e.g. pruning obsolete entries to reduce the recovery time).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Journaling for asynchronous mirroring	G06F 11/2074
Change logging, detection and notification in database systems	G06F 16/2358

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

logging	recording physical or logical changes to stored persistent data to allow a system to recover from crashes or other errors and maintain the stored persistent data in a consistent state.
journal	is a chronological record of data processing operations. It is considered equivalent to logical logging.

G06F 11/1474

in transactions (updating of structured data in databases G06F 16/23)

Definition statement

This place covers:

General recovery techniques of transactional systems.

Attempting to recover from errors within transactions that create/update/modify data. The term transaction is understood broadly.

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References

Limiting references

This place does not cover:

Updating of structured data in databases	G06F 16/23

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error recovery for (main) memory accesses implemented as transactions	G06F 11/141
Transactional file systems	G06F 16/1865

G06F 11/1479

Generic software techniques for error detection or fault masking

Definition statement

This place covers:

All techniques implemented by software means, i.e. where the fault tolerance does not result from the hardware and is not bound to a particular redundant hardware architecture.

Software architectures and structural approaches independent of the particular problem solved or function that is achieved. As a consequence, documents describing such techniques for a particular purpose or hardware architecture as covered by G06F 11/14 and G06F 11/16 should be classified here as well.

Documents where the kind of fault tolerance used (active-active, voting, active-passive, ...) is fixed by the hardware architecture and cannot be influenced by the software, should not be classified in this group.

Examples are:

- Fault-tolerance using data-diversity (e.g. by using different equivalent input data sets for each retry of a function), corrective actions e.g. following a plausibility check.
- Measures taken before run time (e.g. duplication of instructions for comparison at compile time) or robust data structures.

Counterexample: the operating system for a Tandem Himalaya system will not be classified here, because it is bound to a hardware architecture that provides the fault tolerance and it does not employ any of the generic techniques covered by G06F 11/1479.

G06F 11/1482

using middleware or operating system [OS] functionalities

Definition statement

This place covers:

Software layers (on top of the operating system or integrated in the operating system) which make applications which are not fault-tolerant run in a fault tolerant way. Typically, this is done by scheduling requests of the application more than once.

Examples:

- fault tolerant cluster software;

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- OS that detects a faulty process and creates a further copy of the same process on the same processor (but potentially in another memory area).

Special rules of classification

If the software layer implements an application restart or rejuvenation mechanism, this feature is to be additionally classified in G06F 11/1438.

Documents where there is necessarily some hardware redundancy should be classified using indexing codes, as well as in the HW redundancy groups.

Documents which describe said middleware/OS techniques in combination with only one redundant hardware architecture should always be classified into G06F 11/16, but where said techniques are explicitly suitable for other redundant hardware architectures, these documents should be classified in G06F 11/1482 as well.

Restart related aspects of the second example should be classified additionally in G06F 11/1438.

Note that G06F 11/1482 as such does not imply failover mechanisms, although the underlying hardware becomes redundant because of the software layer. Hence, this hardware redundancy aspect requires classification as well, in this particular case in G06F 11/2023.

G06F 11/1487

using N-version programming

Definition statement

This place covers:

For error detection the output of multiple versions (typically based on different source codes) of the application code or portions thereof are compared or voted (note that this is different from an acceptance test as defined in G06F 11/1489). This can be in different programming languages, different compilers or implementation of alternative algorithms. The versions may be executed sequentially, concurrently or in parallel on different hardware (thereby making the latter redundant).

G06F 11/1489

using recovery blocks

Definition statement

This place covers:

For error detection an acceptance test (mostly a plausibility check or a limit on execution time) is performed on critical code blocks. If the test is not passed, the output of another execution of the same or an alternative version of the block is used for recovery. The executions may be sequential or parallel. Note that an acceptance test is performed using the output of only one of the executions.

Special rules of classification

If the other execution is systematically performed on the same hardware, this has to be additionally classified in G06F 11/1497.

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G06F 11/1492

using run-time replication performed by the application software, e.g. N-modular type

Definition statement

This place covers:

In contrast with G06F 11/1482, in this group the redundancy is inherent in the application itself. Thus, the application does not rely on any other layer to be fault tolerant. The redundant portions are necessarily identical, since otherwise the redundancy is not realized at runtime, but is hard coded.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Replication implemented at OS or middleware level	G06F 11/1482
Time redundant execution of software on a single processing unit	G06F 11/1497

G06F 11/1494

{N-modular type}

Definition statement

This place covers:

Using comparison or voting for the concurrently running replicas of the application software.

G06F 11/1497

Time redundant execution of software on a single processing unit

Definition statement

This place covers:

Pieces of software (module, function, complete application, ...) always being executed two or more times sequentially or concurrently (e.g. as threads) on a single processing unit in order to address transient faults.

Aspects relating to the provision of the identical input to all executions of the software. When more than two executions are foreseen, this can be used for error correction (not only detection).

Techniques used to instantiate multiple executions of redundant software, the temporary storage of intermediary results or the duplication of contexts for each instance, as well as the measures taken for the subsequent error detection or fault masking.

(Non-redundant) hardware support for time redundant execution.

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G06F 11/16

Error detection or correction of the data by redundancy in hardware

Definition statement

This place covers:

- Systems where hardware redundancy is used to detect errors or to correct errors based on the output produced by the redundant components.

Relationships with other classification places

There are three types of hardware redundancy that can be found here:

The hardware redundancy is used for error detection only: such systems imply that there are at least (and normally only) two redundant components, which are both active, the output of which is compared (G06F 11/1608, G06F 11/1629). Disagreement indicates an error.

The hardware redundancy is used for error detection and correction: such systems imply that there are at least three redundant components, which are all active, the output of which is voted. In the presence of an error the majority of correct outputs is used to correct the error. Since this is done without reconfiguration of the system, i.e. by ignoring the erroneous component(s), this is called passive fault masking (G06F 11/18).

The hardware redundancy is used for error correction only: such systems imply that there are at least one active component and at least one passive component suited to replace the active one in case the latter is failing. The detection of the failure is not (necessarily) based on hardware redundancy, however the correction of the error is. It requires a reconfiguration of the system as a result of which the functionality of the failing component is switched over to a spare (failover, takeover). This is called active fault masking (G06F 11/20).

In this context, voting and comparing are decision processes as to the correctness of the output of the system. This is in contrast to membership determination processes (which may also use majority building), which concern decisions on what the configuration of a system should be.

Testing of redundant computer hardware justifies an Indexing Code in appropriate subgroups of G06F 11/16. Testing of non-redundant but identical computer hardware (e.g. on a wafer) using comparison or voting techniques is G06F 11/22 only. Verifying components against a "golden master" is neither run-time nor fault-masking, this it is not G06F 11/16 but G06F 11/22 or G01R 31/00.

The subgroups fall apart in 2 types :

- "architectural groups", i.e. groups that specify constructional elements (i.e. G06F 11/1608 and G06F 11/1629)
- "functional groups", i.e. groups that define a particular functionality that is independent of the architecture (i.e. G06F 11/1666 and G06F 11/1675). These groups may be relevant for any type of hardware redundancy or fault masking.

Redundant hardware is a prerequisite to correct permanent (hardware) faults, but is equally successful with transient faults. Thus, G06F 11/18 and G06F 11/20 provide mechanisms that can successfully deal with both types of faults.

- Active fault masking implies a reconfiguration and, thus, a retry in the new configuration for the operation (or set of operations) that encountered the error. Otherwise there would not be error correction. Hence, to avoid double classification of (at least) all documents in G06F 11/20 there is the precedence rule under G06F 11/14.

Examples:

- Not every (symmetric) multiprocessor is redundant per se, because criteria (A) is not necessarily true. However, additional error detection and reconfiguration functionality typically implemented in software (OS or application level) could be used to make processors operate redundantly.

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- A point-to-point connection that initialises to use as many parallel lanes as possible and automatically reconfigures itself to use less lanes following an error implies redundant communication media, because criteria (A) and (B) are both true.

See definitions in G06F 11/2002 and subgroups regarding redundancy in communications.

Special rules of classification

In this group the use of the Indexing Codes G06F 2201/00 and lower is mandatory.

Documents dealing with replication are classified in G06F 11/16 and subgroups (in particular in G06F 11/2094 and (G06F 11/2097 or G06F 11/1658) only when the purpose of the replication is for error handling or error detection. If the use is another one (e.g. performance or load balancing) or is not disclosed, the document should be classified in G06F 16/10 instead.

Some systems having a set of equivalent/similar hardware resources all used under normal conditions may be reconfigured in response to an error to use only a subset of these resources while still providing the same full logical functionality, however possibly with degraded performance.

In order to decide where such documents are to be classified, the following criteria are used:

- (A) If a reconfiguration mechanism is used following the error detection, we are in the presence of error correction using active fault masking.
- (B) If said mechanism is able to correct permanent hardware faults, this implies the presence of some form of redundancy in hardware.

If both criteria apply, the subject-matter is for G06F 11/20: A AND B => G06F 11/20.

Note in particular that:

G06F 11/14 (redundancy in operation) provides mechanisms that can ONLY deal successfully with transient faults.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Redundant hardware	additional hardware for performing the same function as another hardware part, provided that in faultless operation you could renounce on either hardware parts of the system without loosing functionality.

G06F 11/1604

{where the fault affects the clock signals of a processing unit and the redundancy is at or within the level of clock signal generation hardware}

Definition statement

This place covers:

- Systems with multiple clock generating components with active or passive fault masking, i.e. where the system is continuously clocked even in the presence of failing clock generators.
- Single clock generators that are fault tolerant in themselves, e.g. by comprising multiple oscillators.
- Arrangements that only detect clock faults based on redundancy at or in the clock generating level (typically by comparing signals output by two clock generators).
- The symbols G06F 11/1608, G06F 11/18 and G06F 11/20 are to be used where appropriate to capture the type of mechanism implementing the clock fault tolerance, if no EC symbol in the respective field is already given.

Note that this group does not require, that the clocked system itself is fault-tolerant.

References

Limiting references

This place does not cover:

Clock signal generation circuits/techniques as such even when redundancy is involved within such circuits	G06F 1/04
Appropriate clock signal distribution on ICs or between discrete components	G06F 1/10
Clock (phase) synchronisation in general, even when used to ensure the synchronous operation of multiple processors	G06F 1/12
Measures taken at clock level to achieve lockstep operation of redundant processing components	G06F 11/1679
Time of day; time pieces	G04G
Oscillators, pulse generators or clock synthesizers	H03K
Oscillators, pulse generators or clock synthesizers if a loop in involved	H03L 7/00
Synchronisation of processor clocks representing time (time of day, logical/virtual time, real time clocks; NTP, PTP, UTC)	H04J 3/0635

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fault-tolerant synchronisation of clocks representing time	G06F 11/1479
Error detection by comparing the output signals of redundant hardware	G06F 11/1608
Checking static stores for correct operation is	G11C 29/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Clock signal	designates the common periodic square-waved signal on which synchronous digital components base their operations. This signal does not represent any absolute or relative real, logical or virtual time value (although such time may be derived therefrom by counting periods of this clock signal).

Computing-related hardware the run-time behaviour of which is not controlled by software (e.g. ALUs, counters, decoders, ...). As soon as the redundant hardware under consideration, the output of which is compared, comprises a software programmable processor ((micro-)controller, CPU, microprocessor, ...), this should go to the G06F 11/1629.

Comparing is understood largely , i.e. it encompasses coherency checks (are the compared results similar enough to be considered the same or equivalent?) not only identity tests.

Processor(s) comparing the input from redundant sources (like buffers) are G06F 11/1608 as long as they do not compare their own results. The latter would have to be additionally classified in G06F 11/1629.

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G06F 11/1629

{Error detection by comparing the output of redundant processing systems}

Definition statement

This place covers:

This group is intended to contain systems in which the redundant components are programmable (hardware) processors, the runtime behaviour of which is defined by software/firmware.

Comparing is understood largely , i.e. it encompasses coherency checks (are the compared results similar enough to be considered the same or equivalent?), not only identity tests.

Relationships with other classification places

FPGAs are programmable in respect of their configuration only. In general, the resulting run-time functionality thereof does not constitute a software controllable processor, thus systems comprising redundant FPGAs, the functionality of which is not run-time programmable, should be in **16B**, as long as they form part of computer hardware.

Comparisons of input values are not to be classified here. They may, however, be for G06F 11/1608 as long as said input is produced by redundant sources. If such a comparison is used to detect errors in the transmission of data, this should be H04L 1/00. Redundant sources like sensors may be G05B rather than G06F (see also comments of G06F 11/1616).

G06F 11/1633

{using mutual exchange of the output between the redundant processing components}

Definition statement

This place covers:

This group is intended to comprise systems in which there is no comparator hardware. Instead, all redundant components send their respective output results to each other and each perform the comparison (in software) between their own output and the one(s) received from the other redundant components. This would cover processors exchanging results via a local (processor) bus as well as distributed system which communicate the results via LAN or other type of network.

Relationships with other classification places

- If there are more than 2 redundant units, this group applies only as far as there is no fault masking (this would be G06F 11/18).
- Redundant hardware comparators distinct from but directly associated with the redundant processing components go into G06F 11/1645.

G06F 11/1637

{using additional compare functionality in one or some but not all of the redundant processing components}

Definition statement

This place covers:

- Systems often denoted as primary/checker in which there is no separate comparator unit. Instead, one or some of the redundant unit(s) (the checker(s)) do(es) additional work to perform the comparison, thereby detecting erroneous behaviour and checking the system for correct operation.

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The additional compare functionality may be implemented in hardware on the corresponding processing component(s) or in software executed by the corresponding processing component(s).

- Primary-checker-type architectures in which two processors operate in clock lockstep, where the checker compares the values driven by the primary with its own corresponding internally present by otherwise disabled outputs. If a discrepancy is detected, the checker produces an error signal. See the glossary for citations of example primary-checker structures. Note that this type of architectures also falls in the G06F 11/1654.
- Primary-checker architectures where the checker is limited in processing functionality with respect to the primary, even though this is not absolutely in line with our definition of hardware redundancy.

G06F 11/1641

{where the comparison is not performed by the redundant processing components}

Definition statement

This place covers:

Here one or more hardware units separate from the redundant components are used to compare the results produced by the redundant components. Further details of subgroups

G06F 11/1645 and the comparison itself uses redundant hardware

This covers architectures in which there are comparator units (typically but not necessarily respectively associated with but) distinct from each one of the redundant processing components. The comparators are considered redundant when they perform the same comparison on (copies of) the same signals/data.

G06F 11/165

{with continued operation after detection of the error}

Definition statement

This place covers:

Documents in which an additional mechanism is provided to determine which one(s) of the redundant component(s) shall survive after the detection of the error. This may (but need not) involve a determination of which component is correct, in which case this redundant component can be used to correct the error in the other one(s) such that all redundant processing components can finally continue their operation.

Relationships with other classification places

However, since they are not based on a majority decision, (otherwise they would be G06F 11/18, see in particular G06F 11/181), the determination of the surviving component(s) is usually not done using redundancy in hardware. Rather, some diagnostics or simple priority rules, possibly based on prior behaviour are used.

Special rules of classification

Techniques in this group may use active fault masking, passive fault masking (i.e. ignoring the faulty component), or other techniques like retry. If these are described they should get an Indexing Code in the respective field as well.

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G06F 11/1654

{where the output of only one of the redundant processing components can drive the attached hardware, e.g. memory or I/O}

Definition statement

This place covers:

- Here one of the processing components is usually called the "primary", the other(s) may be denoted as secondary, checker(s), or shadow(s). The primary's: outputs drive the system. The secondary's: outputs are used for comparison but are otherwise disabled from reaching other components of the system.
- Architectures in which both processors have a primary and a secondary role but for distinct parts of the system, i.e. for different types of output.

Relationships with other classification places

There may be an overlap of this group with G06F 11/1637 when the secondary itself also performs the comparison, thereby making it a checker as well.

Special rules of classification

This group should only be used when there effectively is an asymmetry in the role of the redundant processors. On the contrary, the mere statement that a comparator or bridge or the like selects the outputs of one the processors to drive the attached components does not suffice to justify a different role of the processors.

G06F 11/1658

{Data re-synchronization of a redundant component, or initial sync of replacement, additional or spare unit}

Definition statement

This place covers:

The following types of data transfer activities (possibly using data replication) from a memory, the content of which is assumed to be good, to a one that is not yet current (note that the concerned memories do not need to be themselves redundant):

- sporadic resynchronisation processes used to reintegrate a redundant component into an active/active system, such process being started in an attempt to correct a fault for instance by rebooting a failing component or by replacing it.
- synchronisation processes occurring at start-up of some redundant active/active systems in which the redundant components have to negotiate when they are all ready to enter the lockstep mode of operation.
- initialisation processes used to make a redundant component ready to work as a stand-by in active/passive systems.

Special rules of classification

Documents in this group describing techniques in the context of active/passive systems should additionally have at least one Indexing Code in the G06F 11/20 (see also the comments in G06F 11/2097).

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G06F 11/1662

{the resynchronized component or unit being a persistent storage device (re-synchronization of failed mirror storage G06F 11/2082; rebuild or reconstruction of parity RAID storage G06F 11/1008)}

Definition statement

This place covers:

- Initialising data of a (newly activated) spare disk, provided this is not a mirror disk (the latter being in G06F 11/2082).
- Typical examples for this are the preparation of file system or database replica.
- G06F 11/1666

G06F 11/1666

{where the redundant component is memory or memory area}

Definition statement

This place covers:

- The term memory is meant to comprise solid state devices used as main memory which is directly addressable by the associated CPU, as well as non addressable solid state internal memories (e.g. registers, buffers). It does however not need to be RAM.
- Redundant caches and main memory mirroring (in which case the Indexing Code G06F 11/20 should be given). One of the following Indexing Codes should be used where appropriate to better characterise the fault detection or correction mechanism involved: G06F 11/18, G06F 11/20.
- Error detection (or fault masking) using data replicated in different areas of the same memory device is also covered.

These documents differ significantly from the other mechanisms in G06F 11/1658 relating to (main) memory.

G06F 11/167

{Error detection by comparing the memory output}

Definition statement

This place covers:

This the appropriate place for comparisons performed on the output of redundant memory (areas).

G06F 11/1675

{Temporal synchronisation or re-synchronisation of redundant processing components}

Definition statement

This place covers:

The 16T groups address the problem of ensuring that corresponding outputs of redundant active components are simultaneously available for error detection or correction at a given time. This does not imply that these outputs are produced simultaneously (see e.g. US2002116662). Such system are frequently said to operate in lockstep (at least at some level of abstraction).

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Some active/standby systems using active fault masking, where a standby unit is to be maintained in close time synchrony with its primary , the standby unit thereby effectively maintaining itself current to be ready for failover. Documents of this latter type shall also get at least an Indexing Code in G06F 11/2097.

G06F 11/1679

{at clock signal level}

Definition statement

This place covers:

Here systems either use a common clock (clock lockstep) or are otherwise synchronised to such an extend that they produce comparable outputs within the same clock cycle, although not necessarily exactly in phase. If not using a common clock , the synchronisation measures taken affect the clock signal.

G06F 11/1683

{at instruction level}

Definition statement

This place covers:

Here we have documents where the synchronisation occurs at statically predictable places in the code either after each instruction or after each instruction of a predetermined type (e.g. memory write or I/O operation) or by using explicit synchronisation instructions/operations.

G06F 11/1687

{at event level, e.g. by interrupt or result of polling}

Definition statement

This place covers:

- Synchronisation mechanisms that are triggered by events asynchronous to the main program. Typical example is synchronisation at the occurrence of an interrupt.
- Also cases in which the events are I/O operations performed in response to a polling mechanism.

G06F 11/1691

{using a quantum}

Definition statement

This place covers:

Here the synchronisation process is initiated when a predetermined count (>1) of units of work is achieved.

This could be clock cycles, (selected types of) instructions, interrupts, I/O-operations, elapsed time units or any other suitable countable unit.

Special rules of classification

In most cases documents should also be classified in one of the other lower subgroups of G06F 11/1675

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Quantum	A predetermined count (>1) of units of work

G06F 11/1695

{which are operating with time diversity}

Definition statement

This place covers:

Time diversity is the concept to have an active/active system in which one of the redundant components operates with a delay with respect to the other in order to avoid common mode failures that would affect both redundant components in the same way at the same time, thereby not being detectable by comparison. Typically the time delay is a small odd multiple of the half clock period. It has to be taken into account when comparing the outputs in order to compare outputs resulting from the same logical steps, which by definition are not produced simultaneously. (Should time diversity turn out to be a concept useable for active/passive system as well, this group would have to be moved one level up).

G06F 11/18

using passive fault-masking of the redundant circuits {(error detection by comparing the output of redundant processing systems with continued operation after detection of the error G06F 11/165)}

Definition statement

This place covers:

- Fault masking: hiding the presence of a fault to the user or the environment of a [computer system by means of some sort of redundancy such that the perceived system functionality is not affected.
- Passive fault masking: when a system operates such that no particular action is necessary to mask a fault because all necessary operations are constantly performed independently of the presence of a fault (e.g. majority voting).

In G06F 11/18 this is achieved by redundant active hardware components, the output of which is subjected to a (voting) process which ensures that only output considered correct is propagated in the system. Thereby, those redundant components which are in error are simply ignored, this resulting in a correction of the error(s) through the hardware redundancy.

Passive fault masking means that a system produces correct behaviour/outputs in the presence of faulty components.

Voting is a majority building process, by which the output agreed upon by a majority of the redundant components is selected as the correct one, thereby tolerating any minority number of erroneous outputs.

Relationships with other classification places

The subgroups fall apart in 2 types:

- "architectural groups", i.e. groups that specify constructional elements (i.e. G06F 11/182, G06F 11/183 and G06F 11/184, G06F 11/185)
- "functional groups", i.e. groups that define a particular functionality that is independent of the architecture (G06F 11/181, G06F 11/187, G06F 11/188).

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References

Limiting references

This place does not cover:

With continued operation after detection of the error	G06F 11/165

G06F 11/181

{Eliminating the failing redundant component}

Definition statement

This place covers:

Documents including an elimination of a faulty component based on the results of a passive fault masking process, through which those components being in the minority are assumed to be the erroneous ones. They can, thus, be eliminated without the need for a separate fault location process. Note that this group implies that the fault masking as such is passive i.e. the correct system output can be produced before the faulty component is eliminated.

G06F 11/182

{based on mutual exchange of the output between redundant processing components}

Definition statement

This place covers:

The voting process when it is performed in software by the redundant components themselves, based on their own output and the ones received from the other redundant components. There is no voter hardware.

Processors exchanging results via a local (processor) bus as well as distributed system which communicate the results via LAN or other type of network.

Redundant processing while the other groups at the same level are not.

A system having only a single redundant processing component performing the voting in software is covered as well.

References

Limiting references

This place does not cover:

Redundant voters distinct from but directly associated with the redundant processing components go into	G06F 11/185.

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G06F 11/183

{by voting, the voting not being performed by the redundant components}

Definition statement

This place covers:

Here one or more hardware units separate from the redundant components are used to vote the results produced by the redundant components.

G06F 11/184 where the redundant components implement processing functionality

Documents where the outputs of redundant processors / CPUs / microcontrollers are voted to perform the passive fault masking.

G06F 11/185 and the voting is itself performed redundantly

Documents where the voting process itself is implemented using redundant hardware, i.e. where the voter does not constitute a single point of failure. The voter does not need to be implemented in hardware, but could be realised as software processes on dedicated voting processors.

Counter-example: each redundant component has a voting module in software, which uses the outputs produced by the other redundant components. This is G06F 11/182.

G06F 11/187

{Voting techniques}

Definition statement

This place covers:

Specifics on how the voting process is performed in contrast to remaining G06F 11/18 groups which relate to architectural aspects of the systems.

Relationships with other classification places

This group is only used for voting for redundant hardware components. See G06F 11/1497 and G06F 11/1479 and subgroups for voting in the context of redundant software.

G06F 11/188

{where exact match is not required}

Definition statement

This place covers:

Concerns documents where the majority is formed by outputs which are considered equivalent, although not identical. This is frequent in control applications where inputs of the redundant components do not originate from the same source of information. or where they are gained at (slightly) different times. Tolerances or other plausibility or coherence criteria may be used to determine which outputs form the majority.

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G06F 11/20

using active fault-masking, e.g. by switching out faulty elements or by switching in spare elements

Definition statement

This place covers:

Head-group for all documents in which faults are masked actively, i.e. after the masking is done, the fault is not present anymore in the active part of the system. It is to be noted as well that we are talking exclusively about fault masking and not about error masking.

The subgroups fall apart in 2 types :

- "architectural groups", i.e. groups that specify the constructional element which is redundant (i.e. G06F 11/2002, G06F 11/202 and G06F 11/2053)
- "functional groups", i.e. groups that define a particular functionality that any active fault masking arrangement needs to implement (i.e. G06F 11/2097). This functionality is independent of the particular constructional element which is redundant.

Special rules of classification

A general concept in the field of active fault masking is that a surviving component takes over the load/ work of failing one in addition to its own normal work. For such documents the symbol G06F 2201/85 should be used except for documents getting a dedicated group for this concept (e.g. G06F 11/2035).

In G06F 11/181 there are also documents dealing eliminating a faulty component. G06F 11/165 possibly uses active fault masking (to ensure the continued operation, some kind of decision is needed to identify one of both components as failed and this one may completely be removed from the system). However, since in those two groups the active fault masking is rather a consequence of the voting or compare, we decided to take this particular subject-matter out of the G06F 11/20.

Failover comprises one or more of the following activities:

- error detection : this is not a failover specific mechanism since there is no link between detection and failover => such docs to be classified according to the used mechanisms but not necessarily in G06F 11/20
- determination of the spare to be used
- activation of the determined spare
- declaration of the activated spare as primary
- elimination of the faulty unit

There is failover taking place as soon as any functionality of a hardware component is taken over by another hardware component, whatever the functionality is.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Fault masking	hiding the presence of an fault to the user or the environment of a computer system by means of some sort of redundancy such that the perceived system functionality is not affected.
Active fault masking	taking particular actions (e.g. reconfiguration, failover) not performed in the error free situation to mask a fault.

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G06F 11/2002

{where interconnections or communication control functionality are redundant (flexible arrangements for bus networks involving redundancy H04L 12/40176)}

Definition statement

This place covers:

All cases where architectural components involved in communication are redundant, as long as no communication protocol layer independent of a particular application is involved.

Examples pertaining to subgroups of G06F 11/2002 are:

- Duplicate connection lines
- Redundant busses (serial or parallel)
- Redundant bus controllers (e.g. PCI)
- Network interface boards describing built-in redundancy
- A redundant setup of two network adapters which are not redundant in themselves

Relationships with other classification places

Fault tolerance in communications is for H04L rather than G06F 11/00 if the mechanism described is implemented by a communication protocol layer that is independent of a particular application.

Examples that should be classified in H04L :

- fault tolerant FTP protocol.
- client having a session management layer, the layer independently maintaining connections with a server.
- operations relating to establishing or cancelling connections between nodes.
- message replication or retry by a routing algorithm (even fault-tolerant routing);
- dealing with transmission errors occurring on the interconnection media (H04L 1/00)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Flexible arrangements for bus networks involving redundancy	H04L 12/40176
Recovering from network faults	H04L 41/0654
Fault tolerant routing	H04L 45/28

Special rules of classification

The subgroups G06F 11/2005, G06F 11/2007 and G06F 11/2012 are to be used together in order to classify 9 different types of redundancy in this field. Regarding details of communication failover no subgroup is foreseen. This has to be searched using the other architectural criteria.

Example: Two PCs connected to a LAN by a respective LAN controller and additionally being connected to each other by a USB cable via respective USB controllers, where the USB connection can be used as alternative path to transmit the same data. This configurations gets all the three subclasses.

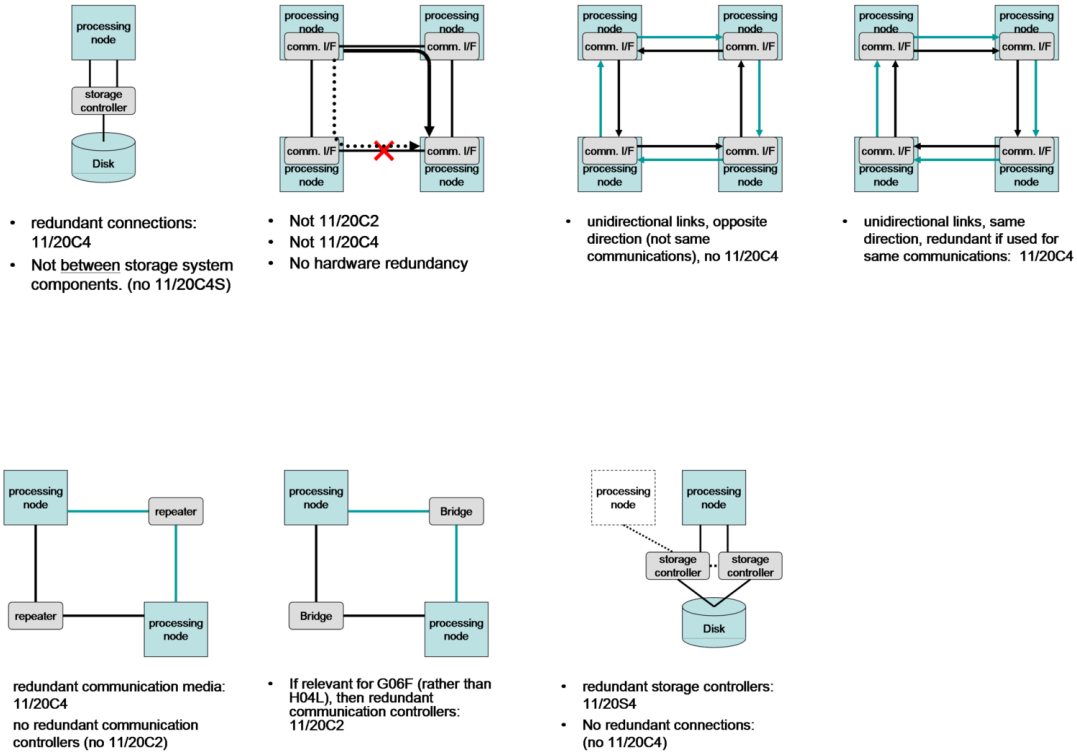
Remarks:

- A communication switch implements control logic to realise physical connections between a set of data input ports and a set of data output ports, thus, if not H04L 49/00 this is G06F 11/2005 .

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- Data transfer between processors and memories is not considered communication (rather it is addressing), hence redundant interconnects between processors and memories is G06F 11/2002 (not G06F 11/2007).

Examples below illustrate how the scheme should work in some typical situations:



- redundant connections: 11/20C4
- Not between storage system components. (no 11/20C4S)
- Not 11/20C2
- Not 11/20C4
- No hardware redundancy
- unidirectional links, opposite direction (not same communications), no 11/20C4
- unidirectional links, same direction, redundant if used for same communications: 11/20C4
- redundant communication media: 11/20C4
- no redundant communication controllers (no 11/20C2)
- If relevant for G06F (rather than H04L), then redundant communication controllers: 11/20C2
- redundant storage controllers: 11/20S4
- No redundant connections: (no 11/20C4)

G06F 11/2005

{using redundant communication controllers}

Definition statement

This place covers:

Communication controllers are nodes as defined under G06F 11/2007 dedicated to performing communication control logic.

G06F 11/2007

{using redundant communication media}

Definition statement

This place covers:

Interconnections are physical media and are of point-to-point type or of bus type. Two interconnections are only considered redundant if:

- they both physically connect the same nodes, wherein nodes are any components performing processing or control functionality (examples: computers, bridges, storage controllers,

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communication switches, counter-example: physical repeater has neither processing nor control logic), and
- are configured to perform the same data transmissions.

Only documents fulfilling these criteria are classified here.

This group covers as well redundant dedicated interconnection media for I/O functionality as long as it does not use general purpose communication interconnection media (like LAN or USB cables).

G06F 11/201

{between storage system components}

Definition statement

This place covers:

E.g. multiple IBM channels between controller and disk

G06F 11/2017

{where memory access, memory control or I/O control functionality is redundant (redundant communication control functionality G06F 11/2005; redundant storage control functionality G06F 11/2089)}

Definition statement

This place covers:

All cases where memory access, memory control or I/O control functionality is redundant. An example would be redundant configurations having an active and a passive graphics adapter.

Special rules of classification

Redundant dedicated interconnection media for such I/O functionality are to be classified in G06F 11/2002 as long as it does not use general purpose communication interconnection media (like LAN or USB cables).

G06F 11/202

{where processing functionality is redundant (redundant communication control functionality G06F 11/2005, redundant storage control functionality G06F 11/2089)}

Definition statement

This place covers:

All subject-matter where the redundancy resides in components that perform processing, i.e. components the runtime functionality of which is controlled by software (or firmware), except for ones dedicated to storage control or communication control (see the precedence rule).

For subject-matter to be classified in this group, it is enough that a fault masking is tried when a failure occurs. It is not necessary to have a guarantee that resources will be available to successfully fail over.

Relationships with other classification places

Two types of subgroups can be identified
- "architectural groups", i.e. groups that specify the actual redundancy arrangement (i.e. G06F 11/2035-G06F 11/2048)

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- "functional groups", i.e. groups that define a particular functionality (i.e. G06F 11/2023, G06F 11/2051). This functionality is independent of the particular redundancy arrangement used.

Special rules of classification

This group has 4 types of subgroups. A class in each of the types should be given (as far as disclosed in the document) systematically. Thus, a document classified in these subgroups will normally have 3 or 4 symbols (invention or additional). The four types are :

- G06F 11/2023 and subgroups
- G06F 11/2035 - G06F 11/2041
- G06F 11/2043 - G06F 11/2048
- G06F 11/2051

G06F 11/2023

{Failover techniques}

Definition statement

This place covers:

Details of the failover mechanism

Also includes documents describing failback, i.e. reverting to the original or replacement primary processing unit when it becomes operational again. Currently this also covers documents dealing with the determination/selection of the spare to be used for replacing the failing component. There is failover taking place as soon as any functionality of a processing component is taken over by another processing component, whatever the functionality is.

G06F 11/2025

{using centralised failover control functionality}

Definition statement

This place covers:

Where a single component implements the control functionality for failover. This may be a distinct hardware module or software implemented on a single one of the redundant processing components.

G06F 11/2028

{eliminating a faulty processor or activating a spare}

Definition statement

This place covers:

Documents describing how to ensure that a failing and formerly active processing component no longer participates in the system functionality. Similarly, documents describing how to activate a former standby processing component to replace the functionality of a failing one. Example: setting bits identifying a node as active in a configuration file.

Special rules of classification

On the contrary, eliminating a backup unit that is not active (i.e. not within a failover process) is not G06F 11/20 since this is not error correction using redundancy in hardware. This is most likely G06F 11/0793.

"Eliminating a faulty processor" needs to be understood broadly. E.g. this includes as well :

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- documents describing a complete reconfiguration of the system which results in eliminating not only the faulty processor, but also some functioning components if needed to come to a fault-free system and
- documents dealing with how to determine the fault-free system configuration which eliminates the minimum number of components.

G06F 11/203

{using migration}

Definition statement

This place covers:

Transferring runtime context of processes, tasks, jobs, threads etc... from a failing processing component to a replacing one.

G06F 11/2033

{switching over of hardware resources}

Definition statement

This place covers:

The process of placing resources (other than the redundant processing components) under control of a replacement processing unit instead of a failing one. Example: attaching a RAID or other I/O device to the spare.

G06F 11/2035

{without idle spare hardware}

Definition statement

This place covers:

There are no processing components left inactive in failure-free operation.

This group contains all subject-matter where the performance is degraded after a failure has occurred, since the same processing needs to be done on less hardware.

However, performance degradation is not a necessary condition for this group, since a safety margin can be used in the failure-free operation.

Special rules of classification

"Hot spare" architectures wherein the spares are maintained updated for immediate failover by performing the same processing as the primary (possibly in clock synchronisation with the latter) do not fall in this group, because such spares are considered inactive to the extent they do not perform system functionality beyond what is necessary to function as spare. The same applies to architectures where spares are not completely idle because they monitor the primary to detect whether it is failing. These examples would rather be classified in G06F 11/2038 or G06F 11/2041.

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G06F 11/2038

{with a single idle spare processing component}

Definition statement

This place covers:

The spare component can be spare for a single one or for a plurality of active processing components. There may be multiple spares which, however, are each a single spare for distinct sets of active processing components.

Also covers the case where the spare component is a hot spare.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Without idle spare hardware	G06F 11/2035

G06F 11/2041

{with more than one idle spare processing component}

Definition statement

This place covers:

A processing component has more than one spare.

Also covers the case where at least one spare component is a hot spare.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Without idle spare hardware	G06F 11/2035

G06F 11/2043

{where the redundant components share a common memory address space}

Definition statement

This place covers:

Examples: symmetric multiprocessor; multicomputer with virtual shared memory based on message passing.

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G06F 11/2046

{where the redundant components share persistent storage (G06F 11/2043 takes precedence)}

Definition statement

This place covers:

Any architecture where redundant components have (at least temporarily) access to common storage independent of whether or not the shared storage is used for or during failover.

References

Limiting references

This place does not cover:

Where the redundant components share a common memory address space	G06F 11/2043

G06F 11/2053

{where persistent mass storage functionality or persistent mass storage control functionality is redundant (error detection or correction in information storage based on relative movement between record carrier and transducer G11B 20/18)}

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Storage	persistent memory subsystems (typically involving disks), the contents of which are not directly physically addressable as data words by a CPU

G06F 11/2056

{by mirroring}

Definition statement

This place covers:

All subject-matter related to mirroring.

Relationships with other classification places

Mirroring means that data replication is performed solely by the storage controller(s) or corresponding drivers without the involvement of higher software layers like file systems or databases. However, information provided by such higher layers within the blocks dealt with by the controllers (like sequence numbers or time stamps) may be used within the mirroring operation.

If a higher software layer is involved, this is not considered as mirroring but as backup (if point-in-time) or replication (if continuous) and should be classified in the appropriate places.

Mirroring implies, that the time at which a piece of data is transferred is determined solely by the mirroring functionality (disk controller, disk driver, ...). In contrast, for backup a trigger is necessary from another (typically higher level) software layer.

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As a counter-example (i.e. which is not mirroring, but something in G06F 11/1402):

- periodic creation of snapshots and transfer of delta between successive snapshots to update a secondary storage.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for replication or mirroring the data, e.g. data synchronisation between network nodes and/or user terminals	H04L 67/1095

G06F 11/2058

{using more than 2 mirrored copies}

Definition statement

This place covers:

Each of the more than 2 copies is a mirrored copy, the original (primary) data itself also being considered as one mirrored copy. An intermediate volume used as a buffer but not representing a full copy (suitable for failover) would not be considered a mirrored copy.

Special rules of classification

Subject-matter combining mirroring and backup should have double classification.

G06F 11/2064

{while ensuring consistency}

Definition statement

This place covers:

This covers distinct types of consistency problems like write order consistency, consistency between different volumes (broken links problem), consistency groups or writes.

G06F 11/2066

{Optimisation of the communication load}

Definition statement

This place covers:

Measures aiming at reducing the amount of data being transferred in the mirror system e.g. from the primary to the mirror site, or between the Host and the primary. Examples: "write coalescing", sending record logs instead of full blocks (journaling).

G06F 11/2079

{Bidirectional techniques}

Definition statement

This place covers:

Systems in which updates occur independently on different mirror copies and are simultaneously propagated to the respective other mirror copies.

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G06F 11/2082

{Data synchronisation}

Definition statement

This place covers:

This covers resynchronisation of a failed or reconnected mirror as well as initial synchronisation to start mirroring.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

For non-mirroring related disk initialisation	G06F 11/1662

G06F 11/2089

{Redundant storage control functionality}

Relationships with other classification places

Mirroring with multiple controllers does not imply that the controllers are redundant. If one of the storage controllers would be faulty in such a system, either the host will not be able to access the storage anymore or the mirroring functionality will be lost. Thus some storage control functionality will be lost and there is no redundancy on this level.

G06F 11/2092

{Techniques of failing over between control units}

Definition statement

This place covers:

This group contains the details about how the faulty storage control element is taken out of operation or how storage control functionality is transferred to other elements.

Examples are :

- changing the system configuration
- shut down of the controller concerned

Counter-example:

Eliminating a backup unit that is not active (i.e. not within a failover process) is not G06F 11/20 since this is not error correction using redundancy in hardware. This is most likely G06F 11/0793.

G06F 11/2094

{Redundant storage or storage space (G06F 11/2056 takes precedence)}

Definition statement

This place covers:

Architectures and problems involving the use of additional storage (space) intended to be used instead of failing storage (space). Typical problems involve eliminating a failing active storage unit or activating spares (possibly storing replicated data).

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Also to be used when it is not clear whether an eliminated disk has its data replicated elsewhere.

Relationships with other classification places

In the case of failing over, this group does not cover the data initialisation of an activated spare, because this is G06F 11/1662.

Note that because of the precedence rule failover in the context of mirroring is not dealt with in this group (see G06F 11/2069).

G06F 11/2097

{maintaining the standby controller/processing unit updated (initialisation or re-synchronisation thereof G06F 11/1658 and subgroups)}

Definition statement

This place covers:

This group contains details of the measures that are taken to keep the data in memory, and/or persistent storage of a spare/stand-by unit (processor or controller) current in order to be ready for take-over. This is a repetitive process (frequently involving data replication) used before the occurrence of the fault.

This group does not contain details of how a component's data is initially made ready to function as backup (this belongs to G06F 11/1658+).

Examples for the use of this group:

- replaying message log on standby node: transmission of log (before failure) is G06F 11/2097, replaying of log is failover (G06F 11/2023) if performed after the failure.
- very hot standby using running standby in lockstep without comparison. The lockstep aspect is to be classified in G06F 11/1675 (Indexing Code or EC according to importance). However, since it addresses the problem of maintaining the standby unit updated G06F 11/2097 (possibly Indexing Code) should be given.

Example: Two redundant disk controllers control a single disk. Host write requests received by one controller are transferred to the second one (including the data) for temporary buffering until the write is performed by the first one. Should the first one crash, the second one is able to perform incomplete writes. Hence, the second one is maintained updated by the first one for potential failover.

Special rules of classification

A symbol to indicate the type of redundancy in Hardware (e.g. G06F 11/2038) must be added as additional, when the type of redundancy is not otherwise classified.

G06F 11/22

Detection or location of defective computer hardware by testing during standby operation or during idle time, e.g. start-up testing

Definition statement

This place covers:

This group and its subgroups also cover testing at system level, i.e. testing of a combination of hardware and software.

This testing occurs at a time outside of "normal operating mode", e.g. during standby, idle time or at power on.

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Next to the testing per se, this group and its subgroups also cover the equipment which is used to test the hardware concerned or to interpret the test results.

Relationships with other classification places

Subject-matter is classified here if programmable processing logic is part of the device under test. Else, the subject-matter belongs to G01R 31/317.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Testing of Software	G06F 11/3668
Verification of a hardware design	G06F 30/00
Testing of digital circuits, e.g. of separate computer components	G01R 31/317
Testing of computer memories	G11C 29/00

Special rules of classification

General rules for G06F 11/22 and subgroups

In G06F 11/22 and subgroups, generally only 1 symbol is allocated. The symbol allocated is the most relevant one for the invention information disclosed.

Only if the component being tested and the test itself are important, should the subject-matter be classified in one of the subgroups G06F 11/2205 together with another group in G06F 11/22.

Only invention information is classified.

If the software testing part is described and is important, the document should also be sent to G06F 11/3668 for classification.

Rules specific to G06F 11/22 per se:

Documents are only classified in G06F 11/22 per se if it can not be established whether the test is marginal checking (classified in G06F 11/24), testing of logical operation (classified in G06F 11/25) or functional testing (classified in G06F 11/26).

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Computer hardware	a digital circuit which has programmable processing logic incorporated.
Testing	an execution of the computer hardware which is dedicated to the detection of faults. Thus, the execution of the hardware during the test is not part of the "useful"processing which contributes to achievement of the intended purpose

G06F 11/2247

{Verification or detection of system hardware configuration}

Special rules of classification

Group no longer used for classification. See G06F 11/2289 instead.

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G06F 11/2252

{using fault dictionaries}

Definition statement

This place covers:

Subject-matter where the testing process or test analysis process is guided by a fault dictionary. This is the case when a lookup (based on the test results) is done directly from a list of entries, without any additional processing.

Although 90% of the documents use the fault dictionary to determine where the fault is located or what actions to take; the group also covers subject-matter where information is looked up in the fault dictionary to determine the next test.

G06F 11/2257

{using expert systems}

Definition statement

This place covers:

Subject-matter where an error message is correlated with other error messages or parameters.

Although 90% of the documents use expert systems to determine where the fault is located or what actions to take; the group also covers subject-matter where the expert system is used to determine the next test.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Expert system	A computer program that contains a knowledge base and a set of algorithms or rules that infer new facts from knowledge and from incoming data.

G06F 11/2263

{using neural networks}

Definition statement

This place covers:

Although 90% of the documents use the neural network to determine where the fault is located or what actions to take; the group also covers subject-matter where the neural network is used to determine the next test.

G06F 11/2273

{Test methods}

Definition statement

This place covers:

Subject-matter where the focus is on how the test is done instead of on what test is done or what is tested.

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In general, the documents classified in this subgroup are of a more theoretical nature.

G06F 11/2284

{by power-on test, e.g. power-on self test [POST]}

Definition statement

This place covers:

Subject-matter describing what tests are being done on power on. The tests concern the correct functioning of the system as a whole.

Relationships with other classification places

Documents describing the execution of tests are classified in G06F 11/26 and subgroups.

G06F 11/2289

{by configuration test}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Detection of the configuration of a system	G06F 8/71

G06F 11/25

Testing of logic operation, e.g. by logic analysers

Definition statement

This place covers:

All testing where the level of the logical value (e.g. 0 or 1) of the signal is tested, independent of functionality.

G06F 11/261

{by simulating additional hardware, e.g. fault simulation}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Debugging using additional hardware	G06F 11/3648

G06F 11/263

Generation of test inputs, e.g. test vectors, patterns or sequences {; with adaptation of the tested hardware for testability with external testers}

Definition statement

This place covers:

Subject-matter concerning the generation of test inputs, where this generation is done externally to the system being tested. It covers as well arrangements where both test input generation and test result processing are done externally to the system being tested.

G06F 11/267

Reconfiguring circuits for testing, e.g. LSSD, partitioning

Definition statement

This place covers:

All adaptations to the hardware being tested to make the hardware more testable.

G06F 11/27

Built-in tests

Definition statement

This place covers:

Those tests which are incorporated in the hardware component itself which is being tested.

G06F 11/273

Tester hardware, i.e. output processing circuits {(G06F 11/263 takes precedence)}

References

Limiting references

This place does not cover:

G06F 11/263 takes precedence.

G06F 11/277

with comparison between actual response and known fault-free response

Special rules of classification

Group no longer used for classification.

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G06F 11/28

by checking the correct order of processing (G06F 11/08 - G06F 11/26 take precedence; monitoring patterns of pulse trains H03K 5/19)

Definition statement

This place covers:

Checking the correct order of processing. the word "order" implies the consideration of a sequence. It can be for example the sequence of instructions in a computer program, the sequence of steps to perform when installing a software on a computer, etc. Typically documents dealing with the verification of a system that is specified in terms of state machine (states and transitions between states) based on reachability analysis can be found in the group. Also documents dealing with the verification that a computer program is executing according to the expected sequence of instructions (i.e. there is no unexpected jump that could be the result of a malicious attack) can be found in the group. This can be done for example by computing a current signature while the program is executing and comparing it to a reference signature.

References

Limiting references

This place does not cover:

Checking the correct execution order of instructions for security purposes	G06F 21/00
Monitoring patterns of pulse trains	H03K 5/19

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

FSM, FSA	A finite state machine (FSM) or finite state automata (FSA) is a mathematical abstraction sometimes used to design digital logic or computer programs. It is a behaviour model composed of states and transitions between the states.
Signature	A signature is a value resulting from the application of a function to some computer data, for example a hash function.

Synonyms and Keywords

In patent documents, the following words/expressions are often used as synonyms:

- "sequence", "FSM (Finite State Machine)" or "FSA (Finite State Automata)"

G06F 11/30

Monitoring

Definition statement

This place covers:

Monitoring refers to an extra functionality for observing properties of a running computing system in its normal operating conditions without inputting test data.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Thermal management in cooling means	G06F 1/206
Power management	G06F 1/3203
Monitoring for error detection	G06F 11/0751
Verification or detection of system hardware configuration	G06F 11/2002
Monitoring intrusion in a computer system	G06F 21/566
Monitoring of control systems	G05B 23/02
Network monitoring	H04L 43/00
Network security. Monitoring network traffic	H04L 63/14
Monitoring testing in wireless networks	H04W 24/00

Special rules of classification

The classification process in the G06F 11/30 and its subgroups has to be carried out performing the following steps:

- 1. If the document contains interesting aspects about the observation of properties of a running computing system over time in its normal operating conditions without inputting test data, then proceed with ALL of the following steps 2, 3, 4.1, 4.2, 4.3, 4.3.1, 4.4, 4.5 and 5 in sequence, otherwise stop because the document is not to be understood to be about monitoring;
- 2. If the document contains interesting aspects about the (visual or acoustical) display of the monitored data, then classify the document in G06F 11/32 and its subgroups;
- 3. If the document contains interesting aspects about the monitoring of computer activity, then classify the document according to the FCRs of G06F 11/34 and subgroups;
- 4.1. If the document contains interesting aspects about monitoring the configuration of the computing system, then classify the document in G06F 11/3051;
- 4.2. If the document contains interesting aspects about monitoring the status of the computing system, then classify the document in G06F 11/3055;
- 4.3. If the document contains interesting aspects about the monitoring of environmental parameters of the computing system, then classify the document in G06F 11/3058 and subgroups;
- 4.3.1. If power consumption is evaluated through the monitoring of computer activity, then also classify the document in G06F 11/34 and subgroups according to the FCRs of G06F 11/34;
- 4.4. If the document contains interesting aspects about the reporting of the monitored data, then classify the document in G06F 11/3065 and its subgroups;
- 4.5. If the document contains interesting aspects about the sensing of the monitored data, then classify the document in G06F 11/3089 and its subgroups;
- 4.6. If the document has been classified at least once in G06F 11/3051, G06F 11/3055, G06F 11/3058, G06F 11/3065, G06F 11/3089 or their subgroups, then classify the document in G06F 11/3003 and its subgroups;
- 5. If none of the steps 2-4.6 apply, then classify the document in G06F 11/30.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Computer activity	For this group and its subgroups, computer activity covers the activities performed by the computer system that involve data (e.g. processing, data storage, data transfer). It also includes user activity.

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Monitoring system	A monitoring system is generally considered to be composed of observing or measuring entities (usually called monitors or observers) and interfaces/probes which link them to the system under observation.
Interfaces/probes	The interfaces/probes sense (or access) data relative to the system under observation and report them to the observing/ measuring entities.
Probe effect	The probe effect is the undesired alteration of a system property caused by the fact that this property is being observed or measured.
Environmental parameters	Environmental parameters of a computing system are: power, currents, temperature, humidity, position, radiation, etc.

G06F 11/3034

{where the computing system component is a storage system, e.g. DASD based or network based (digital input from or digital output to record carriers G06F 3/06; digital recording or reproducing G11B 20/18; for distributed storage of data in networks, e.g. transport arrangements for network file system [NFS], storage area networks [SAN] or network attached storage [NAS], H04L 67/1097)}

References

Limiting references

This place does not cover:

Drivers for digital recording or reproducing units	G06F 3/06
Circuits for error detection or correction within digital recording or reproducing units	G11B 20/18
For distributed storage of data in networks, e.g. transport arrangements for network file system [NFS], storage area networks [SAN] or network attached storage [NAS]	H04L 67/1097

G06F 11/34

Recording or statistical evaluation of computer activity, e.g. of down time, of input/output operation {; Recording or statistical evaluation of user activity, e.g. usability assessment}

Definition statement

This place covers:

For this group and its subgroups, computer activity covers the activities performed by the computer system that involve data (e.g. processing, data storage, data transfer). It also includes user activity.

This group also includes the modeling of the system or its behaviour, or simulating the execution of the system for observing its properties on a theoretical level.

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Special rules of classification

As criterion to decide whether G06F 11/34 and subgroups applies, it needs to be considered whether computer activity or user activity is being monitored or not.

If the monitoring is done purely to detect when an error occurs, G06F 11/0703 and subgroups apply instead of G06F 11/34 and subgroups.

Recording data during software testing or debugging is classified in G06F 11/36 and subgroups.

The subgroups of G06F 11/34 fall apart in 2 blocks :

- G06F 11/3404 - G06F 11/3442 and subgroups deal with what is being monitored.
- G06F 11/3447 - G06F 11/3466 and subgroups deal with how the monitoring is done.

If both aspects are relevant, classes should be given in both ranges. E.g. performance measurement (G06F 11/3409 or subgroups) where a particular monitoring hardware is used to perform the measurement (G06F 11/3466 or subgroups) is classified in both ranges.

Documents where the monitoring relates to the monitoring of user actions must be systematically classified in G06F 11/3438 (as invention or additional information), independent of any other classification.

Following Indexing Codes must be systematically given for documents classified in G06F 11/34 and subgroups :

- G06F 2201/80 if the monitoring is specific to databases
- G06F 2201/81 if a threshold influences the monitoring behaviour
- G06F 2201/815 if the monitoring concerns the effects of virtualisation
- G06F 2201/86 for all event-based monitoring
- G06F 2201/865 if software is being monitored
- G06F 2201/87 if the monitored object is a transaction
- G06F 2201/875 if the monitored system includes the internet
- G06F 2201/88 if counts are used
- G06F 2201/885 if the monitored object includes a cache

If the document does not describe what is being monitored, its subject-matter should not be classified in G06F 11/34, but in G06F 11/30 or other subgroups of G06F 11/30.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Monitoring	Extra functionality for observing properties of a running computing system over time in its normal operating conditions without inputting test data

G06F 11/3404

{for parallel or distributed programming}

Definition statement

This place covers:

The subject-matter of this group covers monitoring of parallel or distributed programming. Typical issues addressed are : determining the degree of parallelism, optimizing the degree of parallellism, performance of distribution algorithms.

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G06F 11/3409

{for performance assessment}

Definition statement

This place covers:

monitoring the performance of the computer system or its components.

This group covers not only the monitoring of time, but usage of any (physical or other) resource as well.

This group applies whatever the component (e.g. disk, processor, scheduler,...) of which the performance is being monitored is.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Monitoring of user actions	G06F 11/3438

G06F 11/3433

{for load management (allocation of a server based on load conditions G06F 9/505; load rebalancing G06F 9/5083; redistributing the load in a network by a load balancer H04L 67/1029)}

Definition statement

This place covers:

Only the monitoring activities to determine the load of a computer system or the distribution of the load on the different components of the computer system. However it does not cover any actions that are performed in response to the determined load.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Adapting or redistributing the load in a computer system	G06F 9/00
Adapting or planning the capacity required	G06F 11/3442
Redistributing the load in a network by a load balancer	H04L 67/1029

Special rules of classification

If time measurement is used to be able to determine the load, documents should be classified as well in G06F 11/3419.

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G06F 11/3438

{monitoring of user actions (tracking the activity of the user H04L 67/535)}

Definition statement

This place covers:

all documents where actions of the user are monitored (e.g. for productivity or allocation of billable employee time).

This includes arrangements to evaluate the usability of a system or component.

References

Limiting references

This place does not cover:

Tracking the activity of the user	H04L 67/535

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Usability	Measure of the ease of use of a specific object or set of objects or of how easy the object or set of objects is to learn to use

G06F 11/3442

{for planning or managing the needed capacity}

Definition statement

This place covers:

This group covers all subject-matter where monitoring is done to come to conclusions about the capacity required. It is necessary that this goal is explicit in the document.

Capacity should be understood here as relating to how much computer resources are needed. In general these are hardware resources (such as the amount of processing power, memory or storage space). However this can also be software resources emulating such hardware (such as an amount of virtual memory, a number of virtual machines, etc.).

In contrast to G06F 11/3433, here the load is taken as a given and the goal is to come to conclusions about the resources that need to be available. The actions taken in response will change the configuration of the system.

Relationships with other classification places

The actions per se performed to adapt the capacity are not classified here, but rather in G06F 9/00.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Measures to allocate resources	G06F 9/00

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G06F 11/3447

{Performance evaluation by modeling}

Definition statement

This place covers:

This group deals with subject-matter where a model of the system to be monitored (or part of it) is made or modified. This group does not cover the use of the model as monitoring tool (which should be classified according to what is being monitored).

E.g. :

- This group covers the construction of a model to determine monitoring points in the system. However, it does not cover a concrete implementation of the monitoring points (which would be in G06F 11/3466).
- This group covers the construction of a model to be used in a simulation. However, the use of the model in a simulation is not covered (this would be in G06F 11/3457).

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Model	description of a system using mathematical concepts and language. It may help to explain a system and to study the effects of different components or parameters, and to make predictions about system behaviour

G06F 11/3452

{Performance evaluation by statistical analysis}

Definition statement

This place covers:

Performance evaluation by statistical analysis means that statistics are used to come to a conclusion regarding a system parameter. This may be to evaluate system parameters or predict the future behaviour of the system.

It covers as well subject-matter where a relation between different parameter is modelled, based on measured values documenting the relationship (e.g. curve-fitting)

Typically, this would involve multiple executions or the analysis of time series observed.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Stochastic model development of the system for monitoring	G06F 11/3447

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G06F 11/3457

{Performance evaluation by simulation}

Definition statement

This place covers:

Simulation means that execution characteristics of the system or component to be monitored are observed without actually executing the real system or without executing the system or component under real conditions.

Examples are:

- Monitoring the execution of the real system but with a fictive workload
- Applying a real workload to a model or a mockup of the system

G06F 11/3466

{Performance evaluation by tracing or monitoring}

Definition statement

This place covers:

The title of this groups should be read as "by tracing". This group and its subgroups are also relevant if the tracing is not explicitly done to evaluate the performance (for instance if no specific purpose is stated for the tracing).

This group covers arrangements that describe how monitored data of the physical system is being collected or made available. These arrangements can be internal in the system (i.e. tracing) or external to the system (general monitoring arrangements used for monitoring computer activity).

Relationships with other classification places

Tracing for software testing or debugging purposes is classified in G06F 11/36 and subgroups.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Tracing	Observing or making available monitored data using additional hardware or software functionality in the monitored system or component

G06F 11/3471

{Address tracing}

Definition statement

This place covers:

Examples are:

- Observing the addresses circulating on a computer bus
- Monitoring memory accesses for certain address ranges

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G06F 11/3476

{Data logging (G06F 11/14, G06F 11/2205 take precedence)}

Definition statement

This place covers:

The scope of this group is not restricted to logging of monitoring data per se. It covers as well the determination of what monitoring data should be logged and how it should be logged (e.g. condensing the logged data, logging statistics, ...) and analysis of logged monitoring data.

G06F 11/3485

{for I/O devices}

Special rules of classification

Documents describing the monitoring of channels should additionally be classified in G06F 11/349.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Channel	An independent hardware component that coordinates all I/O to a set of controllers or devices

G06F 11/349

{for interfaces, buses}

Special rules of classification

Documents describing the monitoring of channels should additionally be classified in G06F 11/3485.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Channel	An independent hardware component that coordinates all I/O to a set of controllers or devices

G06F 11/3495

{for systems}

Definition statement

This place covers:

Applies when communication or interaction between the processing components influences the assessed properties of the whole system.

Thus, it is a necessary condition to have a communication medium involved, however not a sufficient condition. If the system which is observed is limited to the communicaiton medium, it should not be classified here (but in H04L if the medium is a network or in G06F 11/349 if the medium is a bus).

Examples are:

- Monitoring arrangements for distributed systems

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- Arrangements for application level response time measurement of web servers
- Monitoring arrangements in a multiprocessor system

Relationships with other classification places

If the communication protocol or the hardware characteristics of the network are relevant for the monitoring, this should be (additionally) classified in H04L.

G06F 11/36

Prevention of errors by analysis, debugging or testing of software

Definition statement

This place covers:

Evaluating a program's functionality to find and fix bugs or abnormalities with the intent to check the program against its specifications and identify any inconsistencies using a variety of techniques, such as unit testing, integration testing and system testing.

Tools frequently used to identify the source of problems and ensure the software functions as intended are as follows (non-exhaustive):

- debuggers;
- profilers; and
- log analysers.

Relationships with other classification places

Tracing for performing performance analysis; G06F 11/3466

Emulators and simulators used for testing computer hardware; G06F 11/261

User interface programs; G06F 9/451

Generating or modifying source code; G06F 8/30

CASE, software engineering tools; G06F 8/30

Compiling; G06F 8/41

Concurrent instruction execution; G06F 9/38

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for software engineering	G06F 8/00
Program code verification	G06F 9/44589
Generic software techniques for error detection or fault masking using middleware or operating system [OS] functionalities	G06F 11/1479
Detection or location of defective computer hardware by testing during standby operation or during idle time	G06F 11/22
Checking correct execution order of instructions	G06F 11/28
Recording or statistical evaluation of computer activity	G06F 11/34
Security arrangements for protecting computers, components thereof, programs or data against unauthorised activity	G06F 21/00

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Computer aided design	G06F 30/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

bug	a bug in a program results from a faulty implementation and produces an incorrect or unexpected result or causes the program to behave in unintended ways.
software analysis	software analysis aims at verifying that a program or its specification satisfies certain properties without involving testing (no test inputs are provided to the program under analysis). It can involve for example scanning the source code and analysing the dependencies between the various components, or the use of certain variables, etc. It can consist in the use of formal methods, like model checking or theorem proving which aim at formally guaranteeing certain properties, for example that the program is well-typed, or deadlock free etc. In principle software analysis does not require the program to execute (static analysis), but in some cases it does, for example to verify runtime properties.
software testing	software testing is the process of executing a program, or a discrete program unit, with the intent of finding errors. Tests can only reveal the presence of errors, but cannot ensure the absence of errors. When errors are detected in a program, one might want to start debugging it, i.e. locating precisely the error and correcting it. In both cases (testing and debugging), the program is executed.
software debugging	software debugging refers to the activity of locating an error.

G06F 11/3604

Analysis of software for verifying properties of programs (testing of software G06F 11/3668)

Definition statement

This place covers:

Analysis of software, i.e. verifying that a program or its specification satisfies certain properties without involving testing, i.e. no test inputs are provided to the program under analysis. For example, it may involve scanning the source code and analysing the dependencies between the various components, or the use of certain variables. It may involve the use of formal methods, like model checking or theorem proving which aim to formally guarantee certain properties, for example that the program is well-typed or deadlock free. In principle, analysis of software does not require the program to be executed (static analysis), but in some cases the program is executed, for example, to verify runtime properties (dynamic analysis).

References

Limiting references

This place does not cover:

Testing of software	G06F 11/3668

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Program documentation	G06F 8/73
Structural analysis for program understanding	G06F 8/75
Software metrics	G06F 8/77

G06F 11/3608

{using formal methods, e.g. model checking, abstract interpretation (theorem proving G06N 5/013)}

Definition statement

This place covers:

Mathematically-based techniques (model checking, abstract interpretation, formal proof) for the verification of a program.

G06F 11/3612

{by runtime analysis (performance monitoring G06F 11/3466)}

Definition statement

This place covers:

Analysing runtime behaviour to detect errors (e.g. performance bug or infinite loops).

G06F 11/3616

{using software metrics}

Definition statement

This place covers:

A software metric is a measure of some property of a piece of software or its specifications, e.g. number of lines in the code, cyclomatic complexity (number of linearly independent paths through a program's source code), or any measure which aims at evaluating the properties of a program.

References

Limiting references

This place does not cover:

Software metrics used during software generation	G06F 8/77

G06F 11/362

Debugging of software

Definition statement

This place covers:

The activity of identifying, evaluating and fixing bugs that are found during runtime execution or testing.

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G06F 11/3624

{by performing operations on the source code, e.g. via a compiler}

Definition statement

This place covers:

Manual or compiler assisted instrumentation or by any automatic tool of the source code according to an instrumentation policy.

G06F 11/3628

{of optimised code (optimisation G06F 8/443)}

Definition statement

This place covers:

Usually the debugging process is performed on an un-optimised version of a program, and the program is optimised (by the compiler) when fully debugged. However, in some cases one wants to debug the optimised version of a program: for example, some bugs might occur in the optimised version of the code only. An obvious problem that an optimised code will create is when a developer sets a breakpoint in a part of code that has been eliminated by the compiler during optimisation.

G06F 11/3632

{of specific synchronisation aspects}

Definition statement

This place covers:

- Methods and arrangements for dealing with the synchronisation issues involved with debugging operations (e.g. when inserting a breakpoint in a multithreaded or distributed program).
- Method and arrangements for investigating synchronisation problems in distributed or multithreaded programs.

G06F 11/3636

{by tracing the execution of the program}

Definition statement

This place covers:

Methods and arrangements for generating or analysing traces of a program execution.

G06F 11/364

{tracing values on a bus}

Definition statement

This place covers:

Methods and arrangements for gathering or analysing data exchanged on a computer bus (e.g. data bus, memory bus) during the execution of a program.

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G06F 11/3644

{by instrumenting at runtime}

Definition statement

This place covers:

- Instrumenting operations performed on a compiled program directly before execution (e.g. Valgrind).
- Runtime injection: the code is modified at runtime.

References

Limiting references

This place does not cover:

Instrumention of Bytecodes	G06F 11/3624

G06F 11/3648

{using additional hardware}

Definition statement

This place covers:

Hardware arrangements contributing to the debugging process

G06F 11/3652

{in-circuit-emulation [ICE] arrangements}

Definition statement

This place covers:

The term "In-Circuit Emulator" in this group only refers to a device replacing the target microprocessor. The code under debug is not executed on the real target processor but rather on a specific hardware that emulates the target processor and that comprises debug facilities for setting breakpoints or watchpoints.

Special rules of classification

Nowadays, the term "In-Circuit Emulator" refers also to a JTAG or BDM based device which provides access to the internal registers of the target microprocessor. Said device can take control of the target microprocessor, start, stop or resume the code execution. The code under debug is executed on the real target microprocessor, in that case. If the technical contribution of a document refers to such a JTAG/BDM based device, this document should be classified in G06F 11/3656 group (Debug interfaces).

G06F 11/3656

{using a specific debug interface}

Definition statement

This place covers:

Aspects related to communication between a host and a target (e.g. JTAG/BDM based "In-Circuit Emulator").

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

JTAG	Joint Test Action Group (JTAG) is the common name for what was later standardized as the IEEE 1149.1 Standard Test Access Port and Boundary-Scan Architecture. JTAG refers nowadays to a bus for transferring debug commands from a host to a target and debug data from the target to the host.
BDM	Background Debug Mode (BDM) interface is an electronic interface that allows debugging of embedded systems. BDM interface allows a Host to manage and query a target.

G06F 11/366

{using diagnostics (G06F 11/0703 takes precedence)}

Definition statement

This place covers:

Subject matter related to software bugs after the software development phase. For example, a system crash during operation might be caused by a software bug. The system is diagnosed after the crash (or the failure) to find out where the bug was.

References

Limiting references

This place does not cover:

Error or fault processing not based on redundancy, i.e. by taking additional measures to deal with the error or fault not making use of redundancy in operation, in hardware or in data representation	G06F 11/0703

G06F 11/3668

Testing of software

Definition statement

This place covers:

The process of executing a program or a discrete program unit, using test inputs with the intent of finding errors.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Detection or location of defective computer hardware by testing during standby operation or during idle time	G06F 11/22
Software testing in telephone exchanges	H04M 3/242

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G06F 11/3672

{Test management}

Definition statement

This place covers:

The different activities of software testing:

- test case/script/scenario design (G06F 11/3684)
- test coverage analysis (G06F 11/3676)
- execution of the test cases/scripts/scenarii (G06F 11/3688)
- analysis of the test results (G06F 11/3692)
- maintenance and updates of the test cases/scripts/scenarii in parallel to the software evolution during software development (G06F 11/368)

Special rules of classification

The document should be classified according to the most relevant information concerning one activity of the software testing.

- if it is possible to identify one relevant piece of information related to one of the identified software testing activities, the document should be in classified in one of the corresponding subgroups:G06F 11/3676, G06F 11/368, G06F 11/3684, G06F 11/3688, G06F 11/3692.
- If it is not possible to extract any relevant information concerning any of the identified software testing activities, the document should be classified in the test management subgroup (G06F 11/3672)

G06F 11/3676

{for coverage analysis}

Definition statement

This place covers:

Coverage analysis is concerned with the degree to which test cases exercise or cover the logic of the program. Because testing is a time consuming activity that cannot be exhaustive, the key issue is to apply a subset of all possible test cases which has the highest probability of detecting errors. Coverage analysis is therefore an issue at the design stage (strategy for generating test inputs that are effective in terms of coverage) as well as at the execution stage (how to measure coverage).

Test coverage can refer to different aspects:

- path coverage
- data coverage
- line coverage

G06F 11/368

{for test version control, e.g. updating test cases to a new software version}

Definition statement

This place covers:

Maintenance and updates of test scripts in parallel to the evolution of the software during software development.

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References

Limiting references

This place does not cover:

Version control; configuration management for creation of software	G06F 8/71

G06F 11/3684

{for test design, e.g. generating new test cases}

Definition statement

This place covers:

Generation or updates of test cases, scenarios, scripts. Specific languages for writing tests.

G06F 11/3688

{for test execution, e.g. scheduling of test suites}

Definition statement

This place covers:

Scheduling of the tests; recording of test results; regression testing; mutation testing.

G06F 11/3692

{for test results analysis}

Definition statement

This place covers:

Comparing the results of the tests with an oracle (assertions, mathematical models, simulations and the like).

G06F 11/3696

{Methods or tools to render software testable}

Definition statement

This place covers:

Arrangements for facilitating the testing of a software unit:

- Arrangement can be an interface to provide test inputs.
- Arrangement for simulating missing part of software or hardware that are necessary for performing the execution and the testing of the software unit.
- Arrangement for performing a time compression in order to simulate a long term execution of a software program in a short time frame
- Arrangement for performing the test execution on a different platform

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G06F 11/3698

Environments for analysis, debugging or testing of software

Definition statement

This place covers:

Environments, frameworks, graphical user interfaces [GUI] or simulators that aim at supporting or facilitating the task of a user during the various phases of analysing, testing or debugging of software, e.g. to navigate into the code, to add or remove breakpoints, to visualise execution traces or to edit/ maintain/archive test suites.

The environment may be comparable to a software development environment [SDE], but it contains features that are specific to the phases of analysing, testing or debugging of software.

G06F 12/00

Accessing, addressing or allocating within memory systems or architectures (digital input from, or digital output to record carriers, e.g. to disk storage units, G06F 3/06)

References

Limiting references

This place does not cover:

Accessing, addressing or allocation of record carriers, e.g. disk storage	G06F 3/06

Informative references

Attention is drawn to the following places, which may be of interest for search:

Memory management specially adapted to image processing	G06T 1/60
Static stores	G11C

Special rules of classification

Any classification rules applicable to a specific group also apply to any sub-groups thereof unless overruled by more specific rules.

When one or more sub-group definitions are listed in the definition statement of a group no further description of these sub-groups are provided in this FCR.

The group G06F 12/00 contains no material and should not be used for classification.

Use of Indexing Codes:

All groups have corresponding G06F 12/00 Indexing Code-codes, which should be used for secondary aspects (non-invention information).

Indexing Scheme G06F 2212/00:

In November 2011 a new indexing scheme relating to G06F 12/00 has been introduced. The Indexing Codes from the range G06F 2212/20- G06F 2212/7211 are mandatory when applicable. The code range G06F 2212/10- G06F 2212/178 is not mandatory but should preferably be used for documents characterized by specific technical effects or applications.

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Warning: The G06F 2212/00 indexing scheme is new and has not yet been systematically applied to the existing documentation except when explicitly indicated in this document.

G06F 12/02

Addressing or allocation; Relocation (program address sequencing G06F 9/00; arrangements for selecting an address in a digital store G11C 8/00)

References

Limiting references

This place does not cover:

Program address sequencing.	G06F 9/00
Low-level arrangements for selecting an address in a memory device.	G11C 8/00

Special rules of classification

G06F 12/02 should be used only for material not provided for in any of the sub-groups.

G06F 12/0207

{with multidimensional access, e.g. row/column, matrix}

Definition statement

This place covers:

Addressing or accessing memory in two or more dimensions, e.g. for transposing of data.

Addressing of rectangular blocks of data.

References

Limiting references

This place does not cover:

Memory systems specially adapted to graphics processing or display.	G06T, G09G
Memory systems specially adapted to video processing.	H04N

G06F 12/0215

{with look ahead addressing means}

Definition statement

This place covers:

Page mode addressing of DRAM.

Speculative addressing of a memory in general.

References

Limiting references

This place does not cover:

Prefetching to cache memory or use of dedicated prefetch buffers	G06F 12/0862

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Memory controllers	G06F 13/16

G06F 12/0223

{User address space allocation, e.g. contiguous or non contiguous base addressing}

References

Limiting references

This place does not cover:

Module addressing	G06F 12/06

Informative references

Attention is drawn to the following places, which may be of interest for search:

Resource allocation	G06F 9/50

G06F 12/023

{Free address space management}

Definition statement

This place covers:

Dynamic memory allocation.

Explicit memory de-allocation.

Free space management.

G06F 12/0238

{Memory management in non-volatile memory, e.g. resistive RAM or ferroelectric memory}

Definition statement

This place covers:

Memory management in non-volatile memory that is not specific to flash memory, e.g. in emerging memory types such as resistive RAM or ferroelectric memory.

G06F 12/0246

{in block erasable memory, e.g. flash memory}

Definition statement

This place covers:

Addressing of flash memory, e.g. logical to physical address mapping;

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Allocation within flash memory;

Management, e.g. cleaning, compacting, erasing, wear levelling;

Temporary storage of data, e.g. within volatile buffers or in buffer blocks.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of block management in an interface arrangement to a storage system	G06F 3/064
Details of file management in an interface arrangement to a storage system	G06F 3/0643
Details of the controller in an interface arrangement to a storage system making use of vertical data movement	G06F 3/0658
Details of the protocol conversion in an interface arrangement to a storage system making use of vertical data movement	G06F 3/0661
Interface arrangements for single solid-state devices	G06F 3/0679
Interface arrangements for hybrid storage devices, e.g. magnetic and semiconductor mediums sharing the same controller	G06F 3/068
Interface arrangements for storage system comprising multiple controllers and multiple storage medium types, e.g. SSD, HDD and tapes combined	G06F 3/0685
Interface arrangements for storage system comprising multiple controllers and multiple semiconductor storage devices, e.g. Hybrid storage array	G06F 3/0688
Write caching	G06F 12/0804, G06F 12/0866
Non-volatile memories	G11C 16/00

Special rules of classification

Indexing Codes G06F 2212/7201- G06F 2212/7211 are used in this group. The coding of the existing documentation is mostly complete.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Page	The smallest data unit of read or write access in a NAND flash memory.

G06F 12/0253

{Garbage collection, i.e. reclamation of unreferenced memory}

Definition statement

This place covers:

Automatic reclamation of heap-allocated memory after last use by a program, i.e. where the allocated memory is not explicitly freed by the program.

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References

Limiting references

This place does not cover:

Explicit freeing of memory	G06F 12/023
Compaction and cleaning within flash memory	G06F 12/0246

Special rules of classification

The Indexing Code G06F 2212/702 should be used for conservative garbage collection. The coding of the existing documentation is mostly complete.

G06F 12/0284

{Multiple user address space allocation, e.g. using different base addresses (interprocessor communication G06F 15/163)}

Definition statement

This place covers:

Multi-user or multiprocessor address space allocation.

Mapping arrangements therefore, e.g. local to global address space mapping.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Virtual address translation	G06F 12/10
Interprocessor communication	G06F 15/163

G06F 12/0292

{using tables or multilevel address translation means (G06F 12/023 takes precedence; address translation in virtual memory systems G06F 12/10)}

References

Limiting references

This place does not cover:

Free address space management	G06F 12/023
Multiple user address space allocation	G06F 12/0284
Virtual memory address translation.	G06F 12/10

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G06F 12/04

Addressing variable-length words or parts of words

Definition statement

This place covers:

Addressing variable length words.

Addressing parts of a word, e.g. bit fields.

Addressing unaligned words.

References

Limiting references

This place does not cover:

Address generation within processors	G06F 9/34

Informative references

Attention is drawn to the following places, which may be of interest for search:

Information transfer on a bus	G06F 13/38

G06F 12/06

Addressing a physical block of locations, e.g. base addressing, module addressing, memory dedication (G06F 12/08 takes precedence)

Definition statement

This place covers:

Addressing or allocation of physical memory modules or banks.

Module selection, e.g. using chip selects.

References

Limiting references

This place does not cover:

Addressing or allocation within a memory module.	G06F 12/0223
Hierarchical memory arrangements	G06F 12/08

Informative references

Attention is drawn to the following places, which may be of interest for search:

Memory controller.	G06F 13/16
Bank or array addressing within individual memory devices.	G11C 8/00, G11C 11/00

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G06F 12/08

in hierarchically structured memory systems, e.g. virtual memory systems

Definition statement

This place covers:

Hierarchical memory systems.

Virtual memory.

Paging.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hierarchically organised storage systems	G06F 3/06
Virtual address translation	G06F 12/10
Replacement control	G06F 12/12

G06F 12/0802

Addressing of a memory level in which the access to the desired data or data block requires associative addressing means, e.g. caches

Definition statement

This place covers:

Cache memories being part of a memory hierarchy. Information not provided for in the sub-groups is classified in this group, e.g. aspects relating to cache configuration, error handling or testing.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Register cache (for register file).	G06F 9/30
Branch history / target cache.	G06F 9/38
Caching of dynamically generated content, e.g. database query cache, web cache.	G06F 16/00

Special rules of classification

Indexing Code groups G06F 2212/27, G06F 2212/30, G06F 2212/45, G06F 2212/60 are mandatory in this group when applicable.

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G06F 12/0804

with main memory updating (G06F 12/0806 takes precedence)

Definition statement

This place covers:

Write-back of dirty data to main memory.

Saving or preservation of dirty data in case of errors or power failure

Write-back policies, e.g. selective write-through / write-back.

References

Limiting references

This place does not cover:

Multiuser, multiprocessor, multiprocessing cache systems e.g. write-back due to coherency protocol transactions.	G06F 12/0806

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error detection or correction of the data by redundancy in operations	G06F 11/14
Replacement policies	G06F 12/12

G06F 12/0806

Multiuser, multiprocessor or multiprocessing cache systems

Special rules of classification

Indexing Codes G06F 2212/62 are mandatory in this group.

G06F 12/0815

Cache consistency protocols

Definition statement

This place covers:

Cache coherency protocols, e.g. snooping, directory based or software controlled.Further details of subgroups

G06F 12/0833: this group is not used for classification of new material, use G06F 12/0831.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Memory consistency not specific to cache coherency.	G06F 9/46
Locking for the purpose of program synchronization	G06F 9/52

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Special rules of classification

The group G06F 12/0815 should only be used for material not provided for in any of the subgroups G06F 12/0817-G06F 12/0837.

G06F 12/0844

Multiple simultaneous or quasi-simultaneous cache accessing

Definition statement

This place covers:

Simultaneous processing of two or more accesses.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pipeline techniques within processors	G06F 9/38
Module addressing in general	G06F 12/06

G06F 12/0862

with prefetch

Definition statement

This place covers:

Prefetching in cache memory using fixed or adaptive prefetch strategies.

Software controlled prefetching using prefetch instructions.

Use of dedicated prefetch buffer or prefetch cache.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compiling techniques to reduce cache misses	G06F 8/4442
Instruction or operand prefetching within processors	G06F 9/38

Special rules of classification

For prefetching in disk caches this class should be combined with Indexing Code G06F 12/0866.

Indexing Code group G06F 2212/602 is mandatory in this group. The coding of the existing documentation is mostly complete.

G06F 12/0864

using pseudo-associative means, e.g. set-associative or hashing

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Page mode accessing of cache	G06F 12/0882

Special rules of classification

Indexing Code G06F 2212/6032 is mandatory for material dealing with way prediction. The coding of the existing documentation is mostly complete.

G06F 12/0866

for peripheral storage systems, e.g. disk cache

Definition statement

This place covers:

Dedicated cache memory within storage controller or storage device;

Caching of network attached storage or remote server content;

Disk caching in main memory of host computer, e.g. by operating system.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Storage adapters, disk storage management	G06F 3/06
Data buffering arrangements for data transfers within storage systems	G06F 3/0656
Caching of dynamically generated data content, e.g. web caching, database query results	G06F 16/00
Temporary data storage in networks	H04L 67/568

Special rules of classification

Indexing Code groups G06F 2212/21, G06F 2212/22, G06F 2212/26, G06F 2212/28, G06F 2212/31 and G06F 2212/46 are mandatory in this group.

If the invention information can be fully classified in other group(s) it is recommended to add only Indexing Code G06F 12/0866.

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G06F 12/0868

Data transfer between cache memory and other subsystems, e.g. storage devices or host systems

Definition statement

This place covers:

Data transfer control within the cache system, between the cache and the storage devices or between the cache and the host system.

E.g. concurrent transfers, internal buffering arrangements, pipelining.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Write back control	G06F 12/0804
Replacement control	G06F 12/12

G06F 12/0871

Allocation or management of cache space

Definition statement

This place covers:

Allocation of cache space.

Organisation of cache data, data structures therefore.

Free space management within cache.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Replacement control	G06F 12/12

G06F 12/0873

Mapping of cache memory to specific storage devices or parts thereof

Definition statement

This place covers:

Selective allocation of (parts of) cache memory space to specific storage devices or parts of such devices.

This group is limited to large granularity mapping of cache areas to portions of a storage system, e.g. allocating cache partitions to individual storage devices.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Set-associative or similar mappings of individual cache entries to storage device locations.	G06F 12/0864

G06F 12/0875

with dedicated cache, e.g. instruction or stack

Definition statement

This place covers:

Cache memories adapted for particular applications or specific types of data, e.g. stack caches, instruction caches, caches for graphics information.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Branch history cache, branch target cache	G06F 9/38

Special rules of classification

Indexing Code group G06F 2212/45 is used in this group.

Warning: Except for G06F 2212/451 these codes have not yet been allocated to the existing documentation.

G06F 12/0877

Cache access modes

Definition statement

This place covers:

Special access modes to cache memory, e.g. burst mode access, partial line accessing.

G06F 12/0888

using selective caching, e.g. bypass

Definition statement

This place covers:

Selective or conditional caching of data, e.g. based on expected usefulness of caching;

Bypassing of cache.

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G06F 12/0891

using clearing, invalidating or resetting means

Definition statement

This place covers:

Invalidation of the entire cache memory content or parts of the cache memory content, e.g. upon initialization or task switching;

Hardware techniques for cache memory invalidation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Main memory updating, e.g. flushing of cache content	G06F 12/0804
Invalidation forming part of a cache coherency protocol	G06F 12/0815
Initialisation circuits for static stores	G11C 7/20, G11C 11/40

G06F 12/0893

Caches characterised by their organisation or structure

Definition statement

This place covers:

Cache topology;

Cache structurally integrated within a memory device, e.g. DRAM row cache;

Cache employing DRAM or other technology than SRAM.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Static stores in general	G11C

Special rules of classification

Indexing Code G06F 2212/305 is mandatory for memory with integrated cache memory, e.g. cache DRAM. The coding of the existing documentation is mostly complete.

Indexing Code groups G06F 2212/22 and G06F 2212/27 are used in this group.

G06F 12/10

Address translation

Definition statement

This place covers:

Virtual to physical address translation;

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Translation fault handling;

Virtual address space management, see provisionally also G06F 12/0284.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Virtual machines.	G06F 9/455
Logical partitioning	G06F 9/50
Address mapping within flash memory	G06F 12/0246
Multi-user or multiprocessor address space allocation	G06F 12/0284
Address mapping or translation in general, not specific to virtual memory	G06F 12/0292

Special rules of classification

Indexing Codes G06F 2212/65- G06F 2212/657 are used in this group. The coding of the existing documentation is mostly complete.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Page	The unit of paging in virtual memory

G06F 12/1027

using associative or pseudo-associative address translation means, e.g. translation look-aside buffer [TLB]

Definition statement

This place covers:

Caching of address translations;

TLB miss handling.

Special rules of classification

Indexing Code group G06F 2212/681-G06F 2212/684 is used in this group. The coding of the existing documentation is mostly complete.

Replacement control for TLB's is classified in G06F 12/12-G06F 12/128. An Indexing Code G06F 12/1027 should be allocated in such cases.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

TLB	Translation Look-aside Buffer
MMU	Memory Management Unit

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G06F 12/1081

for peripheral access to main memory, e.g. direct memory access [DMA]

Definition statement

This place covers:

Address translation for peripheral devices, channels, I/O adapters, network adapters, DMA controllers etc.

Memory management units within such devices or interfaces.

G06F 12/109

for multiple virtual address spaces, e.g. segmentation (G06F 12/1036 takes precedence)

Definition statement

This place covers:

Translation for multiple virtual address spaces, e.g. identified by an address space identifier;

Segmentation based on a segment identifier;

Guest address space to host address space translation.

Special rules of classification

Indexing Codes G06F 2212/656 and G06F 2212/657 are particularly relevant in this group.

G06F 12/12

Replacement control

Definition statement

This place covers:

Replacement control in virtual memory, cache memory or TLB.

Replacement algorithms.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Write back control in cache	G06F 12/0804

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

LFU	Least Frequently Used
LRU	Least Recently Used
MRU	Most Recently Used
FIFO	First In First Out

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G06F 12/14

Protection against unauthorised use of memory {or access to memory}

Definition statement

This place covers:

Preventing unauthorized access to memory content.

Virtual memory access control.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multiprogramming arrangements	G06F 9/46
Program synchronization, e.g. using locks; mutual exclusion	G06F 9/52
Security arrangements in computers	G06F 21/00
Coded identity card or credit card	G07F 7/08
Secure communication	H04L 9/00

G06F 12/1408

{by using cryptography (for digital transmission H04L 9/00)}

Definition statement

This place covers:

Address scrambling;

Data encryption within a memory, e.g. being dependent on the memory location.

References

Limiting references

This place does not cover:

Data encryption being independent of the memory location	G06F 21/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Secure communication	H04L 9/00

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G06F 12/1416

{by checking the object accessibility, e.g. type of access defined by the memory independently of subject rights (G06F 12/1458 takes precedence)}

Definition statement

This place covers:

Memory protection being independent of the subject identity, e.g. physical write protection of a memory.

References

Limiting references

This place does not cover:

By checking the subject access rights	G06F 12/1458

G06F 12/1458

{by checking the subject access rights}

Definition statement

This place covers:

Memory protection in which the protection depends on the subject identity, e.g. using an access list.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Access list protection in general	G06F 21/00

G06F 12/16

Protection against loss of memory contents {(contains no material, see G06F 11/00)}

Relationships with other classification places

This group is not used for classification and contains no material. Documents relating to protection against loss of memory content are classified within main group G06F 11/00, in particular in the groups G06F 11/14 or G06F 11/16.

References

Limiting references

This place does not cover:

Protection against loss of memory contents	G06F 11/00

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G06F 13/00

Interconnection of, or transfer of information or other signals between, memories, input/output devices or central processing units (interface circuits for specific input/output devices G06F 3/00 {; multiprogram control therefor G06F 9/46}; multiprocessor systems G06F 15/16)

Definition statement

This place covers:

Interconnection of, or transfer of information or other signals between, memories, input/output devices or central processing units.

References

Limiting references

This place does not cover:

Interface circuits for specific input/output devices	G06F 3/00
Multiprogram control therefor	G06F 9/46
Multi-processor systems	G06F 15/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transmission of digital information in general	H04L
Synchronisation in transmission of digital information in general	H04L 7/00
Bus networks	H04L 12/40
Selecting	H04Q

G06F 13/28

using burst mode transfer, e.g. direct memory access {DMA}, cycle steal (G06F 13/32 takes precedence)

Definition statement

This place covers:

Handling requests for interconnection or transfer using burst mode transfer, e.g. direct memory access.

References

Limiting references

This place does not cover:

Access to input/output bus using combination of interrupt and burst mode transfer	G06F 13/32

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Remote DMA	H04L 12/06

G06F 13/38

Information transfer, e.g. on bus (G06F 13/14 takes precedence)

References

Limiting references

This place does not cover:

Handling requests for interconnection or transfer	G06F 13/14

Informative references

Attention is drawn to the following places, which may be of interest for search:

Bus networks	H04L 12/40

G06F 13/382

{using universal interface adapter}

Definition statement

This place covers:

Information transfer, e.g. on bus using universal interface adapter.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital I/O from or to direct access storage devices	G06F 3/0689
Wireless network data management	H04W

Special rules of classification

The information transfer is between components in a computer. Therefore, documents classified in this subgroup should relate to a data transfer in, to or from a computer.

G06F 13/4004

{Coupling between buses}

References

Limiting references

This place does not cover:

Network bridges	H04L 12/46

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G06F 13/4063

{Device-to-bus coupling}

Relationships with other classification places

Documents classified in this subgroup can also be related to some pins configuration, and more also to system configuration.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Booting configuration	G06F 9/445

G06F 13/4081

{Live connection to bus, e.g. hot-plugging (current or voltage limitation during live insertion H02H 9/004)}

Definition statement

This place covers:

Bus structure electrical coupling between device and bus; Live connection to bus, e.g. hot plugging.

References

Limiting references

This place does not cover:

Current or voltage limitation during live insertion	H02H 9/004

Special rules of classification

Documents related to detection of presence and/or type of connected peripheral can be classified in this subgroup.

G06F 13/409

{Mechanical coupling (back panels H05K 7/1438)}

Definition statement

This place covers:

Bus structure based on a mechanical coupling between device and bus.

References

Limiting references

This place does not cover:

Back panels	H05K 7/1438

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Computer enclosure	G06F 1/16
Electrical connector	H01R 13/00

Special rules of classification

Documents related to mechanical coupling between a computer component and a bus can be classified in this subgroup, e.g. coupling of connectors or boards to a computer bus.

G06F 13/42

Bus transfer protocol, e.g. handshake; Synchronisation

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cryptographic protocols; Financial cryptography	H04L 9/00
Network security protocols	H04L 63/00
Protocols for real-time services in data packet switching networks	H04L 65/00
Network protocols for data switching network services	H04L 67/00

G06F 15/00

Digital computers in general (details G06F 1/00 – G06F 13/00); Data processing equipment in general

References

Limiting references

This place does not cover:

Details of digital computers	G06F 1/00- G06F 13/00
Neural networks for image data processing	G06T

G06F 15/02

manually operated with input through keyboard and computation using a built-in program, e.g. pocket calculators

Definition statement

This place covers:

Pocket calculators, e-books, PDA.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details or arrangements for portable computers	G06F 1/1613
Input arrangements or combined input and output arrangements for interaction between user and computer	G06F 3/01

Special rules of classification

When a document qualifies for one of the groups below, G06F 15/02 should not be assigned:

For combination with other devices having a different main function, e.g. watches, pens: G06F 15/0208

Constructional details or arrangements: G06F 15/0216

User interface arrangements, e.g. keyboard, display; Interfaces to other computer systems: G06F 15/0225

With printing provisions: G06F 15/0233

Of the IC-card-like type: G06F 15/0241

Adapted to a specific application: G06F 15/025

For unit conversion: G06F 15/0258

For time management, e.g. calendars, diaries: G06F 15/0266

For measuring: G06F 15/0275

For data storage and retrieval: G06F 15/0283

For reading: G06F 15/0291

G06F 15/16

Combinations of two or more digital computers each having at least an arithmetic unit, a program unit and a register, e.g. for a simultaneous processing of several programs {(coordinating program control therefor G06F 9/52; in regulating and control system G05B)}

Definition statement

This place covers:

MIMD, SPMD Architectures.

Relationships with other classification places

Documents classified in this subgroup can also be related to digital computers for regulating and control system (G05B).

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References

Limiting references

This place does not cover:

Coordinating program control therefor	G06F 9/52
In regulating and control system	G05B

Informative references

Attention is drawn to the following places, which may be of interest for search:

Constructional details on portable computers, PDAs	G06F 1/1613
Initialization of multiprocessor systems.	G06F 9/4405
Partitioning or combining resources in a multiprogramming arrangement.	G06F 9/5061
Intertask communication	G06F 9/54
Fault-tolerance	G06F 11/20
Memory protection	G06F 12/00
Memory access priority	G06F 13/00
Coupling between busses	G06F 13/4022
Multicore processors	G06F 15/7807
Network on chip	G06F 15/7825
Digital computing or data processing equipment or methods, specially adapted for data retrieval.	G06F 16/00
Control area networks (CAN)	B60R 16/023
Multiprocessor for program-control systems	G05B 19/0421
Information and communication technology [ICT] specially adapted for administrative, commercial, financial, managerial or supervisory purposes; systems or methods specially adapted for administrative, commercial, financial, managerial or supervisory purposes, not otherwise provided for	G06Q
Computer aided management of electronic mail	G06Q 10/107
Cryptographic protocols; Financial cryptography	H04L 9/00
Stored and forward switching systems	H04L 12/54
Routing of packets in a LAN/WAN	H04L 45/00
Flow Control in a LAN/WAN	H04L 47/10
Queue Scheduling in a LAN/WAN	H04L 49/00
Packet switches for a LAN/WAN	H04L 49/00
Electronic mail systems	H04L 51/00
Network security protocols	H04L 63/00
Protocols for real-time services in data packet switching networks	H04L 65/00
Network protocols for data switching network services	H04L 67/00
Casings, cabinets, racks, chassis, drawers for data centers	H05K 5/00

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Special rules of classification

When a document qualifies for one of the groups below, none of the groups above should be assigned:

Computing Infrastructure, e.g. cluster racks: G06F 15/161

Inter-processor communication: G06F 15/163

Using a common memory e.g. mailbox, dual port memory, UMA, NUMA architectures: G06F 15/167

Using an interconnection network e.g. message passing architectures: G06F 15/173

Direct connection machines e.g. point to point topologies, buses, (partial) crossbars: G06F 15/17337

Being dynamically configurable e.g. loosely coupled nearest neighbour architecture: G06F 15/17343

Indirect interconnection networks (one or several nodes are traversed before reaching destination): G06F 15/17356

Hierarchical e.g. trees, pyramids : G06F 15/17362

Non-hierarchical: G06F 15/17368

On one dimension e.g. linear arrays,rings: G06F 15/17375

On two dimensions e.g. mesh, torus:G06F 15/17381

Topologies not covered by groups G06F 15/17375 or G06F 15/17381: G06F 15/17387

Intercommunication techniques specific to parallel machines: G06F 15/17306

Routing: G06F 15/17312

Collective communications e.g. gather/scatter, broadcast, multicast, all to all: G06F 15/17318

Synchronization, hardware support therefore: G06F 15/17325

Distributed shared memory, hardware support therefore e.g. RDMA: G06F 15/17331

Details on network interfaces: G06F 15/1735

Initialisation or configuration control: G06F 15/177

G06F 15/163

Interprocessor communication

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interconnection of, or transfer of information or other signals between, memories, input/output devices or central processing units	G06F 13/00

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G06F 15/1735

{Network adapters, e.g. SCI, Myrinet (protocol engines H04L 69/12)}

References

Limiting references

This place does not cover:

Protocol engines	H04L 69/12

G06F 15/76

Architectures of general purpose stored program computers (with program plugboard G06F 15/08; multicomputers G06F 15/16)

Definition statement

This place covers:

System on Board, System on Chip, Reconfigurable Architectures, Data-Parallel Architectures (Vector Architectures, SIMD, Systolic Arrays), Dataflow Architectures, Demand Driven Architectures.

Relationships with other classification places

Documents classified in this subgroup can also be related to general purpose image data processing (G06T).

References

Limiting references

This place does not cover:

Digital computers with program plugboard	G06F 15/08
Multicomputers	G06F 15/16

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Processor architectures; Processor configuration forimage data processing	G06T 1/20

Special rules of classification

Comprising a single central processing unit: G06F 15/78

System on Board: computer system on one or more PCB e.g. motherboards, daughterboards, blades: G06F 15/7803

System on Chip: computer system on a single chip: G06F 15/7807

System in Package: computer system on a number of chips in a single package: G06F 15/7807

On-chip cache, off-chip memory: G06F 15/781

Specially adapted for real time processing e.g. comprising hardware timers :G06F 15/7814

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Specially adapted for signal processing e.g. Harvard Architectures: G06F 15/7817

Tightly coupled to memory e.g. computational memory, smart memory, processor in memory: G06F 15/7821

Globally asynchronous , locally synchronous e.g. Network on Chip: G06F 15/7825

Reconfigurable architectures: G06F 15/7867

Reconfiguration support e.g. configuration loading, configuration switching (hardware OS): G06F 15/7871

Self reconfiguration:G06F 15/7882

Multiple Contexts: G06F 15/7875

Pipeline reconfiguration: G06F 15/7878

Runtime Interface e.g. data exchange, runtime control: G06F 15/7885

Embedded in CPU as a functional unit:G06F 15/7892

As a coprocessor. G06F 15/7889

Modular architectures e.g. assembled from a number of identical packages: G06F 15/7896

Comprising an array of processing units with common control, e.g. single instruction multiple data processors: G06F 15/80

SIMD multiprocessors: G06F 15/8007

One dimensional arrays e.g. rings, linear arrays, buses:G06F 15/8015

Two dimensional arrays. i.e. mesh, torus:G06F 15/8023

Other topologies.e.g. hypercubes: G06F 15/803

Associative processors: G06F 15/8038

Systolic arrays: G06F 15/8046

Vector Processors: G06F 15/8053

Details on exchanging data with memory:G06F 15/8061

Using a cache:G06F 15/8069

Details on exchanging data with registers: G06F 15/8076

Special arrangements thereof.e.g. mask, switch: G06F 15/8084

Array of vector units:G06F 15/8092

Data or demand driven: G06F 15/82

Dataflow computers: G06F 15/825

Here are specified the places which could be assigned in addition to the places above to cover further technical details:

Indexing Code G06F 3/0604 finite state machines: controlled by or implementing FSM

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G06F 16/00

Information retrieval; Database structures therefor; File system structures therefor

Definition statement

This place covers:

- Systems and methods for retrieving digital information stored in databases, data repositories or file systems, locally or remotely.
- Details of the organisation and preparation of information for use during the retrieving of digital information, e.g. generation of indexing information or query formulation.
- Details of data structures used for information retrieval, such as trees, lists or hashing.
- Details of query processing and the presentation of query results, e.g. in textual or graphical form on graphical user interfaces [GUIs].
- Details of browsing digital information.
- Details of architectures of databases, data repositories or file systems, e.g. physical, logical, virtual, central or distributed architectures.
- Details of managing data stored in databases, data repositories or file systems, e.g. tuning, replication, archiving, synchronisation, concurrency control and interfaces therefor such as GUIs.
- Details of optimising the storage and retrieval of digital information, e.g. de-duplication of stored data, application-specific caching and pre-fetching in file systems, (distributed) databases or web browsers.
- Systems and methods for retrieving data from structured databases and for their management. Examples of such structured databases are relational, object-oriented, multidimensional, spatial, temporal and geographical databases.
- Systems and methods for retrieving semi-structured data, e.g. XML formatted data or comma separated values.
- Systems and methods for retrieving text, audio, image, video or multimedia data from databases or for managing document libraries.
- Systems and methods for information retrieval from and browsing in the World Wide Web.

Relationships with other classification places

- Content-based information retrieval in databases storing media data, e.g. audio, image or video data, involves the comparison of a search query with a corresponding representation of the data. The generation of the search query and the representation of the data can involve the analysis of the data and the subsequent low-level and high-level feature extraction. G06F 16/00 covers aspects of the actual process of comparison, e.g. similarity matching. The analysis and feature extraction is covered by G06F 18/00, G06T 7/00, G10H and G10L, depending on the type of data.
- Distributed repositories involve the use of networks for data transmission. Specific protocols for information interchange, including on the application layer, are found generally under H04L.
- Physical data storage details generally are found in G06F 3/06, G11B or G06F 12/00.
- The mere use of databases in specific application fields (e.g. administrative or financial processing systems) is covered by the respective application field, e.g. G06Q.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Version control, e.g. searching in source database; configuration management, in particular source code databases	G06F 8/71
Error detection or correction of the data by redundancy in operations	G06F 11/14

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Pattern recognition	G06F 18/00
Access control or security in information retrieval systems and repositories; anonymising queries and database content	G06F 21/00
CAD database applications	G06F 30/00
Business, financial and administrative related applications	G06Q 10/00 - G06Q 90/00
Image analysis	G06T 7/00
Musical instruments; music analysis	G10H
Speech analysis	G10L
Biological and chemical applications	G16B 50/00, G16C 20/00
Medical applications	G16H
Code conversion and compression	H03M 7/00
Cryptographic mechanisms or cryptographic; arrangements for secret or secure communications; Network security protocols	H04L 9/00
Network architectures or network communication protocols for network security	H04L 63/00
Network arrangements, protocols or services for supporting real-time applications in data packet communication	H04L 65/00
Network protocols, addressing and routing	H04L 67/00
Network arrangements or protocols for supporting network services or applications	H04L 67/00
Telephone directories in telephonic communication systems	H04M
Digital picture intermediate information storage	H04N 1/21
TV guides, electronic programming guides, video distribution, interactive television, VOD (video on demand)	H04N 21/00

Special rules of classification

1. For documents dealing with how a given type of data is retrieved or how the database or repository for this particular type of data is organised, classification should generally take place in the indicated subgroup for the data type as follows:

- In multimedia databases - G06F 16/40
- Geographical information - G06F 16/29
- Still images - G06F 16/50
- Structured information, records - G06F 16/20
- Unstructured text - G06F 16/30
- Audio information (e.g. music, speech) - G06F 16/60
- Video information - G06F 16/70
- Semi-structured information (e.g. XML, CSV) - G06F 16/80

2. If, however, more than one particular data type is described in some detail, classification under each of the corresponding subgroups should be considered.

3. If no specific data type is indicated at all, or an explicit hint is given that the disclosed mechanism can be used for retrieval of arbitrary data types, e.g. a list of alternative data types, then for "generic" data type, use subgroups under G06F 16/90.

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4. In the case of annotated data/metadata-based retrieval, the type of data used for the retrieval is sometimes different from the data type to be finally retrieved (e.g. associated images are used to retrieve text documents).

In this case, the classification should be decided according to the level of disclosed details concerning each aspect:

- According to the data type retrieved if the use of that metadata of different type is only casually described, and
- According to the data type used for retrieval, e.g. type of the metadata if specific details of this use are disclosed.

In the cases where both aspects are well-covered, double classification can be warranted.

Note: Many problems with generic data types, such as under rule 3, arise for documents describing querying systems/methods using metadata wherein the data type of the data finally retrieved is arbitrary or does not really matter. Using the above approach, these documents simply can be classified under the data type used for the retrieval and in the metadata subgroup under the generic data type subgroup. A similar approach can be applied in case of browsing a data type using a different data type.

- For example: browsing a set of audio files by browsing through the titles of the files or through images representing the audio files is to be classified under "browsing of audio data". In case some interesting aspects also merit a classification under text, respectively image browsing, this should be covered by double classification. Again, classification under "browsing of generic data" has to be considered.

5. In this technical field, one does not distinguish between invention and additional information in the sense of the IPC Guide § 77-80. Thus, symbols are allocated only as "invention information" (INV) type, irrespective of the true nature of the information: invention or additional.

G06F 16/10

File systems; File servers

Definition statement

This place covers:

Details of file systems and file servers. In particular, this group covers all aspects of generating, accessing and managing files.

Relationships with other classification places

Relationship of G06F 16/10 with its subgroups:

- For a proper functioning of the file system, management services are used by file system administrators to ensure that the file system provides the expected services; see the definitions below for the subgroup G06F 16/10. A file is an abstract data container used in file systems to manage a set of data. The internal structure of a file normally is not known by the file system, i.e. the file is opaque from the viewpoint of the file system. The internal structure and size of a file is defined by the application generating and using the file but is independent of the underlying physical storage system used to store the file. Access of user or applications to a file is granted by a file system via its file system interface providing services to create, use and manage files. These user or application oriented services are implemented via file system functionality which is referred to in this group as basic file system functionality; see the definitions below for subgroups G06F 16/13, G06F 16/14 and G06F 16/16.

In addition to this basic file system functionality, many file systems provide further functionalities, e.g. to reduce the consumption of resources, to improve the response time or to adapt the file system to individual user needs; see the definitions below for the subgroup G06F 16/17. File systems are used in many different environments and for different purposes. As a consequence, different file system

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types have evolved having different capabilities adapted to the specific requirements of the individual use scenarios; see the definitions below for the subgroup G06F 16/17.

- Subgroups G06F 16/13, G06F 16/14 and G06F 16/16 cover user related aspects of file systems of basic file system functionality, namely file storage and access structures, file search and file and folder operations. These aspects may be found in all types of file systems.
- Subgroup G06F 16/17 covers aspects of further file system functionalities by extending the basic functionality of the file systems e.g. to personalise file systems, to reduce the response time or to minimise required resources such as storage space. These aspects may be found in many types of file systems.
- Subgroup G06F 16/18 covers additional aspects of specific types of file systems. These aspects may be found only in one or few types of file systems.

Relationship of G06F 16/10 with G06F 3/0601:

G06F 16/10 covers all aspects related to files where the internal structure and size of a file is independent of the underlying physical storage system used to store the file. This characteristic distinguishes this group from the technical field G06F 3/0601 which covers all aspects of storing and managing data in physical storage systems where the used storage containers, e.g. volumes, LUNs, blocks, sectors, etc., depend on the individual physical storage system. Thus, G06F 3/0601 covers the use of storage oriented or storage dependent data containers, whereas G06F 16/10 covers the use of application oriented and storage independent data containers. In other words, files and directories provide a logical storage organisation on top of a physical storage layout.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of block level storage systems	G06F 3/0604
Error detection or correction of the data by redundancy in operations	G06F 11/14
Addressing of a memory level in which the access to the desired data or data block requires associative addressing means, e.g. caches	G06F 12/0802
Protecting data against unauthorised access or modification	G06F 21/00

Special rules of classification

The classification system of G06F 16/10 is organised in two dimensions. Subgroups G06F 16/11 - G06F 16/17 define different functional aspects of a standard file system. These functional aspects define the first dimension. The subgroup G06F 16/18 defines additional aspects of different file system types. These file system types represent the second dimension. Double classification for functional aspects according to the first dimension and for additional aspects of different file system types according to the second dimension may be considered if a contribution in both dimensions is present.

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Data backup	A copy of data created by replicating persistent data from a given storage medium (not from a volatile memory) at a particular point in time for the purpose of potentially later recovering said data in the state it was at said particular point in time. The recovery can either occur through restoration of said replicated data onto a storage medium or memory or by using the memory/medium onto which the copy was created. A backup of data typically is used to at least partially correct or restore lost or corrupted data, although it is accepted that the restored state usually is not identical to the state when the data loss occurred, i.e. some data may be unrecoverable.
File	A file is an abstract data container used in file systems to manage a set of data. The internal structure of a file normally is not known by the file system, i.e. the file is opaque from the viewpoint of the file system. The internal structure and size of a file is defined by the application generating and using the file but is independent of the underlying physical storage system used to store the file.
File system	A file system (or filesystem) is a means to organise data expected to be retained after a program terminates by providing procedures to store, retrieve and update data.
Hierarchical Storage Management (HSM)	A particular case of data migration wherein the target medium is lower in a hierarchical storage system and is used for less frequently used data or for data that is no longer actively used. The target medium is suitable for longer-term storage, is slower and has lower cost per unit of data. In contrast to backup, HSM systems do not provide an additional instance of the data.
Data migration	Moving data from one memory or storage medium to another without effectively replicating it since ultimately only one copy persists. Examples: transferring data from a disk to another one having different reliability, performance or cost properties.
Data replication	The act of creating several instances of the same data of which at least two are available in the absence of errors and modifications of the original data. The different instances may be stored on different locations of a given storage medium or memory or they may be stored on physically distinct media or memories. The concept of replication is independent of the purpose for which it is used, e.g. replication may be used for potential restoration of data, for load balancing and performance improvement, for fault tolerance, or for increasing the availability of data, etc. Data replication can occur at different levels of abstraction, e.g. at database level, at file system level, at the level of disk/storage I/O operations or at the level of (main) memory pages or even individual memory write instructions.

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G06F 16/113

{Details of archiving (lifecycle management in storage systems G06F 3/0649; point-in-time backing up or restoration of persistent data G06F 11/1446)}

Definition statement

This place covers:

Long-term storage or digital preservation of historical data object versions whereas the fact that files are stored in an archive is generally known to the user in contrast to Hierarchical Storage Management (HSM) systems in which the actual storage location is NOT known to the user. Whenever a file has been stored in the archive, the original file in the file system will be deleted, normally to free storage space in the file system.

References

Limiting references

This place does not cover:

Lifecycle management in storage systems	G06F 3/0649
Point-in-time backing up or restoration of persistent data	G06F 11/1446

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hierarchical storage management (HSM) systems	G06F 16/185

G06F 16/116

{Details of conversion of file system types or formats}

Definition statement

This place covers:

- Conversion of a file system from a first to a second type or format.
- Upgrade from an older to a newer file system version or vice versa.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File system format conversion of restoring backed-up files	G06F 11/1448

G06F 16/119

{Details of migration of file systems (migration mechanisms in storage systems G06F 3/0647)}

Definition statement

This place covers:

Migration of complete file systems from a first to a second environment, e.g. for replacing old server systems.

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References

Limiting references

This place does not cover:

Migration mechanisms in storage systems, e.g. volume migration	G06F 3/0647

G06F 16/122

{using management policies (point-in-time backing up or restoration of persistent data G06F 11/1446; file migration policies for HSM systems G06F 16/185)}

Definition statement

This place covers:

- Policy-based management of file systems, e.g. in combination with archiving, allowing automatic management of file systems.
- Quota management.
- Allocation policies.

References

Limiting references

This place does not cover:

Point-in-time backing up or restoration of persistent data	G06F 11/1446
File migration policies for HSM systems	G06F 16/185

G06F 16/125

{characterised by the use of retention policies (retention policies for HSM systems G06F 16/185)}

Definition statement

This place covers:

Policy-based management of file systems characterised by the use of retention policies for managing the lifetime of files (lifecycle management of files).

References

Limiting references

This place does not cover:

Retention policies for HSM systems	G06F 16/185

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G06F 16/128

{Details of file system snapshots on the file-level, e.g. snapshot creation, administration, deletion (error detection or correction of the data by redundancy in operations or in hardware G06F 11/14, G06F 11/16)}

Definition statement

This place covers:

Management of snapshots of file systems, e.g. snapshot creation, deletion.

References

Limiting references

This place does not cover:

Error detection or correction of the data by redundancy in operations or in hardware	G06F 11/14, G06F 11/16

G06F 16/13

File access structures, e.g. distributed indices (arrangements of input from, or output to, record carriers G06F 3/06)

Definition statement

This place covers:

- File indexing methods used in file systems and their management, e.g. using directories, trees (e.g. Comprising inodes, vnodes) for indexing and organising files in the file system.
- File indexing methods used in distributed file systems, e.g. the use of a centralised or distributed index in a distributed file system.

References

Limiting references

This place does not cover:

Arrangements of input from, or output to, record carriers	G06F 3/06

G06F 16/134

{Distributed indices}

Definition statement

This place covers:

Use of distributed indices in file systems, e.g. Distributed Hash Tables (DHT).

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G06F 16/137

{Hash-based (content-based indexing of textual data G06F 16/31)}

Definition statement

This place covers:

Use of hashing or hash functions for indexing files in file systems wherein hashing values are calculated from the file content or file metadata, e.g. file name, file path, wherein the internal file structure or the data type of the file content is not relevant for the calculation of the hash-values.

References

Limiting references

This place does not cover:

Content-based indexing of textual data	G06F 16/31

G06F 16/14

Details of searching files based on file metadata

Definition statement

This place covers:

Techniques and architectures for searching files in a file system based on file metadata, e.g. such as file name, associated keywords, time and owner information, creation date, file signatures or dependencies between files.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Content-based searching of textual data	G06F 16/30
Content-based searching of multimedia data	G06F 16/40
Content-based searching of image data	G06F 16/50
Content-based searching of audio data	G06F 16/60
Content-based searching of video data	G06F 16/70
Content-based searching of HTML documents	G06F 16/95

G06F 16/144

{Query formulation}

Definition statement

This place covers:

Specific techniques for generating file search queries.

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G06F 16/148

{File search processing}

Definition statement

This place covers:

Techniques for processing search queries for files in a file system.

Special rules of classification

Specific techniques for processing search queries for files having specific contents, e.g. image files, audio files, video files, multimedia files, semi-structured files or text files.

Such specific file search processing methods must be classified in the file type specific groups.

G06F 16/152

{using file content signatures, e.g. hash values}

Definition statement

This place covers:

Techniques for searching files based on file content signatures such as hash values generated from the file content. The calculation of the file content signature does neither take into account internal structures of the file nor the data type of the file content.

Special rules of classification

Specific methods for searching files having specific contents or data types, e.g. image files, audio files, video files, multimedia files, semi-structured files or text files. Such specific file search methods must be classified in the file type specific groups.

G06F 16/156

{Query results presentation}

Definition statement

This place covers:

Specific methods for the presentation of file search/query results.

G06F 16/16

File or folder operations, e.g. details of user interfaces specifically adapted to file systems

Definition statement

This place covers:

- Details of operations performed on files and folders, in particular at the user level, e.g. file copy, file delete, (automatic) classification of files.
- Generation of file meta data, such as file names.
- Details of user-interfaces specifically adapted to file systems.

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G06F 16/162

{Delete operations (erasing in storage systems G06F 3/0652)}

Definition statement

This place covers:

Erase or delete operations on files and folders, e.g. secure or efficient erase/delete.

References

Limiting references

This place does not cover:

Erasing in storage systems	G06F 3/0652

G06F 16/164

{File meta data generation}

Definition statement

This place covers:

- Methods for generating metadata for files and folders.
- Methods for generating (content based) names of files and folders.

G06F 16/166

{File name conversion}

Definition statement

This place covers:

Methods for converting file and folder names, e.g. for adapting the file names to different OS.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File name conversion of backed up files	G06F 11/1448

G06F 16/168

{Details of user interfaces specifically adapted to file systems, e.g. browsing and visualisation, 2d or 3d GUIs (query results presentation G06F 16/156)}

Definition statement

This place covers:

Aspects of user-interfaces used for accessing or managing files and folders.

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References

Limiting references

This place does not cover:

Presentations of file search/query results	G06F 16/156

Informative references

Attention is drawn to the following places, which may be of interest for search:

Generic interaction techniques for graphical user interfaces	G06F 3/048

G06F 16/17

Details of further file system functions

Definition statement

This place covers:

General optimisations which apply to more than one file system type, e.g. customisation, caching, prefetching, redundancy elimination, support for shared file access, synchronisation, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Specific optimisations which apply only to exactly one file system type	G06F 16/18

G06F 16/172

Caching, prefetching or hoarding of files

Definition statement

This place covers:

- Details of using local or remote file caches, such as file caches in clients, servers or proxies.
- Details of using methods of prefetching or hoarding of remotely stored files, e.g. for supporting disconnected operations of mobile devices.
- File caching policies, e.g. selection of files to be cached.

Relationships with other classification places

G06F 16/172 covers the application of caching in file systems, namely all aspects of using caches for caching files in file systems whereas G06F 12/0866 covers all aspects and details of implementing caches in storage systems.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Caching for peripheral storage systems, e.g. disk cache; all aspects of caching, applied to file caching, which are not specific to files or file systems, e.g. details of cache management, caching architectures	G06F 12/0866

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Caching used in the WWW for retrieving HTML pages	G06F 16/9574
Network-specific arrangements or communication protocols for caching	H04L 67/568

G06F 16/1724

{Details of de-fragmentation performed by the file system (saving storage space on storage systems G06F 3/0608; management of blocks in storage devices G06F 3/064)}

Definition statement

This place covers:

Details of file system defragmentation techniques where file system knowledge is used to reduce the number of file fragments stored on the underlying storage system. These techniques typically are performed by the file system so that the underlying storage system is not aware that a defragmentation operation is executed.

Relationships with other classification places

Details of storage system defragmentation techniques performed by the underlying storage systems without using file system knowledge, particularly in management of blocks in storage devices, is classified in G06F 3/064. In this case, the defragmentation is performed by the storage system but not by a file system.

References

Limiting references

This place does not cover:

Saving storage space on storage systems	G06F 3/0608
Details of storage system defragmentation techniques performed by the underlying storage systems without using file system knowledge	G06F 3/064

G06F 16/1727

{Details of free space management performed by the file system (saving storage space on storage systems G06F 3/0608; management of blocks in storage devices G06F 3/064)}

Definition statement

This place covers:

Details of file system free space management where file system knowledge is used to manage the free space on the underlying storage system. These techniques typically are performed by the file system so that the underlying storage system is not aware that free space management is performed.

Relationships with other classification places

Details of storage system free space management performed by the underlying storage systems without using file system knowledge, particularly in management of blocks in storage devices, is classified in G06F 3/064. In this case, the free space management is performed by the storage system but not by a file system.

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References

Limiting references

This place does not cover:

Saving storage space on storage systems	G06F 3/0608
Details of storage system free space management performed by the underlying storage systems without using file system knowledge	G06F 3/064

G06F 16/173

{Customisation support for file systems, e.g. localisation, multi-language support, personalisation}

Definition statement

This place covers:

- Means and methods for the customisation of file systems.
- Support for localisation (multi-language support).
- Personalisation of the file system to users of the file system.

G06F 16/1734

{Details of monitoring file system events, e.g. by the use of hooks, filter drivers, logs}

Definition statement

This place covers:

- Monitoring events, such as changes or updates to files or file metadata and file system metadata.
- Logging changes or updates to files or file metadata and file system metadata.

Special rules of classification

If the techniques of monitoring file system events are used in a specific application domain, e.g. for synchronisation, indexing, backup, etc., classification in the specific application domain must also be considered.

G06F 16/1737

{for reducing power consumption or coping with limited storage space, e.g. in mobile devices (saving storage space on storage devices G06F 3/0608; power saving in storage systems G06F 3/0625)}

Definition statement

This place covers:

- Specific adaptations of the file system to reduce the power consumption, e.g. in mobile devices.
- Specific adaptations of the file system for copying with limited storage space, e.g. by deleting (policy-based) selected files.

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References

Limiting references

This place does not cover:

Saving storage space on storage devices	G06F 3/0608
Power saving in storage systems	G06F 3/0625

G06F 16/174

Redundancy elimination performed by the file system (error detection or correction of the data by redundancy in operations G06F 11/14)

Definition statement

This place covers:

Techniques for eliminating redundancies in file systems, e.g. by copy on write, sparse files or deduplication.

References

Limiting references

This place does not cover:

Error detection or correction of the data by redundancy in operations	G06F 11/14

G06F 16/1744

{using compression, e.g. sparse files}

Definition statement

This place covers:

Elimination of redundancies in file systems by using compression methods, e.g. sparse files.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of compression	H03M 7/30
Protocols for data compression	H04L 69/04

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G06F 16/1748

{De-duplication implemented within the file system, e.g. based on file segments (de-duplication techniques in storage systems for the management of data blocks G06F 3/0641)}

Definition statement

This place covers:

Elimination of redundancies in file systems by deduplication based on segments of a file when the structure of the file is known. The individual segments of the file may have different lengths.

References

Limiting references

This place does not cover:

Deduplication techniques in storage systems for the management of data blocks	G06F 3/0641

G06F 16/1752

{based on file chunks}

Definition statement

This place covers:

Redundancies in file systems that are eliminated by deduplication based on typically equally sized chunks of a file when the structure of the file is unknown.

G06F 16/1756

{based on delta files}

Definition statement

This place covers:

Redundancies in file systems that are eliminated by using delta-files, e.g. for storing multiple versions of files whereas only the modifications between subsequent versions of a file are stored in the delta-file.

G06F 16/176

Support for shared access to files; File sharing support

Definition statement

This place covers:

Techniques for supporting shared access to files, i.e. more than one application is allowed to access the same file.

G06F 16/1767

{Concurrency control, e.g. optimistic or pessimistic approaches}

Definition statement

This place covers:

File systems providing support for concurrency control to serialise access to files (pessimistic methods like locking) or provide for conflict resolution methods to resolve file system states where conflicting writes to a file have taken place (optimistic methods).

G06F 16/1774

{Locking methods, e.g. locking methods for file systems allowing shared and concurrent access to files}

Definition statement

This place covers:

Locking methods for file systems allowing shared and concurrent access to files.

G06F 16/178

Techniques for file synchronisation in file systems

Definition statement

This place covers:

- Details of synchronisation in file systems, e.g. synchronisation architectures, conflict resolution, administration of synchronisation by using synchronisation policies.
- Techniques for transparent or automatic synchronisation of files in file systems whereas no user interaction is necessary to perform the synchronisation, e.g. transparently keeping replicated file copies consistent with each other, e.g. by propagation of changes to all file replicas.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File management policies in general	G06F 16/122
Change detection in file systems	G06F 16/1734
Distributed file systems	G06F 16/182
Synchronisation of structured data	G06F 16/27
Protocols for data synchronisation between network nodes	H04L 67/1095

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Synchronisation	Synchronisation is a service provided by file systems to synchronise two or more independent file systems or to synchronise replicas in a distributed file system.

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G06F 16/1787

{Details of non-transparently synchronising file systems}

Definition statement

This place covers:

The non-transparent synchronisation of files in file systems whereas user interactions are necessary to perform the synchronisation, e.g. user-based file selection, conflict resolution with user support.

G06F 16/1794

{Details of file format conversion}

Definition statement

This place covers:

Details of file format conversion during synchronisation, e.g. synchronisation between heterogeneous file systems.

G06F 16/18

File system types

Definition statement

This place covers:

Details of specific file system types that are specific to the individual file system types, e.g. details of file systems allowing only read-only access to files.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Generic aspects of file systems	G06F 16/13, G06F 16/14, G06F 16/16, G06F 16/17

G06F 16/1805

{Append-only file systems, e.g. using logs or journals to store data}

Definition statement

This place covers:

- File systems where data is only appended to existing data
- Append-only file systems using logs to store data

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G06F 16/181

{providing write once read many [WORM] semantics}

Definition statement

This place covers:

File system of type WORM (Write Once Read Many), e.g. by using WORM hardware, by using standard hard disk extended by additional functionality implementing the WORM semantic.

G06F 16/1815

{Journaling file systems}

Definition statement

This place covers:

File systems using journals to store files and file metadata.

G06F 16/182

Distributed file systems

Definition statement

This place covers:

Aspects of distributed file systems, e.g. architectures, specific management aspects.

G06F 16/1824

{implemented using Network-attached Storage [NAS] architecture (distributed or networked storage systems G06F 3/067; protocols for distributed storage of data in a network H04L 67/1097)}

Definition statement

This place covers:

Systems and methods for storing files in a Network-Attached Storage system (NAS) which provides data access on the file level. The roles of the clients and the file server(s) are distributed over the network.

References

Limiting references

This place does not cover:

Distributed or networked storage systems which provides data access on the block level	G06F 3/067
Protocols for distributed storage of data in a network	H04L 67/1097

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

NAS	network attached storage
SAN	storage area networks

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G06F 16/1827

{Management specifically adapted to NAS (management of storage area networks [SAN] G06F 3/067)}

Definition statement

This place covers:

Details of management of NAS, e.g. data placement policies of file or file fragments.

References

Limiting references

This place does not cover:

Management of SAN	G06F 3/067

G06F 16/183

{Provision of network file services by network file servers, e.g. by using NFS, CIFS (network file access protocols H04L 67/1097)}

Definition statement

This place covers:

Details of providing network file services by Network-Attached Storage (NAS) file servers accessed over a network using file access protocols, e.g. by using Network File System (NFS) or Common Internet File System (CIFS) to access files.

References

Limiting references

This place does not cover:

Network file access protocols	H04L 67/1097

G06F 16/1834

{implemented based on peer-to-peer networks, e.g. gnutella (p2p communication protocols H04L 67/104)}

Definition statement

This place covers:

File systems storing files in peer-to-peer like storage networks.

References

Limiting references

This place does not cover:

P2P communication protocols	H04L 67/104

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

File system peer	A file system peer implements both the file server and the client role. Thus, a peer may request in its client role a file from another peer. Additionally, the same peer may provide files in its file server role to other peers. Thus, both the client and the server role are distributed over the network.

G06F 16/1837

{Management specially adapted to peer-to-peer storage networks (topology management mechanisms of peer-to-peer networks H04L 67/1042)}

Definition statement

This place covers:

Details of file management specifically adapted to peer-to-peer like storage networks, e.g. data placement of file or file fragments.

References

Limiting references

This place does not cover:

Topology management mechanisms of peer-to-peer networks	H04L 67/1042

G06F 16/184

{implemented as replicated file system}

Definition statement

This place covers:

Details of file systems replicating files on more than one storage place, e.g. a single file or even a complete file system is replicated.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protocols for supporting replication or mirroring of data between network nodes	H04L 67/1095

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Replicated file	A replicated file is a copy of an original file and stored in a different storage place as the original file. The replicated file is kept consistent, i.e. synchronised, with the original file.
File replication	File replication is a service provided by the replicated file system whereas the fact that files are replicated is transparent to the users, such as applications, of the replicated file system.

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G06F 16/1844

{Management specifically adapted to replicated file systems}

Definition statement

This place covers:

Details of management of replicated file systems, e.g. data placement policies of file replicas.

G06F 16/1847

{specifically adapted to static storage, e.g. adapted to flash memory or SSD}

Definition statement

This place covers:

File systems specifically adapted to or used in flash memory, SSDs, etc. File system data structures or corresponding methods are adapted by taking constraints of the static storage into account.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dedicated interfaces to non-volatile semiconductor memory device	G06F 3/0679
Dedicated interfaces to non-volatile semiconductor memory arrays	G06F 3/0688

G06F 16/185

Hierarchical storage management [HSM] systems, e.g. file migration or policies thereof (details of archiving G06F 16/11)

Definition statement

This place covers:

Hierarchical storage management (HSM) used in file systems, e.g. lifecycle management, whereas the fact that files are stored on different levels of the HSM system is generally NOT known to the user in contrast to archive systems in which the actual storage location is known to the user. Further, in contrast to backup system only one copy of data objects exists. Whenever a file has been migrated from one level to another level of the HSM system the file copy stored in the previous level of the HSM will be deleted, normally to free storage space in the HSM system.

References

Limiting references

This place does not cover:

Archive systems	G06F 16/113

Informative references

Attention is drawn to the following places, which may be of interest for search:

Life cycle management in storage devices	G06F 3/0649
Hybrid storage combining heterogeneous device types	G06F 3/0685

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Point-in-time backing up or restoration of persistent data	G06F 11/1446

G06F 16/1858

{Parallel file systems, i.e. file systems supporting multiple processors}

Definition statement

This place covers:

Details of parallel file systems, e.g. General Parallel File Systems (GPFS).

G06F 16/1865

{Transactional file systems}

Definition statement

This place covers:

File systems supporting transactional operations, e.g. commit processing, logging and recovery of file transactions, on file system objects (e.g. files, directories, etc.).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Commit processing in structured data stores	G06F 16/2379

G06F 16/1873

{Versioning file systems, temporal file systems, e.g. file system supporting different historic versions of files}

Definition statement

This place covers:

File system supporting different (historic) versions of e.g. files, directories, etc.

G06F 16/188

Virtual file systems

Definition statement

This place covers:

Virtual file systems where at least one file system component is virtualised, e.g. transparent access to compressed archives via a virtual file system e.g. DoubleSpace. Another example are virtual file systems implemented by database systems. Thus, file system requests are transparently translated into database queries.

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G06F 16/192

{Implementing virtual folder structures}

Definition statement

This place covers:

Virtual file systems with virtual folders or a virtual folder structure.

G06F 16/196

{Specific adaptations of the file system to access devices and non-file objects via standard file system access operations, e.g. pseudo file systems (dedicated interfaces to storage systems G06F 3/0601)}

Definition statement

This place covers:

Details of the file system for accessing devices and non-file objects, e.g. accessing CPU state information, using the standard file system access operations provided by a file system-like interface, e.g. the procfs, sysfs, usbfs, devpts or BSDs kernfs. From an application point of view the devices and non-file objects are accessed as virtual files.

References

Limiting references

This place does not cover:

Dedicated interfaces to storage systems	G06F 3/0601

G06F 16/20

of structured data, e.g. relational data

Definition statement

This place covers:

- Structured data stores comprising all sorts of database management systems based on a particular structured data model such as hierarchical, network (CODASYL), relational, object-relational, object oriented, deductive, and semantic, entity based systems.
- Structured data, in general, means that the data has a certain predetermined structure which is typically the same for a set of managed / stored objects, for example, a set of data records which conform to a certain schema, i.e. the records have a particular number of fields of a certain data type. A schema need not be described explicitly in a document.
- A database system can be implemented on top of a file system, i.e. the records might be simply stored in files. Another indication for structured data could be a sophisticated declarative query / data manipulation language. This criterion should be used when no information about the data type or the storage technology used is available.
- Particular applications of structured data are multidimensional databases that generally are based on specific relational data models.

Relationships with other classification places

Unstructured data being binary data types such as image or audio data, which have merely a bit string structure (binary objects, files) or text documents including documents with mark-up such as HTML.

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Unstructured data is classified according to the respective data type (audio, image, video, multimedia, web, file systems). For semi-structured data, in particular XML, see G06F 16/80.

G06F 16/21

Design, administration or maintenance of databases

Definition statement

This place covers:

Aspects of defining and managing database models and systems at the logical or external levels, above the physical storage. The group is concerned only with aspects of managing a single database system. Details of tools, functions or services used to support a database administrator including data maintenance activities to support front-end applications.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Database storage and indexing details	G06F 16/22
Data updating	G06F 16/23
Data querying (retrieval)	G06F 16/24

G06F 16/211

{Schema design and management}

Definition statement

This place covers:

- Systems which support the creation and maintenance of data dictionaries in database systems.
- Details for mappings between schemas, where the mapping solution is independent of the application.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Uses of mappings between schemas in the relevant application group, e.g. object relational mappers and translation layers in client/server interfaces	G06F 16/252
Abstract models in federated databases systems	G06F 16/256
Replication and update of data dictionaries in distributed database systems	G06F 16/27

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G06F 16/212

{with details for data modelling support}

Definition statement

This place covers:

Support for users to interactively model data dictionaries or conversions from other data models into the data model supported by the DBMS.

G06F 16/213

{with details for schema evolution support}

Definition statement

This place covers:

Facilities that allow the data dictionary of a database to be changed and support the continued operation of the database applications or of other interfacing systems.

G06F 16/214

{Database migration support}

Definition statement

This place covers:

Facilities to allow a database to be migrated between two different DBMS or between different versions of the same DBMS.

G06F 16/215

Improving data quality; Data cleansing, e.g. de-duplication, removing invalid entries or correcting typographical errors

Definition statement

This place covers:

Facilities that promote improvements to the quality of existing data of a database.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Support for consistency and integrity of data during update operations	G06F 16/2365

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G06F 16/217

{Database tuning (G06F 16/2282 takes precedence; database performance monitoring G06F 11/3409)}

Definition statement

This place covers:

Facilities to support the administration of the database operation, i.e. database tuning, not covered by specific storage tuning G06F 16/2282.

References

Limiting references

This place does not cover:

Database performance monitoring	G06F 11/3409
Storage tuning including database reorganisation	G06F 16/2282

G06F 16/219

{Managing data history or versioning (querying versioned data G06F 16/2474; querying temporal data G06F 16/2477)}

Definition statement

This place covers:

Support in a database system to keep the history of changes of records.

References

Limiting references

This place does not cover:

Querying versioned data	G06F 16/2474
Querying temporal data	G06F 16/2477

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multi-version concurrency control	G06F 16/2336

G06F 16/22

Indexing; Data structures therefor; Storage structures

Definition statement

This place covers:

How structured data is stored and maintained at the physical level including indexing in structured data.

An index of a structured database is updated periodically.

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G06F 16/221

{Column-oriented storage; Management thereof}

Definition statement

This place covers:

Details to support databases with storage oriented by columns.

G06F 16/2219

{Large Object storage; Management thereof}

Definition statement

This place covers:

Details of storing and interfacing with Large Objects in databases, e.g. Binary Large OBjects (BLOBs).

G06F 16/2228

{Indexing structures}

Definition statement

This place covers:

Creation and/or assembly of index structures.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Indexing structures for textual data	G06F 16/316

G06F 16/2237

{Vectors, bitmaps or matrices}

Definition statement

This place covers:

Bitmap indices and other array oriented indexing structures.

G06F 16/2246

{Trees, e.g. B+trees}

Definition statement

This place covers:

- Hierarchical indexes and functions therefor, e.g. merging of new data entries into the hierarchical index

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G06F 16/2255

{Hash tables}

Definition statement

This place covers:

Details of hash table implementations used for indexing in structured databases.

G06F 16/2264

{Multidimensional index structures}

Definition statement

This place covers:

Any kind of multidimensional indexes for database systems belong in this group. Double classification with the further groups in G06F 16/2228 should be done when needed.

Dimensionality reduction is used for index generation of a multidimensional database.

G06F 16/2272

{Management thereof}

Definition statement

This place covers:

Automatic or manual management of an already existing index comprising only the organisation but not the modification or updating of index entries. This means that normal adjustments of the index as a consequence of an update operation in a database (insert, delete, update) are not classified here, but reorganisations of the index (e.g. as consequence of degradation due to many updates in the database) are classified here.

Facets: The amount of clustering of an index in a relational database is analysed in order to optimise the index.

G06F 16/2282

{Tablespace storage structures; Management thereof}

Definition statement

This place covers:

Aspects of storing and managing tablespace structures in secondary memory, including partitioning of tables over multiple storage areas, e.g., disks, and reorganisation of databases.

G06F 16/2291

{User-Defined Types; Storage management thereof}

Definition statement

This place covers:

Support for user defined types or abstract data types.

G06F 16/23

Updating

Definition statement

This place covers:

Updating a database based on update requests to modify database records; the update requests are made by users or front-end applications.

G06F 16/2308

{Concurrency control (transaction processing G06F 9/466)}

References

Limiting references

This place does not cover:

Transaction processing	G06F 9/466

Informative references

Attention is drawn to the following places, which may be of interest for search:

Concurrency control in file systems	G06F 16/1767

G06F 16/2315

{Optimistic concurrency control}

Definition statement

This place covers:

Optimistic approaches for concurrency control, i.e. conflicting accesses are not prevented but resolved later.

G06F 16/2322

{using timestamps}

Definition statement

This place covers:

Timestamp based concurrency schemes.

G06F 16/2329

{using versioning}

Definition statement

This place covers:

Version based concurrency schemes.

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G06F 16/2336

{Pessimistic concurrency control approaches, e.g. locking or multiple versions without time stamps}

Definition statement

This place covers:

Pessimistic approaches (avoiding conflicts) for concurrency control, e.g. locking, multiple versions without time stamps, others.

G06F 16/2343

{Locking methods, e.g. distributed locking or locking implementation details}

Definition statement

This place covers:

Locking methods for concurrency control, e.g. multi-granularity/hierarchical/range locking, lock escalation, pre-claiming of locks/consistency levels/predicate locks, distributed locking, locking implementation details, e.g. locking table.

G06F 16/235

{Update request formulation}

Definition statement

This place covers:

Facilitating the definition of requests for updating data.

G06F 16/2358

{Change logging, detection, and notification (replication G06F 16/27)}

Definition statement

This place covers:

Details of implementing logging of database update operations; detecting changes for the purpose of notifying users or other systems.

References

Limiting references

This place does not cover:

Use of logging for replication or synchronisation	G06F 16/27

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G06F 16/2365

{Ensuring data consistency and integrity}

Definition statement

This place covers:

Ensuring database consistency and other ACID (Atomicity, Consistency, Isolation, Durability) properties. Use of triggers and stored procedures to support update operations and related impact in the database.

G06F 16/2372

{Updates performed during offline database operations}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Online updates	G06F 16/2379

G06F 16/2379

{Updates performed during online database operations; commit processing}

Definition statement

This place covers:

Handling record operations for inserts, edit, deletion, and undo. The operations occur on an individual basis, on batches or in the context of transaction processing.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Aspects of transaction processing regarding CPU programming	G06F 9/466

G06F 16/2386

{Bulk updating operations (data conversion details G06F 16/258)}

Definition statement

This place covers:

Handling bulk updates during operation of the database, e.g. to minimise impact on the performance for users.

References

Limiting references

This place does not cover:

Data conversion details	G06F 16/258

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G06F 16/2393

{Updating materialised views}

Definition statement

This place covers:

Aspects of ensuring that materialised views, or persistent queries, are kept up to date during update operations.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Query processing	G06F 16/245
Use of materialised views for optimisation	G06F 16/24539

G06F 16/24

Querying

Definition statement

This place covers:

Processing retrieval requests, i.e. finding records matching a query.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Using cached query results	G06F 16/24539
Caching (including caching in Client/Server database systems): for database cache management	G06F 16/24552
Plan operators for distributed queries such as join-algorithms adapted to distributed query processing	G06F 16/24553
Processing of distributed queries	G06F 16/2471

G06F 16/242

Query formulation

Definition statement

This place covers:

- All aspects of query formulation; textual, graphical, explicit or implicit formulation of database queries.
- User interfaces therefor (including help systems therefor).

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction techniques for graphical user interfaces	G06F 3/048
Conversion of a query to an internal format	G06F 16/2452

G06F 16/2423

{Interactive query statement specification based on a database schema}

Definition statement

This place covers:

- Query wizards such as in MS access for constructing queries.
- Query construction based on database schema or entity relationship diagram of database.

Note: Often the user can see the query statement, which allows the user to learn the syntax of the query language.

- ntelligent help systems for the formulation of queries.

Further examples:

- A query assistant that permits the user to enter valid SQL queries; use of dialog boxes.
- Context sensitive help system for formulation of SQL queries; e.g. lists table names.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interfaces for the formulation of natural language queries	G06F 16/243

G06F 16/2425

{Iterative querying; Query formulation based on the results of a preceding query}

Definition statement

This place covers:

- All iterative approaches to querying; typically the user interacts with a display of the results of a preceding query in order to (re)formulate a new query; for example more restrictive query predicates might be formulated to narrow the focus of the query.
- Feedback on cardinality of qualifying result set.

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G06F 16/2428

{Query predicate definition using graphical user interfaces, including menus and forms (G06F 16/2423 takes precedence)}

Definition statement

This place covers:

- Graphical user interfaces (typically displaying charts, plots, images, maps, multi-media documents, or cubes etc.) for specifying query predicates for attribute values.
- (Hierarchical) menus and forms used for specifying query predicates for attributes.
- Menu entries that typically are generated by querying database catalog or tables; also use of menus to select predefined queries.
- Query-by-example languages where the user fills example values into a tabular scheme.

References

Limiting references

This place does not cover:

Graphical user interface is based on a visual database schema	G06F 16/2423

Informative references

Attention is drawn to the following places, which may be of interest for search:

Iterative querying	G06F 16/2425

G06F 16/243

{Natural language query formulation}

Definition statement

This place covers:

Queries formulated in natural language for querying structured data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Natural language analysis, translation, semantics	G06F 40/20, G06F 40/40

G06F 16/2433

{Query languages}

Definition statement

This place covers:

Details of query languages, e.g. SQL features.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Optimisation aspects	G06F 16/2453
Implementation aspects concerning the execution of the queries	G06F 16/2455

G06F 16/2435

{Active constructs}

Definition statement

This place covers:

Active constructs, e.g. constraints; triggers; Event-condition-action rules.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Implementation aspects	G06F 16/24565

G06F 16/2438

{Embedded query languages}

Definition statement

This place covers:

Embedded query languages, e.g. embedded SQL; data communication structures for cursors, etc.

G06F 16/244

{Grouping and aggregation}

Definition statement

This place covers:

Grouping and aggregation, e.g. GROUP-BY (and Having), SUM, MIN, STDDEV, Percentiles etc.

Examples:

Data Cube: A Relational Aggregation Operator Generalizing Group-By, Cross-Tab, and Sub Totals.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Implementation aspects	G06F 16/24556

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G06F 16/2443

{Stored procedures}

Definition statement

This place covers:

Definition, processing and use of stored procedures.

G06F 16/2445

{Data retrieval commands; View definitions}

Definition statement

This place covers:

Data retrieval commands and view definitions, e.g. in SQL, the command SELECT (including all features of select statements, unless there are particular classes for them) and VIEWs including view definitions.

G06F 16/2448

{for particular applications; for extensibility, e.g. user defined types}

Definition statement

This place covers:

Query languages designed to support particular applications; commands for extensible query languages for adding user-defined/foreign functions etc.

G06F 16/245

Query processing

Definition statement

This place covers:

Query processing comprises all processing steps that need to be done in order to process a received formulated query: parsing, translation, execution and delivery of the results (or an execution error).

G06F 16/2452

Query translation

Relationships with other classification places

For Translating queries between clients (applications) and servers (data sources) see G06F 16/23 and G06F 16/27; for parsing see G06F 8/427.

G06F 16/24522

{Translation of natural language queries to structured queries}

Definition statement

This place covers:

- Translation of the expression in user natural language, e.g. spoken language, of the information to be retrieved, into database queries, e.g. the mapping from natural language (e.g. English) to SQL;

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- Question/answering systems;

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Natural language analysis, translation, and semantics	G06F 40/20, G06F 40/40

G06F 16/24524

{Access plan code generation and invalidation; Reuse of access plans}

Definition statement

This place covers:

- Generation of code for given access plan;
- Invalidation of access plans when database objects / indexes etc. are dropped.

G06F 16/24526

{Internal representations for queries}

Definition statement

This place covers:

Translations into an internal format such as query graph models, algebra, parse trees.

G06F 16/24528

{Standardisation; Simplification}

Definition statement

This place covers:

Standardisation (conjunctive/disjunctive normal form) and Simplification (general logical transformations like De Morgan etc.).

Note: The standardisation and simplification steps also could be viewed first as simple query optimisation steps, but they have been put under query translation because these steps are often independent of the actual optimiser used; the technical aim is to provide a standardised input format for the query optimiser.

G06F 16/2453

Query optimisation

Definition statement

This place covers:

- Rewriting and plan optimisation
- Optimization of application programs by modifying code etc.

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G06F 16/24532

{of parallel queries}

Definition statement

This place covers:

Optimisation of queries for parallel database systems with respect to best use of parallel execution possibilities;

Special rules of classification

Double classification could be necessary; for example, when the join order is optimised to enable bushy trees for parallel join processing and additional classification in G06F 16/24544 is needed.

G06F 16/24534

{Query rewriting; Transformation}

Definition statement

This place covers:

- Transformations of the internal representation of the query: transformations (by means of rewriting rules) between different internal representations on a logical level (e.g. query graph model) and transformations from a logical representation to a physical representation having physical plan operators (i.e. hash join or index-nested-loops-join).
- Transforming a (rewritten) logical internal representation into a physical execution plan with concrete plan operators; typically involves selection of plan operators and their execution order based on estimated execution costs.
- Manual rewriting of query statement; includes also logical tests such as for deciding query containment (for query folding etc.); rewriting one query into several queries.

G06F 16/24535

{of sub-queries or views}

Definition statement

This place covers:

View integration and subquery decorrelation.

G06F 16/24537

{of operators}

Definition statement

This place covers:

Rules for restrictions, joins, group-bys, aggregations, sorting, etc.

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G06F 16/24539

{using cached or materialised query results}

Definition statement

This place covers:

Query folding where a query is mapped to existing results including partial mapping; special case: reuse of cached results of a particular query.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Maintenance of materialised views (updating, replication)	G06F 16/2393
Database cache management in general	G06F 16/24552

G06F 16/2454

{Optimisation of common expressions}

Definition statement

This place covers:

Common subtree recognition and optimisation, also for multi-query optimisation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Query folding (mapping a query to cached results or materialised views)	G06F 16/24539

G06F 16/24542

{Plan optimisation}

Definition statement

This place covers:

- Enumeration algorithms for plan generation and search strategy;
- Selectivity and cost estimation including learning based techniques for these estimations.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Selectivity estimation or determination for joins	G06F 16/24545
Sampling/generation of statistics	G06F 16/2462

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G06F 16/24544

{Join order optimisation}

Definition statement

This place covers:

Join enumeration algorithms for determining the join order, e.g. left deep plans vs. bushy plans etc.

G06F 16/24545

{Selectivity estimation or determination}

Definition statement

This place covers:

- Estimation of the selectivity of query predicates: e.g. estimating the selectivity of the predicate "AGE=40" on a table means estimating which percentage of the records in this table has the value 40 in attribute AGE.
- Other aspects of query cost estimation.

G06F 16/24547

{Optimisations to support specific applications; Extensibility of optimisers}

Definition statement

This place covers:

- Extensibility;
- Particular query types, etc. optimiser hints;
- Query modifications to implement security control (e.g. by adding predicates to a query according to a security policy in order to mask data).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Security, Access control	G06F 21/00

G06F 16/24549

{Run-time optimisation}

Definition statement

This place covers:

- Query optimisation at run time of the query.
- Using execution time statistics for re-optimisation.
- Progress estimation during query execution.

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G06F 16/2455

Query execution

Definition statement

This place covers:

- Actual execution of a single query with a given query execution plan;
- Execution of multiple queries;
- Database hardware, e.g. parallel database machines.

G06F 16/24552

{Database cache management}

Definition statement

This place covers:

- Cache management at the database server itself, at the client/workstation or at the application server.
- Cache management strategies such as cache granularity management.
- Semantic cache management.
- Determining what data to cache.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Query optimisation exploiting the cache	G06F 16/24539

G06F 16/24553

{of query operations}

Definition statement

This place covers:

- Physical operators used to execute operators in a query execution plan; includes particular execution strategies such as returning only the top N rows or delayed delivery of full query results.
- Non-standard query processing operations.

G06F 16/24554

{Unary operations; Data partitioning operations}

Definition statement

This place covers:

- Algorithms for unary operations (which have only one table/data stream as input), such as aggregations/groupings, sorts or scans.
- Data partitioning operators.
- Hash, random, range, window partitioning, etc.
- Can also include (partial) replication.

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G06F 16/24556

{Aggregation; Duplicate elimination}

Definition statement

This place covers:

For example, including algorithms implementing SQL clauses such as having, groupby, cube, rollup, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Corresponding query language aspects	G06F 16/244

G06F 16/24557

{Efficient disk access during query execution}

Definition statement

This place covers:

Scan operators, index access.

G06F 16/24558

{Binary matching operations}

Definition statement

This place covers:

All operators except joins which have two tables (data streams) as input, such as: universal quantification, division, intersection, union, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Joins	G06F 16/2456

G06F 16/2456

{Join operations}

Definition statement

This place covers:

Algorithms for joins such as index nested loops join, sort merge join, hash join, etc.

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G06F 16/24561

{Intermediate data storage techniques for performance improvement}

Definition statement

This place covers:

Compression, bit vectors, surrogate processing, main memory algorithms, etc.

G06F 16/24562

{Pointer or reference processing operations}

Definition statement

This place covers:

- Pointer-based join operations.
- Fast pointer dereferencing.
- Pointer swizzling.

Special rules of classification

Double classification under G06F 16/289 (OODBMS) should be considered.

G06F 16/24564

{Applying rules; Deductive queries}

Definition statement

This place covers:

- Rules including rule constructs in SQL and active databases;
- Deductive databases in general e.g. datalog; fixpoint semantics; deductive database techniques, in general.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Inference methods or devices	G06N 5/04

G06F 16/24565

{Triggers; Constraints}

Definition statement

This place covers:

- Trigger and integrity constraints as commonly used in the context of relational or similar database systems; see example in the third version of the Structured Query Language, SQL3.
- Execution models for determining the correct execution order for multiple constraints/triggers that need to be executed.
- Semantical aspects such as relation to statement/transaction atomicity.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Query language aspects	G06F 16/2435

G06F 16/24566

{Recursive queries}

Definition statement

This place covers:

Operators for computing recursive queries, e.g. in the version of the Structured Query Language adhering to the 1999 standard, SQL1999.

G06F 16/24568

{Data stream processing; Continuous queries}

Definition statement

This place covers:

- Query processing for data streams: continuous queries over a data set; the queries are executed continuously over a database, which means that the query must be executed against newly inserted and updated data.
- Event subscription processing where the event filters (= subscription requests or profiles) are seen as continuous queries.

G06F 16/24569

{Query processing with adaptation to specific hardware, e.g. adapted for using GPUs or SSDs}

Definition statement

This place covers:

Specific properties of the hardware environment, e.g. GPU, SSDs, on which the query is executed being taken into account.

G06F 16/2457

with adaptation to user needs

Definition statement

This place covers:

Query processing based on:

- User profiles.
- Weighting of query attributes specifying preferences of users, e.g. for ranking/relevance.
- User context such as location or user's information needs.

Learning aspects for adapting to user needs, e.g. learning user preferences.

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G06F 16/24573

{using data annotations, e.g. user-defined metadata}

Definition statement

This place covers:

- Query processing using user-defined meta-data / annotations to the data, whereas the user-provided metadata is added to the database.
- Manual classification of data contents for query processing.

G06F 16/24575

{using context}

Definition statement

This place covers:

Using the context of a user or client application as query criteria; context can be diverse, e.g. user's mood or location.

G06F 16/24578

{using ranking}

Definition statement

This place covers:

Sorted output of query results in order of relevance; can use weights, etc., to specify relevance. Using this relevance for ranking and cut-off of results after returning the top-N hits.

G06F 16/2458

Special types of queries, e.g. statistical queries, fuzzy queries or distributed queries

Special rules of classification

Similarity queries for structured data could be classified in this group or for example in G06F 16/24558 (binary matching operations, if the document concerns the implementation of the similarity matching); for sorted result output by relevance, see G06F 16/24578.

G06F 16/2462

{Approximate or statistical queries}

Definition statement

This place covers:

Approximate query processing which is based on sampling, models or statistical techniques and creates fast, but imprecise answers to queries such as:

- Queries for the generation of statistics about the database, e.g. attribute value distributions.
- Database sampling.

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G06F 16/2465

{Query processing support for facilitating data mining operations in structured databases}

Definition statement

This place covers:

Specific support for data mining such as database operators for that purpose or optimisations.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clustering and classification in relational databases	G06F 16/285

G06F 16/2468

{Fuzzy queries}

Definition statement

This place covers:

Query processing based on fuzzy functions or imprecise query predicates. Text related search predicates (using phonetic searches, etc.) should be further classified in the specific text class for this aspect.

G06F 16/2471

{Distributed queries}

Definition statement

This place covers:

- Mapping of queries for distribution transparency.
- Optimizing the execution order of the plan fragments (subqueries) which need to be executed at the various sites.

G06F 16/2474

{Sequence data queries, e.g. querying versioned data}

Definition statement

This place covers:

- Querying sequence data, such as time sequences like, for example, stock price sequences, which typically supports operations such as aggregations or window queries on the sequence data.
- Implementation techniques such as indexing and optimisation therefor.
- Querying versioned data.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Processing data streams	G06F 16/24568

G06F 16/2477

{Temporal data queries}

Definition statement

This place covers:

Querying

- Specifically adapted to deal with temporal data such as T-SQL or bitemporal models;
- Referring to points in absolute time such as timestamps.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of timestamps for internal purposes such as concurrency control	G06F 16/2322
Documents where time or date attributes are treated as ordinary attributes without specific support	G06F 16/24
Time sequences which refer to a relative sequence of points in time	G06F 16/2474

G06F 16/248

Presentation of query results

Definition statement

This place covers:

- Display of the results of a query, e.g. in tabular form, with interface to modify display formats.
- Complex visualisations such as displaying results on a geographical map.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Browsing techniques (e.g. navigating in database)	G06F 16/26

Special rules of classification

Generating/modifying the layout of business reports etc. is not classified in G06F 16/00.

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G06F 16/25

Integrating or interfacing systems involving database management systems

Definition statement

This place covers:

Interfaces between systems involving at least a database supporting ad-hoc interaction, systematic integration or some type of co-operation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Organised distribution or systematic replication of data between databases or database systems	G06F 16/27

G06F 16/252

{between a Database Management System and a front-end application}

Definition statement

This place covers:

Solutions specific for the interfaces between clients and a database system.

G06F 16/254

{Extract, transform and load [ETL] procedures, e.g. ETL data flows in data warehouses}

Definition statement

This place covers:

Details for implementation of data workflows transferring data from a plurality of databases into a common data store, in particular, the Extract, Transform, Load (ETL) operations to create and maintain data warehouses.

G06F 16/256

{in federated or virtual databases}

Definition statement

This place covers:

Systems providing a data abstraction layer on top of a set of heterogeneous database systems to convey the concept of a single virtual database to the end users or client systems.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Distributed queries	G06F 16/2471

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G06F 16/258

{Data format conversion from or to a database}

Definition statement

This place covers:

- Specific details of exchanging data between database systems involving a conversion of the data.
- Export and import operations involving some conversion.

G06F 16/26

Visual data mining; Browsing structured data

Definition statement

This place covers:

- Visualisation of data sets from a database in order to allow a user to discover interesting data properties without formulating an explicit query.
- Using the meta data (schema information) for visualisation of attribute values.
- Browsing a database including navigating between data items.
- Adaptation of the browsing process to the specifics of a database, e.g. displaying database schema information for browsing.

Examples:

- Organising large (structured) data sets by grouping to make them conveniently accessible on a small display device.
- Visualising structured data such as: interactions between customers and merchants and interactions associated with a time value, e.g. hits per hour on a web server.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Query formulation aspects	G06F 16/242
Query result display	G06F 16/248

G06F 16/27

Replication, distribution or synchronisation of data between databases or within a distributed database system; Distributed database system architectures therefor

Definition statement

This place covers:

Systems that distribute or replicate data between themselves; descriptions of architectures thereof; details in relevant subgroups.

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G06F 16/273

{Asynchronous replication or reconciliation}

Definition statement

This place covers:

Implementation details of asynchronous replication and in particular for reconciliation procedures.

G06F 16/275

{Synchronous replication}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Concurrency control for distributed databases	G06F 16/2308

G06F 16/278

{Data partitioning, e.g. horizontal or vertical partitioning}

Definition statement

This place covers:

Implementation details for data partitioning between databases that fully or partially distributed the data between themselves.

G06F 16/28

Databases characterised by their database models, e.g. relational or object models

Definition statement

This place covers:

Implementation details of specialised database models which are not already covered by subgroups G06F 16/21 - G06F 16/27.

Special rules of classification

In general, double classification in at least one of the functional subgroups G06F 16/21 - G06F 16/27 and one of the subgroups of G06F 16/28 should be considered.

G06F 16/282

{Hierarchical databases, e.g. IMS, LDAP data stores or Lotus Notes}

Definition statement

This place covers:

Implementation details of supporting the storage and management of hierarchical data.

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G06F 16/283

{Multi-dimensional databases or data warehouses, e.g. MOLAP or ROLAP}

Definition statement

This place covers:

Assembly or functionality of multi-dimensional databases or data warehouses [MDDB].

Special rules of classification

Double classification with regard to subgroups G06F 16/22, G06F 16/24, and G06F 16/26 should be considered.

G06F 16/284

{Relational databases}

Definition statement

This place covers:

Implementation details specific to relational databases not - covered by any of the subgroups G06F 16/21 - G06F 16/27.

G06F 16/285

{Clustering or classification}

Definition statement

This place covers:

Clustering or classification of structured data. Classes / clusters may already exist or can be created during the classification / clustering process. Documents disclosing class / cluster management of classification or clustering systems also can be found in this group.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clustering or classifying textual data	G06F 16/35

G06F 16/287

{Visualization; Browsing}

Definition statement

This place covers:

- Cluster or class visualization or browsing.
- Graphical presentation of clusters or classes as result of a clustering or classification process. Additional data can be displayed with the clusters or classes. Typically, when a mouse pointer is brought over them, additional data about the clusters is displayed (interactive cluster display device).

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Visualisation or browsing of textual data	G06F 16/358

G06F 16/288

{Entity relationship models}

Definition statement

This place covers:

Implementation details specific to entity-relationship models not covered by any of the subgroups G06F 16/21- G06F 16/27.

Special rules of classification

In general, double classification in at least one of the functional subgroups G06F 16/21- G06F 16/27 and subgroup G06F 16/288 should be considered.

G06F 16/289

{Object oriented databases}

Definition statement

This place covers:

- Implementation details specific to object-oriented databases not covered by any of the subgroups G06F 16/21- G06F 16/27.
- Hybrid Object-Relational database models.

Special rules of classification

In general, double classification in at least one of the functional subgroups G06F 16/21 - G06F 16/27 and subgroup G06F 16/289 should be considered.

G06F 16/29

Geographical information databases

Definition statement

This place covers:

Data structures and retrieval of geographical or spatial information, e.g. digital maps.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Location-dependent Web search services	G06F 16/9537
Instruments for geographical navigation	G01C 21/00
Geographical navigation systems, route searching	G01C 21/20
Retrieval, searching and output of Points of Interest (POI) information	G01C 21/3679

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Three dimensional geographic models	G06T 17/05

G06F 16/30

of unstructured textual data (document management systems G06F 16/93)

Definition statement

This place covers:

Retrieval of unstructured or raw text data in databases and/or employing metadata of the text type for retrieving other information, possibly of a different type.

References

Limiting references

This place does not cover:

Document management systems	G06F 16/93

Informative references

Attention is drawn to the following places, which may be of interest for search:

Image retrieval using shape and object relationship, including layout-based retrieval of text documents	G06F 16/5854
Retrieval from the web, e.g. using search engines	G06F 16/95
Text processing, parsing or translation of natural language	G06F 40/40

G06F 16/31

Indexing; Data structures therefor; Storage structures

Definition statement

This place covers:

- Details about the creation or structure of an index.
- Updating or maintenance of indexes.

G06F 16/313

{Selection or weighting of terms for indexing}

Definition statement

This place covers:

- Extraction of strings from a text for indexing purposes.
- Identification or extraction of important information (special words, regions, relations between words in the text, etc.) from text content using mathematical calculations or dictionaries. The weight value indicating the importance of the information may be attached to it.

Facets:

- Automatically extracting information for annotating a document;
- A text is stemmed, stop words are removed and the remaining words are weighted according to their frequency of occurrence;

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- Segmentation and topic identification of texts. Weight values may be used to express semantics;
- Extracting relevant information for indexing from natural language texts by parsing the text into components and extracting elements of information from the respective components;
- Transforming unstructured text into structured data (using criterion-value pairs, e.g. model, year, colour as criterions for text relating to automobiles); expansion of indexing terms, e.g. with synonyms or spelling variants.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Extraction or weighting of terms for query translation	G06F 16/3334
Extraction or weighting of terms for text summarization	G06F 16/345

G06F 16/316

{Indexing structures}

Definition statement

This place covers:

Creation or structuring of a physical index storing the information to be indexed together with a physical location.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Indexing structures for structured data	G06F 16/2228

G06F 16/319

{Inverted lists}

Special rules of classification

Inverted lists often are used to index terms in a database. When these terms consist of text, these documents should be classified here and not in the G06F 16/22 (Database / building index) groups.

G06F 16/322

{Trees}

Definition statement

This place covers:

Documents disclosing hierarchical indexes.

Facets: Character strings in a text are stored hierarchically as keywords in an index file.

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G06F 16/325

{Hash tables}

Definition statement

This place covers:

Implementation details of hash tables used for indexing textual documents.

G06F 16/328

{Management therefor}

Definition statement

This place covers:

Documents focussing on the automatic or manual management of an already existing index. This only comprises the organisation and not the modification or updating of index entries.

Facets:

- Compression of a text index
- Using a GUI to manage an index

G06F 16/33

Querying

Definition statement

This place covers:

Processing of retrieval requests for finding unstructured textual data matching a query.

G06F 16/332

Query formulation

Definition statement

This place covers:

- Aspects of query formulation for the retrieval of unstructured or raw text data, such as query recommendation.
- User interfaces for query formulation (including help systems therefor).

G06F 16/3322

{using system suggestions (G06F 16/3325 takes precedence)}

Definition statement

This place covers:

- Query formulation based on system suggestions, e.g. by using keywords, categories, etc. The user can decide whether to make use of these suggestions or not.
- Using (parts of) previous queries as suggestions for new queries.
- Using pre-stored categories for making system suggestions.

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References

Limiting references

This place does not cover:

Query reformulation based on results of preceding query	G06F 16/3325

Informative references

Attention is drawn to the following places, which may be of interest for search:

Natural language query formulation in dialogue systems	G06F 16/33295
Automatic query expansion with no user interaction	G06F 16/3338
Reuse of stored results of previous queries	G06F 16/3349

G06F 16/3323

{using document space presentation or visualization, e.g. category, hierarchy or range presentation and selection}

Definition statement

This place covers:

Interactive interfaces for formulating queries using a category hierarchy.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

(Categorized) browsing without generating a query	G06F 16/34

G06F 16/3326

{using relevance feedback from the user, e.g. relevance feedback on documents, documents sets, document terms or passages}

Definition statement

This place covers:

The user informing the system about the relevance (or non-relevance) of (some of) the results. This relevance information is used in reformulating the query.

Facets:

- Explicit feedback by the user.
- Evaluating implicit feedback, e.g. click through data.
- Pseudo-feedback (where no real relevance feedback from the user is received but the top-ranking documents are considered as being highly relevant).

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G06F 16/3328

{using graphical result space presentation or visualisation}

Definition statement

This place covers:

Iterative refinement or modification of the query formulation based on a graphical display of the results.

Facets: Limiting the next query to certain documents by graphically selecting these documents in the result set (e.g. using a rectangle or lasso tool).

Example:

Text content: Making a standard keyword query and presenting the results in a 2D map by building feature vectors, mapping each information item to a point in the 2D map based on similarity. Choosing a query area in the 2D map, displaying the items belonging to the query area

G06F 16/3329

Natural language query formulation

Definition statement

This place covers:

Formulation of queries in natural language for querying unstructured data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Character input using prediction techniques	G06F 3/0237
Suggesting modifications to executable queries	G06F 16/3325

G06F 16/33295

{in dialogue systems}

Definition statement

This place covers:

- Formulation of queries in natural language for querying unstructured data in dialogue systems, e.g. Q&A systems.
- Using a dialogue between the system and the user to establish an executable query.
- Natural language question-answering systems and methods wherein prefabricated answers are retrieved.

Relationships with other classification places

Q&A systems constructing an answer by mining knowledge from e.g. a text corpus are covered by G06N 5/00.

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G06F 16/3331

Query processing

Definition statement

This place covers:

General aspects of processing queries.

G06F 16/3332

Query translation

Definition statement

This place covers:

Pre-processing the query to make it more suitable for query execution; it is typically done internally with no user interaction.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Modification of queries with user interaction	G06F 16/332

G06F 16/3334

{Selection or weighting of terms from queries, including natural language queries}

Definition statement

This place covers:

Identifying or extracting important information (for the purpose of querying) from an input (query) text or a query.

Facets:

- Identifying keywords in a text (e.g. an SMS), a query is generated therefrom for retrieving a set of images illustrating the text.
- Identifying (spoken) keywords in a phone conversation used for querying a knowledge base.
- A user inputs a plurality of search terms, e.g. by copy and paste from a text. The system extracts the search terms that occur infrequently in the set of documents.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Feature extraction for indexing purposes	G06F 16/313

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G06F 16/3335

{Syntactic pre-processing, e.g. stopword elimination, stemming}

Definition statement

This place covers:

Basic pre-processing steps like eliminating words useless for purposes of retrieval (stop word elimination) and reducing variants of the same root word to a common stem (stemming).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lexical analysis	G06F 8/425

G06F 16/3337

{Translation of the query language, e.g. Chinese to English}

Definition statement

This place covers:

- Translating queries in the native language of the user (e.g. Chinese) to the query language of the respective search engine (e.g. English).
- Translating English queries into Spanish equivalent for querying a Spanish index.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Language translation	G06F 40/40

G06F 16/3338

{Query expansion}

Definition statement

This place covers:

Automatically adding query terms to a given query/automatically reformulating the query.

Facets:

- Query expansion/reformulation based on semantic information stored in thesauri and/or ontologies; use of synonyms/hypernyms/hyponyms for query expansion/reformulation.
- Concept-based querying of a document database.
- Expanding a query using different spelling variants of query terms.
- A set of text documents is queried not only using the most recent user query but also using keywords extracted from the queries received since the last switch of query topic was detected.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Query expansion by the user based on system suggestions	G06F 16/3322

G06F 16/334

Query execution (filtering based on additional data G06F 16/335)

Definition statement

This place covers:

Methods used to calculate the degree of similarity between two entities (typically documents) or an entity and a query. These methods normally are used to rank query results.

Example: Degree-of-similarity score is calculated and reorganised into heap form to select the highest score.

References

Limiting references

This place does not cover:

Filtering based on additional data, e.g. user or group profiles	G06F 16/335

G06F 16/3341

{using boolean model}

Definition statement

This place covers:

Similarity calculated or estimated with boolean or extended boolean models.

G06F 16/3343

{using phonetics}

Definition statement

This place covers:

Matching phoneme lattices of a query with phonemes of information annotated to the information to be retrieved.

G06F 16/3344

{using natural language analysis}

Definition statement

This place covers:

Similarity that is estimated based on the semantic meaning of the query and the semantic meaning of every sentence in a document collection. For this purpose, the relation and associated sense of different parts of sentences (sub sentences, words or suffixes) to each other are analysed.

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In some documents, the term "natural language query" that is often used for queries which are not really natural language based but a simple enumeration of query words connected by a logical AND (e.g. Google queries).

Facets:

Similarity that is calculated by creating and using a graph for every sentence where words are nodes and the relationship of the words is represented as links between the nodes.

Relationships with other classification places

Q&A systems constructing an answer by mining knowledge from a text corpus: G06N 5/00

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Q&A systems matching natural language queries to prefabricated answers	G06F 16/33295

G06F 16/3346

{using probabilistic model}

Definition statement

This place covers:

Ranking that is done on the probability that a retrieved document really comprises what the user is looking for. The sum of the probability that the document is important and the probability that the document is not important has to be one.

Facets:

Two content vectors are given; the probability that the first content vector is relevant to the second content vector is estimated using distributions of words.

G06F 16/3347

{using vector based model}

Definition statement

This place covers:

Documents that are represented as content vectors in a vector space. Relevance of a query result is calculated by operations done in vector space.

Facets:

- Feature vector of a document is created comprising content vector, size of the font, date of publication and name of author.
- Document vectors that are formed from word vectors and compared to a query vector.

Relationships with other classification places

Feature vectors representing web pages including content vectors of the page should be double classified here and in the corresponding web group in G06F 16/95.

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G06F 16/3349

Reuse of stored results of previous queries

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of previous queries for suggesting formulations of new queries	G06F 16/3322
Reformulation of queries based on results of previous queries	G06F 16/3325

G06F 16/335

Filtering based on additional data, e.g. user or group profiles (filtering in web context G06F 16/9535, G06F 16/9536)

Definition statement

This place covers:

Filtering or routing of textual data based on additional information, e.g. user profiles, preferences, learned set of abstract rules or an explicit query provided by the user.

Facets: Composing personalized online newspapers based on user interests.

References

Limiting references

This place does not cover:

Search customisation based on user profiles and personalisation	G06F 16/9535
Search customisation based on social or collaborative filtering	G06F 16/9536

G06F 16/337

{Profile generation, learning or modification}

Definition statement

This place covers:

Generation of the user profiles, either automatically or manually, and/or learning of the user preferences.

Facets: Different user profiles are analysed and compared to expand the profile of an individual user.

G06F 16/338

Presentation of query results

Definition statement

This place covers:

- Highlighting of search terms in the result set of a query.
- Visualizing the relevance of the query results showing the respective contribution of the individual query terms.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Presentation or visualization of query results integrated with query re-formulation	G06F 16/3328
Browsing or Visualization without relation to a query, e.g. simply visualizing a document or document space	G06F 16/34
Clustered display of query results	G06F 16/358

G06F 16/34

Browsing; Visualisation therefor (browsing or visualisation for clustering or classification G06F 16/358)

Definition statement

This place covers:

Mechanisms using non-textual data (e.g. graphical data) for the visualization of collections of text documents, single text documents and concepts of text documents. These mechanisms can be used for document browsing.

Facets:

- Highlighting important sentences in a text document.
- Creating a table of contents of a text document that can be used for browsing (eBook).
- A calendar-based user interface for date-based browsing of electronically stored documents.

References

Limiting references

This place does not cover:

Browsing or visualisation for clustering or classification	G06F 16/358

Informative references

Attention is drawn to the following places, which may be of interest for search:

Document space visualisation for the purpose of query formulation	G06F 16/3323
Visualisation of query results	G06F 16/338
Document space presentation for browsing in web context	G06F 16/954

G06F 16/345

{Summarisation for human users}

Definition statement

This place covers:

Summarization of text content for presenting to a human user. Normally, important text fragments are extracted and presented to the user.

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Facets:

- Summarization of text based on users focus.
- Summarization of a collection of related documents.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Extracting text features for indexing purposes	G06F 16/313

G06F 16/35

Clustering; Classification

Definition statement

This place covers:

- Automatic content-based text classification or clustering.
- Management of classes or clusters (GUI or machine based).
- Overviews of different content-based clustering or classification methodologies.

Example: A GUI based system to create/modify the names of classes in an existing classification tree.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Manual classification of textual data	G06F 16/38

G06F 16/353

into predefined classes

Definition statement

This place covers:

Classification or clustering into predefined classes or clusters. The existing classes or clusters may not be changed.

Documents that also should be classified in this group if they do not tell whether classes are created, modified or predefined.

Facets:

- Books are classified by their genre.
- Patent documents are classified into a patent classification scheme.
- A system that reclassifies all documents in a classification tree because the class definitions were changed.

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G06F 16/355

Creation or modification of classes or clusters

Definition statement

This place covers:

Creation or modification of classes or clusters during the clustering or classification process.

Facets:

- Groups which become to big are divided by the system.
- If a document does not fit in any existing group and a new group is created for it.
- Clusters of words of a text are allocated.

G06F 16/358

Browsing; Visualisation therefor

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Visualisation of query results, including e.g. in ranked clusters	G06F 16/338
Browsing or visualisation of unstructured textual data in general	G06F 16/34

G06F 16/36

Creation of semantic tools, e.g. ontology or thesauri

Definition statement

This place covers:

Creation (NOT THE USE) of structures that help in understanding the semantics of words.

G06F 16/367

{Ontology}

Definition statement

This place covers:

Creation of Ontologies (concept/term networks, graphs, trees, etc.).

G06F 16/374

{Thesaurus}

Definition statement

This place covers:

Creation of thesauri (dictionaries, synonym lists).

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G06F 16/38

Retrieval characterised by using metadata, e.g. metadata not derived from the content or metadata generated manually

Definition statement

This place covers:

Techniques for usage of metadata for text retrieval. The metadata can be human generated or machine made and may be extracted out of text content.

Facets:

- Manual classification systems (such as patent classification schemes) should be classified in this group.
- All kinds of metadata, e.g. citations, barcodes, keywords, etc.
- Also generation of metadata.
- Keywords extracted and stored as additional data.
- Searching a document in a library using descriptive information, e.g. author, document state, archiving status, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Extraction of Metadata for indexing purposes	G06F 16/313
Layout-based retrieval of text documents	G06F 16/5854

G06F 16/381

{using identifiers, e.g. barcodes, RFIDs (for URLs G06F 16/9554)}

References

Limiting references

This place does not cover:

Retrieval of web documents by barcodes etc., e.g. encoding the URL	G06F 16/9554

Informative references

Attention is drawn to the following places, which may be of interest for search:

Document management	G06F 16/93

G06F 16/382

{using citations (hypermedia G06F 16/94)}

Definition statement

This place covers:

Retrieval of documents where the bibliographic data (metadata) is a citation to other document or documents.

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Facets:

- CiteSeer, where documents cited/citing can be retrieved following the citation chain.

References

Limiting references

This place does not cover:

Hypermedia, including creation/management of hyperlinks	G06F 16/94

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of hyperlinks in HTML documents	G06F 16/9558

G06F 16/40

of multimedia data, e.g. slideshows comprising image and additional audio data (retrieval of still image data G06F 16/50; retrieval of audio data G06F 16/60; retrieval of video data G06F 16/70)

Definition statement

This place covers:

- Retrieval of media data incorporating multiple media types, e.g. slideshows comprising image and additional audio data.
- Retrieval of media data where the retrieval algorithm is suitable for various media types.
- Automatic creation of multi-media presentations or documents as a result of a query, e.g. slide-shows, multimedia playlists, multimedia albums comprising various media types such as images, text, audio clips, video clips, etc.
- Adaptation of multimedia formats, e.g. selection of multimedia formats based on the capabilities of a client.
- Generation of multimedia documents.
- Multimedia databases index structures and management thereof.

References

Limiting references

This place does not cover:

Retrieval of image data	G06F 16/50
Retrieval of audio data	G06F 16/60
Retrieval of video data	G06F 16/70

Informative references

Attention is drawn to the following places, which may be of interest for search:

Editing or indexing of data stored based on relative movement between record carrier and transducer	G11B 27/00

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Media type	The expression media type encompasses image data, audio data, video data and text data

G06F 16/41

Indexing; Data structures therefor; Storage structures

Definition statement

This place covers:

Specific indexing aspects, data structures or storage structures for multimedia data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Indexing specially adapted for contents retrieved by relative movement between record carrier and transducer	G11B 27/10
Indexing by using information signals detectable on the record carrier and recorded by the same method as the main recording	G11B 27/28

G06F 16/43

Querying

Definition statement

This place covers:

Processing details of multimedia retrieval requests.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Programed access in sequence to addressed parts of tracks of operating discs	G11B 27/105

G06F 16/432

Query formulation

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction techniques for graphical user interfaces	G06F 3/048

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G06F 16/433

{using audio data}

Definition statement

This place covers:

Query formulation using a piece of audio data as retrieval argument, such as a selected audio file, music, which is currently playing, speech input, or environmental noises.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of audio retrieval	G06F 16/60
Electrophonic musical instruments	G10H
Speech recognition	G10L 15/00
Speaker recognition	G10L 17/00
General determination or detection of speech characteristics	G10L 25/00

G06F 16/434

{using image data, e.g. images, photos, pictures taken by a user}

Definition statement

This place covers:

Query formulation using a piece of image data such as a selected image file, a photograph, which currently is captured by the camera of the user, a document, a barcode or scanned text.

G06F 16/435

Filtering based on additional data, e.g. user or group profiles

Definition statement

This place covers:

Wherein the retrieval is taking further parameters into account, such as user or group profile data for filtering the search space or the results.

G06F 16/436

{using biological or physiological data of a human being, e.g. blood pressure, facial expression, gestures}

Definition statement

This place covers:

Using biological or physiological metrics obtainable by monitoring the human body (e.g. heartbeat, pulse, body temperature, brain waves) or biometric techniques (e.g. fingerprint, iris or retina, face, voice or gait recognition) in formulation or personalisation of queries.

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G06F 16/437

{Administration of user profiles, e.g. generation, initialisation, adaptation, distribution}

Definition statement

This place covers:

Techniques for modelling the changing interest of a user over time including manual, semi-automatic or automatic initialisation of user profiles, their maintenance and modification by monitoring the user's history of content selection, his history of interaction with the selected content, the management of the shared profile of a group of users, e.g. profile splitting or stereotyping.

G06F 16/438

Presentation of query results

Definition statement

This place covers:

Where invention information is present in the visual or acoustic presentation of the query results to the user.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Menu, index or table of content presentation of record carriers	G11B 27/32, G11B 27/34

G06F 16/4387

{by the use of playlists}

Definition statement

This place covers:

Methods or interfaces to create, modify or manage multimedia playlists.

G06F 16/4393

{Multimedia presentations, e.g. slide shows, multimedia albums}

Definition statement

This place covers:

Multimedia presentations of query results, e.g. slideshow presentations, photo albums enriched with multimedia content, e-books with multimedia content, etc.

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G06F 16/44

Browsing; Visualisation therefor

Definition statement

This place covers:

Wherein a visual metaphor is provided for supporting the search process of the user, and wherein the retrieval is performed through arbitrary or guided browsing.

G06F 16/444

{Spatial browsing, e.g. 2D maps, 3D or virtual spaces}

Definition statement

This place covers:

Using graphical representations of geographical, urban or virtual space, e.g. 2D or 3D maps, city plans, virtual spaces, as a paradigm for browsing representations of multimedia objects.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction with 3D GUI environments in general	G06F 3/04815

G06F 16/447

{Temporal browsing, e.g. timeline}

Definition statement

This place covers:

Using graphical representations of time, e.g. timelines, calendars, diaries, as a paradigm for browsing representations of multimedia objects.

G06F 16/45

Clustering; Classification

Definition statement

This place covers:

Automatic content-based multimedia document classification and clustering. Management of classes or clusters (GUI or machine based), overviews of different content-based clustering or classification methodologies.

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G06F 16/48

Retrieval characterised by using metadata, e.g. metadata not derived from the content or metadata generated manually

Definition statement

This place covers:

Retrieval or indexing of multimedia data using metadata.

Note: Group G06F 16/48 concerns the use of metadata not derived from the multimedia content, or manually generated information, such as bibliographic information (e.g. title, composer, etc.), usage information, user ratings, tags etc.

These data may be generated by automatic annotation of multimedia data, generation from existing data sources, e.g. data mining, collaborative annotation, creation of semantic ontologies, tagging.

G06F 16/483

using metadata automatically derived from the content

Definition statement

This place covers:

Retrieval or indexing of multimedia data using metadata that automatically is derived from the multimedia content.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Query formulation using audio data	G06F 16/433
Query formulation using image data	G06F 16/434

G06F 16/487

using geographical or spatial information, e.g. location

Definition statement

This place covers:

Where the feature used for retrieval or indexing is any kind of absolute, relative or fuzzy representation of location, e.g. GPS coordinates, postal address, rooms of a building, user's car.

G06F 16/489

{using time information}

Definition statement

This place covers:

Where the feature used for retrieval or indexing is of any kind absolute, relative or fuzzy representation of time, e.g. hour, date, time of the day, season of the year, rush hour, sunset or holiday.

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G06F 16/50

of still image data

Definition statement

This place covers:

Systems and methods (1) for retrieving digital still images in databases or (2) related to how metadata of the image type is used to retrieve other information, possibly of a different type.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Retrieval of multimedia data	G06F 16/40
Pattern recognition	G06F 18/00
Image analysis, e.g. from bitmapped to non-bitmapped	G06T 7/00
ICT specially adapted for handling medical images, e.g. DICOM, HL7 or PACS	G16H 30/00
Digital picture intermediate information storage	H04N 1/21

G06F 16/51

Indexing; Data structures therefor; Storage structures

Definition statement

This place covers:

- Data structures for images or image database organisation.
- Aspects of accessing the images in the database to deal with bandwidth problems on the network or the computer, typically using caching or image interleaving.
- Specific indexing aspects.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Indexing specially adapted for contents retrieved by relative movement between record carrier and transducer	G11B 27/10

G06F 16/53

Querying

Definition statement

This place covers:

Processing details of still image retrieval requests.

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G06F 16/532

Query formulation, e.g. graphical querying

Definition statement

This place covers:

Wherein the contribution is in specific query formulation aspects, in particular graphical user interface supporting the user in specifying a graphical query.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction techniques for graphical user interfaces	G06F 3/048

G06F 16/535

Filtering based on additional data, e.g. user or group profiles

Definition statement

This place covers:

Wherein the retrieval is taking further parameters into account, such as user or group profile data for filtering the search space or the results.

G06F 16/538

Presentation of query results

Definition statement

This place covers:

Presentation of the query results to the user.

G06F 16/54

Browsing; Visualisation therefor

Definition statement

This place covers:

Wherein a visual metaphor is provided for supporting the search process of the user, and wherein the retrieval is performed through arbitrary or guided browsing.

G06F 16/55

Clustering; Classification

Definition statement

This place covers:

Automatic image classification and clustering. Management of classes or clusters (GUI or machine based), overviews of different content-based clustering or classification methodologies.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clustering techniques for pattern recognition	G06F 18/23

G06F 16/56

having vectorial format

Definition statement

This place covers:

Vectorial images, which are typically used in CAD oriented databases.

Images also can be retrieved according to colours, shapes, etc. but the data structures are completely different as are the techniques of indexing/querying.

G06F 16/58

Retrieval characterised by using metadata, e.g. metadata not derived from the content or metadata generated manually

Definition statement

This place covers:

Indexing and retrieval of still image data using metadata.

G06F 16/583

using metadata automatically derived from the content

Definition statement

This place covers:

Image databases relying on feature information (previously indexed or obtained on-the-fly) derived from the image data by automatic image analysis.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Feature extraction	G06V 10/40

G06F 16/5838

{using colour}

Definition statement

This place covers:

Where the information extracted by analysis is related to colours present in the image, e.g. histograms.

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G06F 16/5846

{using extracted text}

Definition statement

This place covers:

Text extracted from the still images, in opposition to text added from external sources or inputs, for retrieval.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Character recognition, recognising digital ink or document-oriented image-based pattern recognition	G06V 30/00

G06F 16/5854

{using shape and object relationship}

Definition statement

This place covers:

Using recognized shapes or spatial relationships between objects/blocks of the images for retrieval.

G06F 16/5862

{using texture}

Definition statement

This place covers:

Using texture descriptors for the retrieval.

G06F 16/5866

{using information manually generated, e.g. tags, keywords, comments, manually generated location and time information}

Definition statement

This place covers:

Wherein the metadata used for retrieval has been generated manually, for example, human labels, tags, keywords, comments or manually entered time and location data (as opposed to automatically obtained time or GPS provided data).

G06F 16/587

using geographical or spatial information, e.g. location

Definition statement

This place covers:

Where the feature used for retrieval or indexing is any kind of absolute, relative or fuzzy representation of location, e.g. GPS coordinates, postal address, rooms of a building, user's car.

G06F 16/60

of audio data

Definition statement

This place covers:

Retrieval of audio data from audio databases, e.g. retrieval of songs, by using content features or bibliographical data associated with the audio data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Retrieval of general multimedia	G06F 16/40
Retrieval of video data	G06F 16/70
Electrophonic musical instruments	G10H
Speech recognition	G10L 15/00
Speaker recognition	G10L 17/00
General determination or detection of speech characteristics	G10L 25/00
Editing or indexing of data stored based on relative movement between record carrier and transducer	G11B 27/00

G06F 16/61

Indexing; Data structures therefor; Storage structures

Definition statement

This place covers:

Specific indexing aspects, data structures and storage structures for audio data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Indexing specially adapted for contents retrieved by relative movement between record carrier and transducer g	G11B 27/10
Table of contents on a record carrier	G11B 27/327

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G06F 16/63

Querying

Definition statement

This place covers:

Processing details of audio retrieval requests

G06F 16/632

Query formulation

Definition statement

This place covers:

Wherein the contribution is in specific query formulation aspects supporting the user in inputting a query.

G06F 16/634

{Query by example, e.g. query by humming}

Definition statement

This place covers:

Formulation of the query predicate as an existing/example audio content, e.g. query by humming, or using a recorded piece of audio data as example.

G06F 16/635

Filtering based on additional data, e.g. user or group profiles

Definition statement

This place covers:

- Filtering rules.
- Retrieval personalisation.
- Generation, learning, modification and use of user profiles.
- Monitoring of user activities for profile generation (in particular generation and use of reproduction/ playback histories/logs).
- Relevance feedback.

G06F 16/636

{by using biological or physiological data}

Definition statement

This place covers:

Using biological or physiological metrics obtainable by monitoring the human body (e.g. heartbeat, pulse, body temperature, brain waves) or biometric techniques (e.g. fingerprint, iris or retina, face, voice or gait recognition) in formulation or personalisation of audio queries.

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G06F 16/637

{Administration of user profiles, e.g. generation, initialization, adaptation or distribution}

Definition statement

This place covers:

Techniques for modelling the changing taste of a user over time including manual, semi-automatic or automatic initialisation of user profiles, their maintenance and modification by monitoring the user's history of audio content selection, his history of interaction with the selected content, the management of the shared profile of a group of users, e.g. profile splitting or stereotyping.

G06F 16/638

Presentation of query results

Definition statement

This place covers:

Visual or acoustic presentation of the query results to the user.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Menu, index or table of content presentation of record carriers	G11B 27/32, G11B 27/34

G06F 16/639

{using playlists}

Definition statement

This place covers:

Methods presenting the results of query for audio data in form of a list which defines an order between the audio data used during the replay of the audio data, e.g. methods or interfaces to create, modify and manage audio playlists.

G06F 16/64

Browsing; Visualisation therefor (generation of a list or set of audio data G06F 16/638)

Definition statement

This place covers:

Browsing, e.g. a list or a collection/database of song titles or images or icons representing audio data. Such lists or sets of audio data representations may be the results of a querying operation. However, the contribution is the browsing method.

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References

Limiting references

This place does not cover:

The generation of the list or set of audio data	G06F 16/638

Informative references

Attention is drawn to the following places, which may be of interest for search:

Trick modes	G11B 27/005
Browsing through audio recorded on operating discs	G11B 27/105

G06F 16/65

Clustering; Classification

Definition statement

This place covers:

Automatic audio classification and clustering. Management of classes or clusters (GUI or machine based), overviews of different content-based clustering or classification methodologies.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clustering techniques for pattern recognition	G06F 18/23
Classification techniques for pattern recognition	G06F 18/24

G06F 16/68

Retrieval characterised by using metadata, e.g. metadata not derived from the content or metadata generated manually

Definition statement

This place covers:

Indexing and retrieval of audio data using metadata.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Metadata derived by content-analysis	G06F 16/683
Programmed access in sequence to addressed parts of tracks of operating discs	G11B 27/105

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G06F 16/683

using metadata automatically derived from the content

Definition statement

This place covers:

Retrieval and/or indexing methods using features derived from the audio content. This subgroup covers the mere use of audio content features in the context of audio data retrieval. This metadata comprises, for example, descriptors, fingerprints, signatures, MEP-cepstral coefficients, musical score, tempo.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Analysis and extraction of content specific audio features	G10H
Audio watermarking, e.g. by inserting fingerprints	G10L 19/018
Determination or detection of speech characteristics	G10L 25/00
Indexing by using information signals detectable on the record carrier and recorded by the same method as the main recording	G11B 27/28

G06F 16/685

{using automatically derived transcript of audio data, e.g. lyrics (speech recognition G10L 15/00)}

Definition statement

This place covers:

Text data used to retrieve audio content, e.g. text derived from speech or music, phonetic transcript, music scores (sheet music), etc.

References

Limiting references

This place does not cover:

Speech recognition	G10L 15/00

G06F 16/686

{using information manually generated, e.g. tags, keywords, comments, title or artist information, time, location or usage information, user ratings}

Definition statement

This place covers:

Where the retrieval and/or indexing method uses manually generated information, e.g. data created by humans and added to the audio data at a post-production phase by manual annotation/tagging, e.g. title, song writer, interpret, users' tags, comments or annotations etc.

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G06F 16/687

using geographical or spatial information, e.g. location

Definition statement

This place covers:

Where the feature used for retrieval or indexing is any kind of absolute, relative or fuzzy representation of location, e.g. GPS coordinates, postal address, rooms of a building, user's car.

G06F 16/70

of video data

Definition statement

This place covers:

- Video retrieval using content features.
- Video retrieval using bibliographical data.
- Details or video query formulation and video query processing.
- Browsing videos and the internal structure of videos.
- Presenting video query results.
- Video database index structures and management thereof.

Video data model used in this group: the structure of this group relies on the following data model of video. Video content is the originally produced data comprising:

- The visual data (video frames).
- Accompanying audio track(s).
- Original textual content (typically subtitles, which can be coded and stored/transmitted either in binary/visual format or in textual format). Whatever data is added to video later, e.g. at a post-production phase, is referred to as bibliographical data or metadata.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Video data retrieval specially adapted for selective content distribution, e.g. interactive television or video on demand [VOD]	H04N 21/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Retrieval of multimedia	G06F 16/40
Image retrieval	G06F 16/50
Audio retrieval	G06F 16/60
Recognising patterns	G06F 18/00
Image analysis	G06T 7/00
Editing or indexing of data stored based on relative movement between record carrier and transducer, e.g. video data	G11B 27/00
Source coding or decoding of digital video signal	H04N 19/00

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G06F 16/71

Indexing; Data structures therefor; Storage structures

Definition statement

This place covers:

Specific indexing aspects, data structures or storage structures for video data.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Indexing specially adapted for contents retrieved by relative movement between record carrier and transducer	G11B 27/10
Table of contents on a record carrier	G11B 27/327

G06F 16/73

Querying

Definition statement

This place covers:

Processing details of video retrieval requests.

G06F 16/732

Query formulation

Definition statement

This place covers:

Query formulation and processing for the retrieval of video data.

G06F 16/7328

{Query by example, e.g. a complete video frame or video sequence (graphical querying G06F 16/7335)}

Definition statement

This place covers:

Formulation of the query predicate as an existing/example of video content, e.g. a video sequence or its excerpt/clip; typically a content-based descriptor computed from said example content during query processing; if there is contribution in the usage of a particular content feature or metadata, this should be classified under a relevant G06F 16/78 subgroup, respectively; if there is a contribution in a particular content feature extraction, characterisation or analysis, this should be classified under the relevant G06F 18/00, G06V or G06T 7/00 subgroup(s).

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References

Limiting references

This place does not cover:

Graphical querying	G06F 16/7335

G06F 16/7335

{Graphical querying, e.g. query-by-region, query-by-sketch, query-by-trajectory, GUIs for designating a person/face/object as a query predicate (end-user interface involving hot spots associated with the video H04N 21/4725; end-user interface for selecting a Region of Interest H04N 21/4728)}

Definition statement

This place covers:

Graphical user interfaces [GUIs] for specifying graphical query predicates interactively (a mere selection of an example video sequence as a query predicate shall be classified in G06F 16/7328). These GUIs may for example allow a specification of sought-for regions, to sketch a desired scene, a trajectory, or to designate a person, a face or an object as query predicate.

References

Limiting references

This place does not cover:

End-user interface involving hot spots associated with the video	H04N 21/4725
End-user interface for selecting a Region of Interest	H04N 21/4728

Informative references

Attention is drawn to the following places, which may be of interest for search:

Query by an example video sequence	G06F 16/7328

G06F 16/7343

{Query language or query format}

Definition statement

This place covers:

Query formulation using a specific query language or format of the query, e.g. SQL variants adapted for video or specific formats for expressing query parameters.

G06F 16/735

Filtering based on additional data, e.g. user or group profiles

Definition statement

This place covers:

- Filtering rules.
- Retrieval personalisation.

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- Generation, learning, modification and use of user profiles.
- Monitoring of user activities for profile generation (in particular generation and use of reproduction/ playback histories/logs).
- Relevance feedback.
- Playlist-based retrieval and playlist generation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Recommending movies involving learning viewer preferences	H04N 21/251, H04N 21/466
Creating a personalised video channel	H04N 21/2668, H04N 21/458
Monitoring the number of times a movie has been viewed	H04N 21/44204
Monitoring of user selections, e.g. selection of programs	H04N 21/44222

G06F 16/738

Presentation of query results

Definition statement

This place covers:

Presentation of query results, in particular visual presentation methods/interfaces.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Presentation in form of a video summary	G06F 16/739
Browsing a video collection	G06F 16/743
Two dimensional image generation	G06T 11/00

G06F 16/739

{in form of a video summary, e.g. the video summary being a video sequence, a composite still image or having synthesized frames}

Definition statement

This place covers:

- Video summarisation, also called video abstraction, which produces a shorter and/or more condensed version of the original video. For example, video skimming produces a shorter video sequence at the output, typically comprising a subset of key frames extracted from the original video or a subset of excerpts / sub-sequences of the original video.
- Composite still images (2-D or 3-D), called,for example, a video mosaic, storyboard, video poster or "movie bar", typically comprising re-sized key-frames extracted from the original video, arranged into the still image like in a comic book or like stones in a mosaic.
- Video sequences comprising artificial (synthesized) frames, e.g. with an artificial (synthesized) view not existing in any of the single frames of the original video, with a stitched panorama

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showing a broader view and/or more motion than any single original frame or with a view having overlaid multiple instances of the same moving object.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Two dimensional image generation	G06T 11/00

G06F 16/74

Browsing; Visualisation therefor (end-user interfaces for requesting or interacting with video content, e.g. video on demand interfaces or electronic programme guides, H04N 21/472)

Definition statement

This place covers:

- Browsing a plurality of video files/sequences in a video collection/database.
- Browsing the internal structure of a single video sequence.
- Systems and methods for hyperlinking in hypervideo.

References

Limiting references

This place does not cover:

End-user interface for requesting or interacting with video content, e.g. video on demand interface or electronic programme guides	H04N 21/472

Informative references

Attention is drawn to the following places, which may be of interest for search:

Indicating arrangements in the context of indexing and addressing recorded information	G11B 27/34

G06F 16/743

{a collection of video files or sequences}

Definition statement

This place covers:

Browsing a plurality of video files/sequences in a video collection/database, e.g. using thumbnails, (moving) icons, cover art, etc.

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G06F 16/745

{the internal structure of a single video sequence}

Definition statement

This place covers:

Browsing the internal structure of a single video sequence, e.g. browsing by jumping between shots, scenes, objects or events in the content of the sequence.

G06F 16/748

{Hypervideo (linking data to content, e.g. by linking an URL to a video object in the context of video distribution systems H04N 21/858)}

Definition statement

This place covers:

- Systems and methods for hyperlinking in hypervideo.
- Computed links, including dynamically determined anchor and targets of links.
- Management of annotations linked to other documents.

References

Limiting references

This place does not cover:

Linking data to content, e.g. by linking an URL to a video object in the context of video distribution systems	H04N 21/858

G06F 16/75

Clustering; Classification

Definition statement

This place covers:

Automatic video classification and clustering. Management of classes or clusters (GUI or machine based), overviews of different content-based clustering or classification methodologies.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clustering techniques for pattern recognition	G06F 18/23
Classification techniques for pattern recognition	G06F 18/24

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G06F 16/78

Retrieval characterised by using metadata, e.g. metadata not derived from the content or metadata generated manually

Definition statement

This place covers:

Indexing and retrieval of video data using metadata

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Use of information derived by content analysis	G06F 16/783

G06F 16/783

using metadata automatically derived from the content

Definition statement

This place covers:

- Retrieval and/or indexing methods using features derived from the video content.
- Retrieval using video signatures/fingerprints based on statistical/probabilistic methods or hashing algorithms.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Extraction of features or characteristics for pattern recognition of the image	G06V 10/40
Recognising video content	G06V 20/52

G06F 16/7834

{using audio features}

Definition statement

This place covers:

Using features of the audio track of the video content, e.g. where query predicate(s) are in audio format (e.g. query-by-speech, query-by-music) or where retrieval or indexing uses low-level audio features (e.g. using magnitude/energy analysis, using speaker recognition methods).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Contents oriented musical parameter indexing, e.g. tempo	G10H
Speech recognition	G10L 15/00

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Speaker recognition	G10L 17/00
General determination or detection of speech characteristics	G10L 25/00

G06F 16/7837

{using objects detected or recognised in the video content}

Definition statement

This place covers:

Where the feature used for retrieval or indexing is a detected or recognised object.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Methods for image acquisition of a pattern to be recognized involving target detection	G06V 10/255

G06F 16/784

{the detected or recognised objects being people}

Definition statement

This place covers:

Where the features used for retrieval or indexing are detected or recognised people, e.g. faces.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Human body recognition	G06V 40/103
Face recognition	G06V 40/16
Speaker recognition	G10L 17/00

G06F 16/7844

{using original textual content or text extracted from visual content or transcript of audio data}

Definition statement

This place covers:

Retrieval of video data by using metadata automatically derived from the content such as:

- Textual content (part (3) of the video content according to the video data model - see note of G06F 16/70), e.g. the original subtitles (closed captions) transmitted in textual-format as part of the video stream or
- Extracted text from the video frames or from binary visually-coded subtitles (closed captions) or
- Text derived from speech or music, phonetic transcript, music scores (sheet music), etc.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Extraction of overlay text	G06V 20/635

G06F 16/7847

{using low-level visual features of the video content}

Definition statement

This place covers:

- Usage of low-level visual features extracted from the video content for video indexing and retrieval.
- Examples of descriptors range from a single value or a histogram of a particular low-level feature to a complex/statistical descriptor based on one or more features, e.g. video signature/fingerprint.
- Usage of particular low-level visual features should be classified in one or more of the subgroups.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Image processing in general	G06T
Methods for preprocessing an image in order to extract features of a pattern to be recognized	G06V 10/40
Recognising video content	G06V 20/52

G06F 16/785

{using colour or luminescence}

Definition statement

This place covers:

Using colour or luminescence as the low-level visual feature for querying.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Colour analysis on image data	G06T 7/90

G06F 16/7854

{using shape (G06F 16/7837 takes precedence)}

Definition statement

This place covers:

Using detected shapes as the low-level visual feature(s) for querying, e.g. based on a detected sketched shape drawn by the user.

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References

Limiting references

This place does not cover:

Using objects detected or recognised in the video content	G06F 16/7837

Informative references

Attention is drawn to the following places, which may be of interest for search:

Segmentation or edge detection on image data	G06T 7/10
Analysis of geometric attributes	G06T 7/60

G06F 16/7857

{using texture (G06F 16/7837 takes precedence)}

Definition statement

This place covers:

Using texture as the low-level visual feature.

References

Limiting references

This place does not cover:

Using objects detected or recognised in the video content	G06F 16/7837

Informative references

Attention is drawn to the following places, which may be of interest for search:

Texture analysis on image data	G06T 7/41, G06T 7/49

G06F 16/786

{using motion, e.g. object motion or camera motion}

Definition statement

This place covers:

Using a motion feature, e.g. motion vector(s), as the low-level visual feature.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Motion analysis	G06T 7/20

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G06F 16/7864

{using domain-transform features, e.g. DCT or wavelet transform coefficients}

Definition statement

This place covers:

Using features of a specific domain transform as the low-level visual features, e.g. wavelet or Discrete + Cosine Transform (DCT) transform coefficients; this approach is often referred to as retrieval or indexing "in compressed domain".

G06F 16/7867

{using information manually generated, e.g. tags, keywords, comments, title and artist information, manually generated time, location and usage information, user ratings}

Definition statement

This place covers:

Retrieval and/or indexing methods using information not-derived from the video content, e.g. data created by humans and added to video at a post-production phase by manual annotation/tagging, e.g. title, author, director, actors' names, users' tags, comments, annotations, usage information, user ratings etc.

G06F 16/787

using geographical or spatial information, e.g. location

Definition statement

This place covers:

Retrieval or indexing where the features used are any kind of absolute, relative or fuzzy representations of location, e.g. GPS coordinates, postal address, rooms of a building, user's car.

G06F 16/80

of semi-structured data, e.g. markup language structured data such as SGML, XML or HTML (content-based retrieval of web data G06F 16/95)

Definition statement

This place covers:

Semi-structured data, which is a form of structured data that does not conform with the formal structure of data models associated with relational databases or other forms of data tables, but nonetheless contains tags or other markers to separate semantic elements and enforce hierarchies of records and fields within the data.

References

Limiting references

This place does not cover:

Content-based retrieval of web data	G06F 16/95

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Web site document structures and storage, e.g. HTML extensions	G06F 16/986
Use of codes for handling textual entities	G06F 40/12

G06F 16/81

Indexing, e.g. XML tags; Data structures therefor; Storage structures

Definition statement

This place covers:

Creation or maintenance of an index comprising tag (structure) and content information that is used to retrieve information in semi-structured documents.

G06F 16/83

Querying

Definition statement

This place covers:

Assembly, generation and maintenance of semi-structured (xml) databases as well as operations performed on semi-structured (xml) databases. Querying of said databases is also encompassed (XQuery etc.).

G06F 16/832

Query formulation

Definition statement

This place covers:

Example:

- Comparative analysis of XML query languages; graphical XML query language.

G06F 16/835

Query processing

Definition statement

This place covers:

Examples:

- Implementing an XML query language.
- Query processing in Xyleme - a native XML DBMS.
- Implementing an XML query language.

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G06F 16/8358

{Query translation}

Definition statement

This place covers:

- Translation of a query into internal representation.
- Translation of XML specific query language into SQL as internal representation.

G06F 16/8365

{Query optimisation}

Definition statement

This place covers:

Example:

- XML query (XQuery) optimization and normalization.

G06F 16/8373

{Query execution}

Definition statement

This place covers:

Execution of one or more (already generated and optimized) query execution plan(s).

Examples:

- Pipelined query execution of a ranking operator for XQuery.
- Intra-document indices to improve XQuery processing over XML streams.

G06F 16/84

Mapping; Conversion

Definition statement

This place covers:

Mapping or conversion of semi-structured documents to other structures.

G06F 16/86

{Mapping to a database}

Definition statement

This place covers:

Mapping of semi-structured documents to databases (relational, object oriented, etc.).

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G06F 16/88

{Mark-up to mark-up conversion (conversion for visualization in web browsing G06F 16/9577)}

Definition statement

This place covers:

Normalisation or conversion of semi-structured documents into another semi-structured scheme.

References

Limiting references

This place does not cover:

Conversion for visualization in web browsing	G06F 16/9577

G06F 16/90

Details of database functions independent of the retrieved data types

Definition statement

This place covers:

- Retrieval of information, wherein the retrieval method is not related to any particular type of data, in particular if no specific data type is indicated or implied by the context of the document at all, or an explicit hint is given that the disclosed mechanism can be used for retrieval of arbitrary data types.
- Retrieval from the web.

G06F 16/901

Indexing; Data structures therefor; Storage structures (for retrieval from the web G06F 16/951)

Definition statement

This place covers:

Details about data structures for storage and indexing of generic data, independent of its type.

References

Limiting references

This place does not cover:

Storage and indexing structures for retrieval from the Web	G06F 16/951

Informative references

Attention is drawn to the following places, which may be of interest for search:

Storage and indexing structures for databases wherein the data type of the retrieved information can be identified as structured	G06F 16/22

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G06F 16/9014

{hash tables}

Definition statement

This place covers:

Retrieval of data by calculating a storage address, for example in a table, file or main memory from a given key, or converting somehow this key to that storage address; for example using a hashing function to map an information key to the address where that information is stored.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Accessing data in main memory systems with address translation involving hashing techniques	G06F 12/1018
Routing in networks, hashing functions for network address lookup	H04L 45/00

G06F 16/9024

{Graphs; Linked lists (G06F 16/9027 takes precedence)}

Definition statement

This place covers:

Systems, methods for managing data structures such as data graphs, linked lists, being specifically adapted for accessing of index data accessible in a chained manner, e.g. including some form of pointers from one index record to one or more other index records.

References

Limiting references

This place does not cover:

Trees	G06F 16/9027

G06F 16/9027

{Trees}

Definition statement

This place covers:

- Details of implementation in memory of the tree structures, compact representations.
- Techniques to re-balance trees after updates (e.g. insertions or deletions).
- Extensions to basic tree structures to offer alternative navigation paths through the trees.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Management of index trees for structured data stores	G06F 16/2246

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Management of index trees for unstructured text data	G06F 16/322

G06F 16/903

Querying (for retrieval from the web G06F 16/953)

References

Limiting references

This place does not cover:

Querying for retrieval from the web	G06F 16/953

G06F 16/90324

{using system suggestions}

Definition statement

This place covers:

- While inputting a query, the system predicts the most probable next query words and displays a list for the user to choose from using the mouse.

G06F 16/90339

{by using parallel associative memories or content-addressable memories}

Definition statement

This place covers:

- Use of Content Addressable (CAM) or Parallel Associative Memories (PAM) to match search arguments with a large number of elements in parallel.
- Architecture making use of CAM units for speeding up retrieval.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Internal architecture of CAM, PAM	G11C 15/00
Use of CAM for routing and flow control of packets in data switching networks	H04L 45/00, H04L 47/10

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

CAM	Content Addressable Memory
PAM	Parallel Associative Memory

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G06F 16/90344

{by using string matching techniques}

Definition statement

This place covers:

Retrieval of data by using string matching, e.g. using finite state machines or genetic algorithms.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Orthographic correction	G06F 40/232
Sequence comparison in bioinformatics	G16B 30/00
String matching used for packet routing in packet switching systems	H04L 45/00

G06F 16/90348

{by searching ordered data, e.g. alpha-numerically ordered data}

Definition statement

This place covers:

Searching dictionaries or (alpha-numerically) ordered lists; includes taking advantage on the ordering for binary or simple sequential access.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Sequence comparison in bioinformatics	G16B 30/00

G06F 16/904

Browsing; Visualisation therefor (for navigating the web G06F 16/954; browsing optimisation for the web G06F 16/957)

Definition statement

This place covers:

- Navigating/Browsing a set of generic items (consumer products, homes, wallpaper patterns) using operations like "more of this" and "less of that".
- 3D-based approach of browsing through data items corresponding to files or folders.

References

Limiting references

This place does not cover:

For navigating the web	G06F 16/954
Browsing optimisation for the web	G06F 16/957

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G06F 16/907

Retrieval characterised by using metadata, e.g. metadata not derived from the content or metadata generated manually

Special rules of classification

Documents describing retrieval of arbitrary data types based on a specific type of metadata in addition may be classified in the group corresponding to the data type used for the retrieval, depending on the level of disclosed details concerning the data type used for retrieval.

G06F 16/93

Document management systems

Definition statement

This place covers:

- Organisation of collections of digital documents (scanned, OCRed, semi-structured or unstructured representation) in document library databases.
- Retrieval of digital representations of documents.
- Techniques for associating physical paper documents with their digital representation as stored in a database, e.g. by attaching barcodes to documents.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Retrieval of unstructured textual data	G06F 16/30
Retrieval of image data	G06F 16/50
Retrieval of semi-structured data	G06F 16/80

G06F 16/94

{Hypermedia (Hyperlinking G06F 40/134)}

Definition statement

This place covers:

- Systems and methods for hyperlinking in documents.
- Computed links, including dynamically determined anchor and targets of links.
- Management of annotations linked to other documents.

References

Limiting references

This place does not cover:

Hyperlinking	G06F 40/134

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Navigation in hyperlinked Web environments	G06F 16/954

G06F 16/95

Retrieval from the web

Definition statement

This place covers:

- Systems and methods for browsing and retrieving information on the web.
- Aspects in subgroups that deal with search engines specifics (e.g. crawling, indexing, search personalisation), web navigation, web site management (e.g. content collection, organisation and management of web sites, publication of same) and browsing optimisations (e.g. for quicker access or adequate visualisation).

Relationships with other classification places

Close relationship with H04L 65/40 and H04L 67/00, especially due to particulars in OSI model's level 7: application layer.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Web site advertisement	G06Q 30/00
Cryptographic protocols; Financial cryptography	H04L 9/00
Routing of packets, address resolution in data networks	H04L 61/00
Network security protocols	H04L 63/00
Protocols for real-time services in data packet switching networks	H04L 65/00
Network protocols for data switching network services	H04L 67/00
Implementation or adaptation of Internet protocol [IP], of transmission control protocol [TCP] or of user datagram protocol [UDP]	H04L 69/16

G06F 16/951

Indexing; Web crawling techniques

Definition statement

This place covers:

- Systems and methods for collecting, organising or managing indexation of information originating from more than one data source in order to support keyword based searching.
- Web retrieval techniques dealing specifically with the nature of the web:
- Heterogeneity of data, users and devices.
- Large number of documents and users.
- Lack of detailed knowledge about the data sources.
- Specific web retrieval techniques such as:
- Crawling techniques to discover/navigate sites and document hyperlinks.

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- Meta-search engines:
- Remote systems interactions for web retrieval purposes, e.g. distributed and remote indexing of web content.
- Handling documents in different languages.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Text content indexation	G06F 16/31

Special rules of classification

Local, keyword-based search engines should be classified in the appropriate subgroups according to the retrieved type of data; for example, if dealing with: unstructured text, see G06F 16/30.

G06F 16/9535

Search customisation based on user profiles and personalisation

Definition statement

This place covers:

- Techniques to select the information conveyed to the user during his retrieval session, usually in complement to an explicit user query request.
- Personalisation of queries and/or of returned results.

Facets which include:

- Censoring by filtering documents (e.g. by keyword or objectionable images).
- Using inclusive/exclusive lists of sites/pages to define viewable content.
- Sharing user profile knowledge or identifying common interests to identify relevant information.
- Systems using a single user profile to filter information or enhance query.
- Aggregation of information (personalised online newspapers).
- User navigation monitoring to identify user interests and consequent query refinement.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

When censoring comprises modifying the content	G06F 16/9577
Filtering pages containing malware, virus or phishing attempts	G06F 21/56, H04L 63/00
Recommendation not directed at the retrieval of documents, but rather to items for sale, or "friends" (e.g. social matchmaking)	G06Q
Personalisation for targeted marketing or advertisement	G06Q 30/00

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G06F 16/9537

Spatial or temporal dependent retrieval, e.g. spatiotemporal queries

Definition statement

This place covers:

- Methods and systems where the client accessing a web site conveys somehow localization or temporal information that is used then to personalise queries and/or results.
- Methods and systems where web content indexation involves localization information (spatial information).
- Integration of geographic (spatial) information in Web pages with other information.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Messaging using geographical location information	H04L 51/222
Network protocols in which the network application is adapted for the location of the user terminal	H04L 67/52
Services or facilities specially adapted for wireless communication network making use of the locations of the users	H04W 4/02

G06F 16/954

Navigation, e.g. using categorised browsing

Definition statement

This place covers:

- Interactive ways to help the user in recognising desired information in web sites/web pages.
- Methods and systems to help an interactive navigation within the document space on the web, in a search narrowing approach, including providing suggestions of pages to visit which appear relevant to the user's search path.
- Methods and systems whereby visual cues typically are provided to show existing relationships among documents or to provide a document space visualisation.
- Passive browsing, guided tours, wherein a list of web pages to visit is prepared in advance or automatically devised.

Examples:

- Methods can be based on a classification or clustering approach to organise the documents.
- Categorised browsing, portals, virtual worlds' tours or visual networks of documents.
- Using a query to select a starting point for navigation, showing how the returned documents relate to each other.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Document hyperlinking per se, computed links	G06F 16/94
Returning a document set as a result of a query	G06F 16/951

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G06F 16/955

using information identifiers, e.g. uniform resource locators [URL]

Definition statement

This place covers:

Cases where the user already has an identifier for the information he wants to retrieve. Typically, the identifier is a product code or a bookmark. The general idea is that the user does not have to blindly search for the information.

G06F 16/9554

{by using bar codes}

Definition statement

This place covers:

- Use of a barcode reader (e.g. to read a UPC code or even a URL printed on a product) connected to a computer with a browser which fetches the relevant information on the Internet.
- Also systems wherein the user inputs the product code directly in a browser link field.

Facets:

- The code can be a direct URL or one that needs to be first resolved in an intermediary server.
- The code can further comprise commands or information used for personalising the search.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Details of bar codes and readers per se	G06K 19/00

G06F 16/9558

{Details of hyperlinks; Management of linked annotations}

Definition statement

This place covers:

- Details of hyperlinking in hypertext.
- Computed links, including dynamically determined anchor and targets of links.
- Management of annotations linked to other hypertext.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Navigation in hyperlinked web environments	G06F 16/954

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G06F 16/9562

{Bookmark management}

Definition statement

This place covers:

- Methods and systems whereby the browser bookmarks are used to reference, organise, classify and access information.
- Local or central bookmark storage, managed by an individual or an organisation.
- Related management functions such as: replace in bulk, share bookmarks, detect broken links, add comments for later reference, extract from files, enhance visual aspect (e.g. icons, colours for easier recognition), automatic extraction (from pages), classification, etc.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Bookmarks	Represent information already identified as relevant for the user; they are user oriented and they represent information of interest already identified.
Portals	Present a way for information yet to be discovered, and they are not specific to a user.

G06F 16/9566

{URL specific, e.g. using aliases, detecting broken or misspelled links}

Definition statement

This place covers:

- Variations of URLs in order to facilitate or simplify the access to the information (e.g. alias in non-Latin characters, tiny URLs).
- These URLs can refer to existing documents but also to virtual pages created at access-time or accessing transparently other links.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Address allocation to terminals or nodes connected to a network	H04L 61/00
Use of aliases or nicknames in arrangement for managing network naming	H04L 61/30
Addressing or naming in networks with short addresses	H04L 2101/672

G06F 16/957

Browsing optimisation, e.g. caching or content distillation

Definition statement

This place covers:

Optimisations in the browsing process concerned with faster or simpler access to information.

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Improvements that enhance or simplify the understanding of data or the visualization of data on the user's device. These include among others:

- Identifying changes in pages or sections of pages.
- Combined printing of web documents; for example, several web pages forming a single document.
- Combined access to CD-ROM information with internet browsing.
- Using specific data viewers (e.g. Mime dependent).
- In general, improvements with the browsing process.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Voice browsers, e.g. interpreting VoiceXML, for providing telephonic information services	H04M 3/4938

G06F 16/9574

{of access to content, e.g. by caching}

Definition statement

This place covers:

- Ways to speed up access to information on the Internet, typically, via caching and/or prefetching.
- Content dissemination systems.
- Look-ahead (Web) caching.
- Caching static and/or all of portions of dynamic data.
- Caching or hoarding of Web content on local removable storage (CDs, DVDs, USB keys) for later browsing.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Accessing, addressing or allocating within memory systems and caches	G06F 12/08
Network arrangements for storing temporarily data at an intermediate stage, e.g. caching	H04L 67/568

Special rules of classification

The type of caching referred to in this group usually occurs at an application level; it is content aware, meaning that the system has some knowledge about the data content and will decide what and how to cache it based on this content.

This is opposed to system level caching, where the data content is transparent to the cache.

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G06F 16/9577

{Optimising the visualization of content, e.g. distillation of HTML documents}

Definition statement

This place covers:

- Methods and systems manipulating web page content (e.g. HTML) for the purpose of changing the presentation of a page, in order to enhance the comprehension or visual rendering of its content.
- Adapting content for providing support to devices with various displays (e.g. PDA small screen).
- Reorganizing or simplifying the page layout.
- Using user profiles or templates to create or change the page presentation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Web page authoring	G06F 40/00
Manipulation for advertisement or marketing purposes	G06Q 30/00
Message adaptation based on network or terminal capabilities	H04L 51/06
Protocols for network applications adapted for terminals or networks with limited resources and for terminal portability	H04L 67/04
Arrangements for conversion or adaptation of application content or format	H04L 67/565

Special rules of classification

While the manipulation of navigation items in a Web page (e.g. hyperlinks) to simplify browsing (for example associating a visible numerical code to links on a page and allowing keying in the code instead of activating the link with a pointer device) pertains to this group, document navigation techniques themselves should be classified in G06F 16/954.

May also include simple cases of document summarisation (priority to G06F 16/30) as long as the goal is page visualisation and not to be used for the purpose of document indexation. Typically uses an HTML parser (for parsing techniques used in software development see G06F 8/427). Format conversions not presentation dependent or related are classified in G06F 16/1794.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Distillation	Process of reducing the amount of information before delivery, in particular to eliminate information which cannot be rendered on the end device (colour on a black and white screen or downscaling of images in a Web page for a small screen)

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G06F 16/958

Organisation or management of web site content, e.g. publishing, maintaining pages or automatic linking

Definition statement

This place covers:

Organisation or management of web sites: how data is collected, stored and organised in a server, and how the information is published (e.g. dynamic web page servers) and made available or sent to users such as:

- Creation of site maps
- Registration of sites/pages in search engines
- Link organisation and maintenance
- Push channels, syndication and subscription systems
- Web CMS (Content Management Systems) repositories

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Web page authoring	G06F 40/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

ASP	Active Server Page: Microsoft Tool for dynamically serving Web pages
JSP	Java Server Page: Java tools for dynamically serving Web pages

G06F 16/972

{Access to data in other repository systems, e.g. legacy data or dynamic Web page generation}

Definition statement

This place covers:

- Documents concerned with technologies to support the access to data in proprietary or legacy systems from the Internet.
- Systems and methods to translate, offline or on the fly, proprietary formats to the open standards of the Internet.
- Dynamic page creation from legacy system.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

File format conversion	G06F 16/1794
Tree transformation in markup documents, XSLT	G06F 40/154

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G06F 16/986

{Document structures and storage, e.g. HTML extensions}

Definition statement

This place covers:

- The way documents are represented and their structures are used.
- Extensions to or special uses of the HTML coding language.

G06F 17/10

Complex mathematical operations {(function generation by table look-up G06F 1/03; evaluation of elementary functions by calculation G06F 7/544)}

Definition statement

This place covers:

Algorithms for:

- performing complex mathematical operations (e.g. matrix-vector multiplication G06F 17/16, discrete Fourier transform G06F 17/141);
- solving generic mathematical problems (e.g. system of linear equations G06F 17/12);
- manipulating mathematical objects (e.g. matrix factorization G06F 17/16);

evaluating complex mathematical functions (e.g. by interpolation of known function values G06F 17/17);

- computing statistical descriptions of data sets (e.g. histogram computation G06F 17/18)
- mathematical analysis of data not provided elsewhere (e.g. mathematical spectral analysis algorithms based on the discrete Fourier transform G06F 17/141)and the implementation of such algorithms
- as computer programs (for general-purpose digital processors), eventually with specially adapted data structures for storing the mathematical objects upon which the operations are performed (e.g. specific matrix storage formats), or
- as dedicated digital hardware circuits, described on the level of adders, subtractors, multiplexers, etc.

The groups in G06F 17/10 are function-oriented and are intended to cover mathematical methods and devices which are in principle not tied to a particular application field.

To be classified in G06F 17/10 and subgroups, a document should not merely disclose how a (technical) problem in an application field is reduced to a particular mathematical problem (e.g. a particular set of equations) but it must also disclose details of the mathematical algorithm used to solve this particular mathematical problem. Furthermore, the mathematical problem and/or the mathematical algorithm used to solve it should also be sufficiently generic in the sense that they may be relevant outside the particular application field (even if this fact is not mentioned in the document itself).

Subject-matter classified in group G06F 17/10 itself (because it does not fall in any of the subgroups) includes among others:

- Numerical computation of the derivative of a function;
- Numerical integration of a function, e.g. Using monte-carlo methodology;
- Methods enabling symbolic mathematical calculations, e.g. In computer algebra systems;
- Graph algorithms not classified elsewhere.

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Relationships with other classification places

When a document discloses a mathematical algorithm applied in a particular application field, classification in the relevant application-related group(s) should also be considered.

References

Limiting references

This place does not cover:

Function generation working, at least partially, by table look-up	G06F 1/03
Computational arithmetic, e.g.number representation systems (e.g. conversion between number formats, rounding issues in fixed-point / floating-point arithmetic)implementation of arithmetic operations (addition, subtraction, multiplication, division), also for complex numbers (e.g. using CORDIC)	G06F 7/00
Evaluation of elementary functions (e.g. trigonometric functions, power, roots, logarithmic and exponential functions) by calculation	G06F 7/544
Arithmetic circuits for sum of products per se, e.g. multiply-accumulators (MACs)	G06F 7/5443
Arithmetic logic units (ALUs)	G06F 7/57
Generation of random or pseudo-random numbers	G06F 7/58
Digital differential analysers	G06F 7/64
Computational residue arithmetic, e.g. modular inversion or exponentiation;computational elliptic curve arithmetic	G06F 7/72
Basic logic circuits (e.g. AND, NAND, OR)	H03K 19/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pattern recognition	G06F 18/00
Computer-aided design and simulation	G06F 30/00
Reservoir modelling	E21B 49/00
Geophysics, seismic data analysis	G01V 1/28
Neural networks	G06N 3/02
Genetic algorithms	G06N 3/126
Computer systems using knowledge base models	G06N 5/00
Computer systems based on specific mathematical models	G06N 7/00
Probabilistic networks, e.g. Bayesian networks	G06N 7/01
Using fuzzy logic	G06N 7/02
Image processing	G06T
Digital filters	H03H 17/00
Data compression in general	H03M 7/30
Coding/decoding in general	H03M 13/00
Decoding based on Viterbi algorithm	H03M 13/41

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Special rules of classification

A document disclosing a device which is configurable to perform several complex mathematical operations (e.g. a circuit configurable to perform either a DFT or a convolution operation) is to be classified in the relevant groups (G06F 17/141 and G06F 17/15) if the document discloses details of the computations which are specific to the different mathematical operations. However, if no such details are provided, the document is to be classified only in the broadest group covering these operations. For example, a document disclosing a circuit able to perform any linear transform, including DFT and DCT, without providing details specific to the DFT or DCT computations, is to be classified only in G06F 17/14.

G06F 17/11

for solving equations {, e.g. nonlinear equations, general mathematical optimization problems (optimization specially adapted for a specific administrative, business or logistic context G06Q 10/04)}

Definition statement

This place covers:

- Solving non-linear equations (e.g. By iterative methods)
- Mathematical algorithms for solving general mathematical optimization problems (e.g. Linear, non-linear, mixed-integer or combinatorial optimization problems)

Relationships with other classification places

The use of mathematical optimization to solve a problem in an administrative, business or logistic context is usually classified in G06Q 10/04. However, if the document provides also details regarding the mathematical algorithm used for solving the resulting mathematical optimization problem and if the mathematical optimization problem and/or the mathematical algorithm are sufficiently generic (i.e. if they may be relevant outside the particular application context), the document should also be classified in G06F 17/11.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Computer-aided design, e.g. circuit design, network design	G06F 30/00
Dynamic search techniques, heuristics, branch-and-bound used in computer systems utilising knowledge based models	G06N 5/01
Optimization specially adapted for a specific administrative, business or logistic context	G06Q 10/04

G06F 17/12

Simultaneous equations {, e.g. systems of linear equations}

Definition statement

This place covers:

Methods for solving systems of linear equations Ax=b, e.g. by direct or iterative methods.

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Special rules of classification

Details of matrix factorization algorithms or matrix storage formats used in the context of a specific method for solving a system of linear equations are additionally classified in G06F 17/16 if they are per se relevant.

G06F 17/13

Differential equations (using digital differential analysers G06F 7/64)

Definition statement

This place covers:

- Solving ordinary or partial differential equations.
- Qualitative analysis of dynamical systems, e.g. Determining attractors.

References

Limiting references

This place does not cover:

Solving differential equations using digital differential analysers	G06F 7/64

Informative references

Attention is drawn to the following places, which may be of interest for search:

Computer-aided design	G06F 30/00
Simulation using finite difference or finite element methods	G06F 30/23
Adaptive control systems	G05B 13/00
Creation and adaptation of a mathematical model used to control a system	G05B 17/00

G06F 17/14

Fourier, Walsh or analogous domain transformations {, e.g. Laplace, Hilbert, Karhunen-Loeve, transforms (for correlation function computation G06F 17/156; spectrum analysers G01R 23/16)}

Definition statement

This place covers:

- Efficient computation of domain transforms
- By extension, G06F 17/14 and its subgroups (in particular G06F 17/141 and G06F 17/148) do also include
- General mathematical algorithms for spectral analysis based on a domain transform (e.g. a method for DFT resolution enhancement by zero-padding is classified in G06F 17/141)
- Domain transforms not covered by its subgroups, e.g. Laplace, Hilbert or Karhunen-Loève transforms. It does also cover devices enabling computation of broad classes of domain transforms.

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References

Limiting references

This place does not cover:

Correlation function computation using a domain transform	G06F 17/156
Spectral and Fourier analysis devices, e.g. digital spectrum analysers, in which the focus is on the electrical signal measurement apparatus and not on a mathematical spectral analysis algorithm	G01R 23/16
Frequency selective networks using specific transformation algorithms	H03H 17/0211

G06F 17/141

{Discrete Fourier transforms}

Definition statement

This place covers:

- Discrete Fourier Transform (DFT) computation, e.g. partial DFT, Goerzel method, recursive DFT computation, short-time DFT

Fast Fourier Transform (FFT) and Prime Factor algorithms for computing the DFT and corresponding devices are classified in subgroups.

By extension, G06F 17/141 also includes:

- general mathematical algorithms for spectral analysis based on the DFT, e.g. DFT resolution enhancement by zero-padding

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multi-carrier modulation systems	H04L 27/2601
Inverse Fourier transform modulators	H04L 27/2628
IFFT/IDFT in combination with other circuits for modulation	H04L 27/2634
Fourier transform demodulators	H04L 27/265

G06F 17/142

{Fast Fourier transforms, e.g. using a Cooley-Tukey type algorithm}

Definition statement

This place covers:

- DFT computation by means of a Fast Fourier Transform (FFT) algorithm, e.g. Cooley-Tukey or mixed-radix type
- processing elements specially adapted for FFT butterfly operations
- memory addressing schemes specially adapted for FFT computation

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G06F 17/144

{Prime factor Fourier transforms, e.g. Winograd transforms, number theoretic transforms}

Definition statement

This place covers:

- prime factor algorithm (PFA) or Good-Thomas algorithm
- Winograd Fourier transform algorithm (WFTA)

G06F 17/145

{Square transforms, e.g. Hadamard, Walsh, Haar, Hough, Slant transforms}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Direct-sequence spread-spectrum techniques, e.g. CDMA	H04B 1/707

G06F 17/147

{Discrete orthonormal transforms, e.g. discrete cosine transform, discrete sine transform, and variations therefrom, e.g. modified discrete cosine transform, integer transforms approximating the discrete cosine transform (G06F 17/145 takes precedence)}

Definition statement

This place covers:

- Discrete Cosine Transform (DCT)
- Discrete Sine Transform (DST)
- Modified Discrete Cosine Transform (MDCT)
- Integer transforms approximating the DCT, e.g. IntDCT

References

Limiting references

This place does not cover:

Square transforms, e.g. Hadamard transform	G06F 17/145

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coding or decoding of speech or audio signals	G10L 19/00
Discrete cosine transform modulators in multi-carrier modulation systems	H04L 27/2639
Transform-based video coding	H04N 19/60
The transform being DCT	H04N 19/625

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G06F 17/148

{Wavelet transforms}

Definition statement

This place covers:

- Fast Wavelet Transform.
- Integer Wavelet Transform.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Transform-based video coding, the transform being sub-band based, e.g. wavelets	H04N 19/63

G06F 17/15

Correlation function computation {including computation of convolution operations (arithmetic circuits for sum of products per se, e.g. multiply-accumulators G06F 7/5443; digital filters, e.g. FIR, IIR, adaptive filters H03H 17/00)}

Definition statement

This place covers:

- Correlation computations, e.g. Sliding correlation, cross-correlation, auto-correlation
- Convolution operations

References

Limiting references

This place does not cover:

Arithmetic circuits for sum of products per se, e.g. multiply-accumulators (MACs)	G06F 7/5443

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pattern recognition	G06F 18/00
Convolution neural network	G06N 3/02
Digital filters, e.g. FIR, IIR, adaptive filters	H03H 17/00
Direct-sequence spread-spectrum techniques, e.g. CDMA	H04B 1/707

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G06F 17/153

{Multidimensional correlation or convolution}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Convolution neural network	G06N 3/02
Image enhancement, e.g. noise filtering, using multidimensional convolution operations	G06T 5/00

G06F 17/156

{using a domain transform, e.g. Fourier transform, polynomial transform, number theoretic transform}

Definition statement

This place covers:

FFT-based correlation and convolution.

G06F 17/16

Matrix or vector computation {, e.g. matrix-matrix or matrix-vector multiplication, matrix factorization (matrix transposition G06F 7/78)}

Definition statement

This place covers:

- Matrix-matrix multiplication
- Matrix-vector multiplication
- Vector product, dot product computation
- Matrix inversion
- Matrix factorization, e.g. Svd, lu, qr, cholesky decompositions
- Matrix storage formats, e.g. For sparse matrices
- Software and hardware implementations thereof, e.g. a systolic array specially adapted for QR decomposition.

References

Limiting references

This place does not cover:

Matrix transposition	G06F 7/78

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for executing machine-instructions	G06F 9/30
To perform operations on data operands, e.g. arithmetic instructions	G06F 9/30007

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Concurrent instruction execution using a plurality of independent parallel functional units, e.g. SIMD, MIMD	G06F 9/3885
Architecture of general-purpose stored program computer	G06F 15/76
Reconfigurable architectures	G06F 15/7867
Architectures comprising an array of processing units, e.g. single instruction multiple data (SIMD) processors	G06F 15/80
Systolic arrays	G06F 15/8046
Vector processors	G06F 15/8053
Solving simultaneous equations, e.g. systems of linear equations	G06F 17/12

G06F 17/17

Function evaluation by approximation methods, e.g. inter- or extrapolation, smoothing, least mean square method ({G06F 17/18 takes precedence } ; interpolation for numerical control G05B 19/18)

References

Limiting references

This place does not cover:

Evaluating statistical data, e.g. function fitting based on least-mean squares method	G06F 17/18
Interpolation for numerical control	G05B 19/18

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital function generation working, at least partially, by table look-up; reduction of look-up table size	G06F 1/03

G06F 17/175

{of multidimensional data}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Geometric Image transformation, e.g. interpolation-based scaling	G06T 3/00

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G06F 17/18

for evaluating statistical data {, e.g. average values, frequency distributions, probability functions, regression analysis (forecasting specially adapted for a specific administrative, business or logistic context G06Q 10/04)}

Definition statement

This place covers:

- Computing the (running) average of a set of data.
- Computation of confidence intervals.
- Computing a probability density function, e.g. An histogram, for a set of data.
- Regression analysis, e.g. Least-mean square methods for fitting a function to statistical data.
- General statistical analysis methods not covered elsewhere.

References

Limiting references

This place does not cover:

Computing the maximum, minimum or median value of a set of data	G06F 7/22

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pattern recognition using clustering techniques	G06F 18/21
Forecasting specially adapted for a specific administrative, business or logistic context	G06Q 10/04
Bioinformatics	G16B
Healthcare informatics	G16H

G06F 17/40

Data acquisition and logging (for input to computer G06F 3/00)

Definition statement

This place covers:

Logging and acquisition of digital data.

Data logging, the act of storing and possibly organising collected data in such a way that some (temporal) ordering between the data is kept.

Log processing that is independent of the semantics of the log content.

Relationships with other classification places

In case the representation of the data is changed during the act of storing, this change process is considered data conversion. Data conversion in general, i.e. whereby the same information is represented with a different sequence or number of digits is classified in H03M 7/00.

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References

Limiting references

This place does not cover:

Input arrangements for transferring data to be processed into a form capable of being handled by the computer	G06F 3/00

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Error or fault reporting or storing in computer systems	G06F 11/0766
Logging of test results	G06F 11/2268
Monitoring of computer systems	G06F 11/30
Flight recorders and related data acquisition	B64D 45/00
Storage of video surveillance data	G08B 13/19665
Arrangements monitoring consumption of a utility or use of an appliance which consumes a utility to detect unsafe condition, e.g. metering of water, gas or electricity, use of taps, toilet flush, gas stove or electric kettle	G08B 21/0484
Data acquisition and logging in alarm systems	G08B 25/00, G08B 26/00
Management of faults or events or alarms in packet switching networks involving network fault data acquisition and logging	H04L 41/06
Arrangements for monitoring packet switching networks involving capturing and processing of network packets	H04L 43/00
Scanning of documents	H04N 1/00
Arrangements in telecontrol or telemetry systems for selectively calling a substation from a main station, in which substation desired apparatus is selected for obtaining measured values therefrom	H04Q 9/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital input using the sampling of an analogue quantity at regular intervals of time	G06F 3/05
Reading record carriers	G06K 7/00
Record carriers as such	G06K 19/00
Conversion of a code in general, e.g. compression of data	H03M 7/00

Special rules of classification

Data acquisition normally always is linked to a particular application in the form of specifying what data is being acquired or from what entity data is being acquired and must be classified with those applications.

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G06F 18/00

Pattern recognition

Definition statement

This place covers:

Pattern recognition techniques in general.

These include in particular:

- Pre-processing, data cleansing;
- Analysing;
- Post-processing;
- Software arrangements specially adapted for pattern recognition;
- Pattern recognition of signals other than images or video.

Note:

Pattern recognition refers to the automated recognition of patterns and regularities in data and includes using statistical or machine learning techniques to solve problems such as authentication, identification, classification or clustering.

Relationships with other classification places

Systems and methods for retrieving digital information stored in databases, data repositories or file systems, locally or remotely, retrieving structured data, semi-structured data, text, audio, image, video or multimedia data from databases, or for managing document libraries are classified in group G06F 16/00.

Higher-level interpretation and recognition of images or videos, which includes pattern recognition, pattern learning and semantic interpretation as fundamental aspects, are classified in subclass G06V. These aspects involve the detection, categorisation, identification and authentication of image or video patterns by acquiring, pre-processing, extracting distinctive features or matching, supervised or unsupervised clustering or classification of these features or representations derived from them leading to one or several decisions, related confidence values (e.g. probabilities) or classification/ clustering labels, for explanatory purposes or to derive a certain meaning.

Computing systems where the computation is not based on a traditional mathematical model or computer, for example neural network architectures, are classified in subclass G06N. In particular, techniques for machine learning are covered by group G06N 20/00.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Data processing for commercial or financial purposes	G06Q
Image or video recognition or understanding	G06V
Bioinformatics	G16B
Chemoinformatics and computational material science	G16C
Healthcare informatics	G16H

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Content-based image retrieval	G06F 16/50
Fourier, Walsh or analogous domain transformations	G06F 17/14
Matrix or vector computation	G06F 17/16
Security arrangements for protecting computer systems against unauthorised activity	G06F 21/00
Authentication of user input in security arrangements for computers	G06F 21/31
Computer-aided design	G06F 30/00
Handling natural language data	G06F 40/00
Control or regulating systems in general	G05B
Speech recognition	G10L 15/00
Speaker recognition	G10L 17/00
Secret or secure communication	H04L 9/00

Special rules of classification

This main group covers functional aspects of pattern recognition, i.e. algorithms or computer systems specifically designed therefor, regardless of a particular application and, therefore, of any particular type of data. In this group, it is desirable to add the indexing codes of group G06F 2123/00.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Authentication	Verifying the identity of a sample using a test of genuineness. It generally involves a one-to-one comparison with the genuine (authentic) sample.
Categorisation	Assigning a data sample to a class according to certain distinguishing properties (or characteristics) of that class, and it generally involves a one-to-many test in which one data sample is compared with the characteristics of several classes.
Classification	Assigning labels to patterns.
Clustering	Grouping data samples in groups or classes based on their properties (or characteristics) and it generally involves a many-to-many (dis)similarity test. Grouping or separating patterns according to their closeness or dissimilarity.
Feature extraction	Deriving descriptive or quantitative measures from data.
Identification	In the context of collecting of data samples, identification means selecting a particular sample having a (predefined) characteristic which distinguishes it from the others. Several data samples are generally matched against the characteristic sample in a many-to-one process.
Pattern patterns	Data having characteristic regularity, or a representation derived from it, having some explanatory value or being able to provide an interpretation.

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G06F 18/10

Pre-processing; Data cleansing

Definition statement

This place covers:

Removing bad data or interpolating missing values, finding hidden correlations in the data, identifying sources of data that are the most accurate and determining which data items are the most appropriate for use in analysis.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Improving data quality; Data cleansing, e.g. de-duplication, removing invalid entries or correcting typographical errors	G06F 16/215
Complex mathematical operations for evaluating statistical data	G06F 17/18
Single-class perspective, e.g. one-against-all classification; Novelty detection; Outlier detection	G06F 18/2433

G06F 18/20

Analysing

Definition statement

This place covers:

Extraction of features.

Matching criteria.

Clustering techniques.

Classification techniques.

Fusion techniques.

Discovering frequent patterns.

Regression.

Determining representative reference patterns.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Arrangements for image or video recognition or understanding	G06V 10/00
ICT specially adapted for biostatistics; ICT specially adapted for bioinformatics-related machine learning or data mining, e.g. knowledge discovery or pattern finding	G16B 40/00
Machine learning, data mining or chemometrics for chemoinformatics	G16C 20/70

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ICT specially adapted for computer-aided diagnosis, e.g. based on medical expert systems	G16H 50/20

Informative references

Attention is drawn to the following places, which may be of interest for search:

Image analysis	G06T 7/00

G06F 18/211

Selection of the most significant subset of features

Definition statement

This place covers:

Feature selection by using evolutionary computational techniques, e.g. genetic algorithms.

Feature selection by ranking or filtering the set of features, e.g. using a measure of variance or of feature cross-correlation.

Feature selection by evaluating class separability based on distance or (dis)similarity measures between (sub)sets of data samples. The intention for adopting distance metrics defined on features is to embed objects belonging to the same class, i.e. small intraclass distances, while embedding objects of different classes far away from each other in different classes, i.e. large interclass distances.

The processing can be iterative and, starting with no samples, it can successively include data samples by evaluating a model fit criterion, i.e. "forward" selection, or starting with all the samples and successively delete samples by evaluating a model fit criterion, i.e. backward elimination.

G06F 18/2115

by evaluating different subsets according to an optimisation criterion, e.g. class separability, forward selection or backward elimination

Definition statement

This place covers:

Finding a set of features that are effective for classification, and determining whether the resulting features or feature dimensions are the most powerful for classification, e.g. such as class separability.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Organisation of the matching processes	G06V 10/75
Organisation of the matching processes for character recognition or recognising digital ink or document-oriented image-based pattern recognition	G06V 30/19

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G06F 18/2133

based on naturality criteria, e.g. with non-negative factorisation or negative correlation

Definition statement

This place covers:

The matrix factorisation to ensure the non-negativity of the elements in the obtained matrix factors and, at the same time, nonlinear dimensionality reduction, i.e. non-negative factorisation, in order to prevent the negative elements of the selected feature subset from being contrary to the physical reality.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Complex mathematical operations for evaluating statistical data	G06F 17/18

G06F 18/214

Generating training patterns; Bootstrap methods, e.g. bagging or boosting

Definition statement

This place covers:

Techniques for generating training patterns which are generally intended to improve the performance of a pattern recognition system in cases where the data representative of a certain observation/event is scarce. This can be achieved by generating new training sets by sampling the original data set, replacement of some of its data or creation of new data, as in bootstrapping.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Generating sets of training patterns; Bootstrap methods, e.g. bagging or boosting	G06V 10/774

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ensemble learning	G06N 20/20

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G06F 18/22

Matching criteria, e.g. proximity measures

Definition statement

This place covers:

Matching which involves comparison of data values, combinations thereof or features derived from them, in which one entity is considered as a template pattern and the other is the input pattern (template matching). The matching process might involve transforming the patterns to accommodate for distortions.

The proximity measures used during matching may include classical distances, such as Euclidian distances, or more involved distances, divergences or other measures between probability density functions [PDF] or other statistical representations (e.g. mean, standard deviation, moments, kurtosis or Chi-square distance), for instance:

- Kullback-Leibler divergence;
- Mutual Information;
- Bhattacharyya distance;
- Hamming distance;
- Earth mover, Wasserstein distance
- Chi-square distance;
- Hellinger distance.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Image or video pattern matching; Proximity measures in feature spaces	G06V 10/74
Organisation of the matching processes	G06V 10/75
Organisation of the matching processes for character recognition or recognising digital ink or document-oriented image-based pattern recognition	G06V 30/19

G06F 18/23

Clustering techniques

Definition statement

This place covers:

Techniques of grouping patterns together in order to reveal a certain structure or a meaning. These techniques aim at identifying different groups of similar entities by assigning them to a group (cluster) according to a measure of their similarity or, on the opposite, identify dissimilar items to split them into different groups. Separability is determined by measuring the similarity/dissimilarity, mostly to minimise the intra-cluster variations while maximising the inter-cluster ones. This is usually performed in a high-dimensional feature space constructed by extracting features, but can also be performed in the original domain.

Any pattern may belong exclusively to a single cluster (hard clustering) or it may belong simultaneously to more than one cluster up to a certain degree (fuzzy clustering) according to a proximity measure that may determine similarity or dissimilarity. Depending on the clustering method

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used, proximity may be defined (a) between vectors, (b) between a vector and a set of vectors (or a cluster), and (c) between sets of vectors (or different clusters).

Examples of proximity measures are: dissimilarity measures (based on l_1, l_2, and l_∞ norms), similarity measures (inner product, cosine, Pearson's correlation coefficient, Tanimoto distance, etc.).

Different clustering algorithms include:

a) clustering based on statistical measures (which mainly employ numerical data) which adopt a cost function J related to possible groupings which is subject to a global or local optimisation criterion, and return a clustering that optimises J. Examples of algorithms are:

- Hard clustering algorithms, where a vector belongs exclusively to a specific cluster, e.g. k-means, k-medoids, Linde-Buzo-Gray, ISODATA, DBSCAN or Neural Gas;
- Fuzzy clustering algorithms, where a vector belongs to a specific cluster up to a certain degree, e.g. fuzzy c-means, Adaptive Fuzzy C-Shells [AFCS], Fuzzy C Quadric Shells [FCQS] or Modified Fuzzy C Quadric Shells [MFCQS];
- Probabilistic clustering algorithms, which follow Bayesian classification arguments and in which each vector is assigned to the cluster according to a probabilistic set-up, e.g. Expectation-Maximization [EM], Gaussian Mixture Model [GMM] or Mean-Shift;

b) graph-based clustering, e.g. minimum spanning tree [MST] clustering, clustering based on directed trees, spectral clustering or graph-cut optimisation;

c) Competitive learning algorithms for clustering in which a set of representatives is selected and the goal is to move each of them to regions of the vector space that are "dense" in terms of other vectors. Examples are leaky learning algorithm, Self-Organizing Maps [SOM] or Learning Vector Quantization [LVQ].

Hierarchical clustering is one of the popular techniques from the class of graph-based clustering, with its agglomerative or divisive variants. Various criteria can be used for determining the groupings, such as those based on matrix theory involving dissimilarity matrices. Algorithms included in this scheme are:

- Single link algorithm;
- Complete link algorithm;
- Weighted Pair Group Method Average [WPGMA];
- Unweighted Pair Group Method Average [UPGMA];
- Weighted Pair Group Method Centroid [WPGMC];
- Ward or minimum variance algorithm.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Information retrieval of still images; Clustering; Classification	G06F 16/55
Information retrieval of video data; Clustering; Classification	G06F 16/75
Image or video recognition or understanding using clustering, e.g. of similar faces in social networks	G06V 10/762

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

AFC	Adaptive Fuzzy Clustering

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AO	Alternative Optimisation
CCM	Compatible Cluster Merging
DBSCAN	Density-Based Spatial Clustering of Applications with Noise, a non-parametric clustering algorithm which does not require specifying the number of clusters in advance.
FCSS	Fuzzy C-Spherical Shells
FCV	Fuzzy C-Varieties
FHV	Fuzzy Hyper Volume
KNN	k-Nearest Neighbour; a classification algorithm which, for a given data sample, chooses the k most similar samples from a training set, retrieves their respective class labels, and assigns a class label to the data sample by majority decision; variant: 1NN, which is KNN for k=1.
LVQ	Learning Vector Quantisation

G06F 18/24

Classification techniques

Definition statement

This place covers:

Classification in general, namely identifying to which category or which set of categories (classes) a new data or some other representation originating from it belongs, on the basis of a training set of data containing observations (or instances) whose category membership is known. Often, the individual observations are analysed into a set of quantifiable properties, known as explanatory variables or features. These properties may be categorical, ordinal, integer-valued, real-valued, etc. Other classifiers perform a class assignment by comparing current observations to previous observations by means of a similarity or distance function.

A classifier can be parametric or non-parametric depending on the type of model adopted for the observations.

Classification algorithms include those:

- based on the distance between a decision surface and training patterns, e.g. support vector machines [SVM];
- based on the distance between the pattern to be recognised and some reference, where the reference can be a prototype, a centroid of samples of the same class or the closest patterns from the same class or different classes, e.g. nearest-neighbour classification;
- based on a parametric, probabilistic model, where the model uses the Neyman-Pearson lemma, likelihood ratios, Receiver Operating Characteristics [ROC], plotting the False Acceptance Rate [FAR] versus the False Rejection Rate [FRR], Bayesian classification, etc.;
- based on a graph-like or tree-like model, e.g. decision trees, random forests, etc. Examples are the Classification and Regression Trees [CART], ID3 [Iterative Dichotomiser 3], C4.5, etc.

When the decision surface of the classifier is considered, this can be a linear classifier or non-linear classifier. Linear classifiers model the boundaries between different classes in the feature space as hyperplanes. Non-linear classifiers use e.g. quadratic, polynomial, or hyperbolic functions instead.

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References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Information retrieval of still images; Clustering; Classification	G06F 16/55
Information retrieval of video data; Clustering; Classification	G06F 16/75
Image or video recognition or understanding using classification	G06V 10/764

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

CART	Classification and Regression Tree
C4.5	Classification algorithm using a decision tree
FAR	False Acceptance Rate
FRR	False Rejection Rate
Gini impurity	A measure of how often a randomly chosen element from the set would be incorrectly labeled if it was randomly labeled according to the distribution of labels in the subset; usually used at the level of the nodes of tree-based classifiers.
ID3	Iterative Dichotomiser 3, a precursor of C4.5
ROC	Receiver Operating Characteristics

G06F 18/25

Fusion techniques

Definition statement

This place covers:

Combining the information from several sources in order to form a unified data representation.

A simple fusion process combines raw data from several sources or different modalities (e.g. fusing spatial and temporal data). Besides fusing the raw data, it is also possible to first process the sensor data to extract features and then combine the extracted features into a joint feature vector. Alternatively, it is possible to fuse classification results, e.g. inputting the features from different sensor modalities to separate classifiers, receiving respective classification scores from each classifier, and combining the individual scores into a final classification result.

Examples are probabilistic fusion, statistic fusion, fuzzy reasoning fusion, fusion based on evidence and belief theory, e.g. Dempster-Shafer or fusion by voting.

Fusion can also be applied at different stages of a recognition system for different purposes, e.g. for dimensionality reduction, computing robustness, improving precision and certainty in the classification decisions, etc.

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References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Image or video recognition or understanding using fusion, i.e. combining data from various sources at the sensor level, preprocessing level, feature extraction level or classification level	G06V 10/80

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Dempster-Shafer	General framework for reasoning with uncertainty which combines evidence from different sources and arrives at a degree of belief (represented by a mathematical object called belief function) that takes into account all the available evidence.

G06F 18/27

Regression, e.g. linear or logistic regression

Definition statement

This place covers:

Pattern recognition techniques based on regression, i.e. statistical techniques for estimating the relationships between a dependent variable (often called the "outcome" or "response" variable) and one or more independent variables (often called "predictors", "covariates" or "explanatory variables"), where the variables model the underlying data.

Common forms of regression are:

- Linear regression - the model specification is that the dependent variables are a linear combination of the parameters (but need not be linear in the independent variables). The goal is to find a line (or a more complex linear combination) that most closely fits the data according to a specific mathematical criterion (e.g. by minimising the least-mean-squares criterion). For example, the method of ordinary least squares computes the unique line (or hyperplane) that minimises the sum of squared differences between the true data and that line (or hyperplane);
- Non-linear regression, e.g. polynomial, binomial, binary, logistic, multinomial logistic, etc.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Image or video recognition or understanding using regression, e.g. by projecting features on hyperplanes	G06V 10/766

Informative references

Attention is drawn to the following places, which may be of interest for search:

Complex mathematical operations for evaluating statistical data	G06F 17/18

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

LMS	Least Mean Squares
RANSAC	RANdom SAmple Consensus – an iterative algorithm for fitting a linear mathematical model such as a line or a plane through a set of points by eliminating the influence of outliers

G06F 18/40

Software arrangements specially adapted for pattern recognition, e.g. user interfaces or toolboxes therefor

Definition statement

This place covers:

Details of software arrangements specifically adapted for pattern recognition or pattern recognition of signals. These include specifically designed user interfaces or toolboxes for solving pattern recognition problems.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interaction techniques based on graphical user interfaces [GUI]	G06F 3/048
Execution arrangements for user interfaces	G06F 9/451
GUI for database retrieval, e.g. presentation of query results, browsing or visualisation therefor	G06F 16/248, G06F 16/26
ICT specially adapted for bioinformatics-related data visualisation, e.g. displaying of maps or networks	G16B 45/00
Data visualisation for chemoinformatics	G16C 20/80

G06F 21/00

Security arrangements for protecting computers, components thereof, programs or data against unauthorised activity

Definition statement

This place covers:

Security arrangements for protecting computers or their components, programs and data against unauthorised activity, e.g. intrusion into a computer, computer malware detection and handling, authentication, unauthorised use of data, dishonest alteration of data, theft of secret data.

In particular, the following subjects are covered:

- Protecting specific internal or peripheral components in which the protection of a component leads to protection of the entire computer;
- Monitoring users, programs or devices to maintain the integrity of platforms;
- Authenticating users, programs or devices;
- Protecting distributed programs or content, e.g. vending or licensing of copyright material;
- Protecting data used within a computer.

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Relationships with other classification places

This group covers security arrangements for local platforms.

Classification should be directed to groups H04L 9/00 - H04L 9/32 when the subject is secret or secure communication involving the use of encryption.

Furthermore, classification should be directed to group when cryptographic protocols are of relevance H04L 9/00, H04L 63/00 when network security protocols are of relevance, H04L 65/60 when Media handling, encoding, streaming or conversion are of relevance, H04L 67/01 when network protocols for data switching network services are of relevance.

Finally, classification should be directed to group H04W 12/00 when security or authentication arrangements in wireless communication networks are of relevance.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Program control, executing machine-instructions, program loading or initiating in general, task interaction, specific resource access rights	G06F 9/00
Multiprogramming	G06F 9/46
Error detection, error correction, monitoring	G06F 11/00
Electric safety arrangements in control or regulating systems	G05B 9/02
Electric program-control in control or regulating systems	G05B 19/02
Record carriers for use with machines and with at least a part designed to carry digital markings	G06K 19/00
Protecting identification code in record carriers	G06K 19/073
Systems or methods specially adapted for administrative, commercial, financial, managerial or supervisory purposes	G06Q
Complete banking systems	G07F 19/00
Alarms or alarm systems	G08B 13/00- G08B 31/00
Equipment anti-theft monitoring by a central station	G08B 26/00
Ciphering apparatus	G09C
Information storage based on relative movement between record carrier and transducer	G11B
Arrangements for conditional access to broadcast information using cryptography	H04H 60/23
Secret or secure communication, e.g. including authentication means	H04L 9/00- H04L 9/32
Key distribution in cryptographic systems	H04L 9/08
Algorithms, certificates, signatures, hash functions, encryption	H04L 9/32
Data switching networks	H04L 12/00
Scanning, transmission or reproduction of documents	H04N 1/00
Selective content distribution, e.g. interactive television, video on demand	H04N 21/00
Security arrangements, e.g. access security or fraud detection; authentication in wireless communication networks	H04W 12/00

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Special rules of classification

The general rule is to limit to the best-suited group but there could be a plurality of groups for a document if that document discloses many relevant aspects when taken separately (e.g. a document having isolated disclosures) or in combination, in particular when a combination of groups is more suited to reflect the disclosure.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Content	means any intellectually created work whose copyright is to be safeguarded

G06F 21/10

Protecting distributed programs or content, e.g. vending or licensing of copyrighted material (protection in video systems or pay television H04N 7/16) {; Digital rights management [DRM]}

Definition statement

This place covers:

Protecting software against unauthorised usage in a vending or licensing environment, e.g. protecting the software provider's copyright. The protection is generic, i.e. not specific to the type of content.

Protecting data in an environment substantially outside the data owner's control (or in a hostile environment). The term "hostile environment" means data and operational environment of the data are controlled by different entities.

Example: hostile environment: Financial Times [FT] has a server where users who pay get a key that enables locally stored encrypted FT-newspaper-articles to be decrypted and read. The articles are in a hostile environment, the computer of the user, where FT has limited or no influence, therefore the article needs to be protected from the user, in this case by encryption.

References

Limiting references

This place does not cover:

Protection in video systems or pay television	H04N 7/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

If protection is restricted to techniques specific to executables	G06F 21/12
Protecting data in an environment substantially within the data owner's control (or in a non-hostile environment)	G06F 21/60
Games systems, i.e. specific solutions for security of games	G06F 2221/2109
Chip on media	G06F 2221/2121
Preventing unauthorized non-electronic copying	G03G 21/04
Commerce, e.g. marketing, shopping, billing, auctions or e-commerce	G06Q 30/00
Business processing related to protecting distributed files or licensing	G06Q 2220/10 - G06Q 2220/18

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Image watermarking when the watermarking itself is concerned	G06T 1/0021
Preventing of unauthorized reproduction or copying of media	G11B 20/00086
Preventing unauthorized electronic reproduction of physical documents	H04N 1/00838
Digital watermarking on images when the watermarking itself is concerned	H04N 1/32144
Protecting content in television systems	H04N 21/00

G06F 21/101

{by binding digital rights to specific entities}

Definition statement

This place covers:

Different protection for each instance of software or content, e.g. creating hardware or user specific versions, binding software or content to specific terminals or devices.

G06F 21/1011

{to devices}

Definition statement

This place covers:

Binding licenses to one rendering device the user uses, e.g. mp3-player, computer or mobile phone.

G06F 21/1012

{to domains}

Definition statement

This place covers:

Binding licenses to a group or type of rendering devices the user uses, e.g. list, type or capabilities of devices, something the device belongs to.

G06F 21/1013

{to locations}

Definition statement

This place covers:

Binding licenses to a location.

G06F 21/1014

{to tokens}

Definition statement

This place covers:

Binding licenses to something the user possesses, e.g. tokens, mobile phones, recording media or USB-sticks. The content can be transferred from one device to another.

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Token	not rendering the content

G06F 21/1015

{to users}

Definition statement

This place covers:

Binding the content to a user.

Binding licenses to characteristics of the user, e.g. biometrics, fingerprint, iris or behaviour.

Binding licenses to a group the user belongs to, e.g. domain, family, friends, university, library or company.

Binding licenses to something the user knows, e.g. a password.

G06F 21/105

{Arrangements for software license management or administration, e.g. for managing licenses at corporate level}

Definition statement

This place covers:

Examples: Managing floating licenses to protect against unauthorized usage of distributed programs or content.

G06F 21/1062

{Editing}

Definition statement

This place covers:

Editing or modifying the content by the user.

Modifying or creating licenses for e.g. re-distributing rights, adjustment to user-needs, license changes, also including shareware where the license is updated.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Personalisation of content	G06F 21/1063
Superdistribution of content	G06F 21/1086

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G06F 21/1063

{Personalisation}

Definition statement

This place covers:

Converting content for different system requirements, e.g. different digital right management systems, less powerful devices, interoperability or compatibility.

User defined content, specifically created on user or business request.

Watermark identifying e.g. content, user or device.

Same copy for demo version or product version.

G06F 21/1064

{Restricting content processing at operating system level}

Definition statement

This place covers:

Usage restrictions implemented at operating system level to prevent e.g. access to registers, clipboard or APIs.

G06F 21/1066

{Hiding content}

Definition statement

This place covers:

Hiding content, licenses or keys, e.g. inside the content, file systems, at operating system level or by obfuscating.

G06F 21/107

{License processing; Key processing}

Definition statement

This place covers:

Techniques of key generation specifically designed for digital right management implementation.

Techniques of key distribution specifically designed for digital right management implementation.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Key distribution or management, e.g. generation, sharing or updating, of cryptographic keys or passwords	H04L 9/08

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G06F 21/1073

{Conversion}

Definition statement

This place covers:

Converting a license for e.g. different digital right management systems, languages, versions, user needs, less powerful devices, interoperability or compatibility.

Grace period, e.g. in offline systems the user should be able to continue for some time even if a license is expired.

Definition of rights, e.g. rights definition languages, grammar, syntax, semantics, graphical representations of rights, parsers or right consistency.

G06F 21/1076

{Revocation}

Definition statement

This place covers:

Methods for revoking licenses, e.g. preventing licenses to be restored again from backup or looking after copies of the license to delete all instances of the license.

G06F 21/1077

{Recurrent authorisation}

Definition statement

This place covers:

Performing recurrent authorisation checks, not just at installation or loading time.

G06F 21/1078

{Logging; Metering}

Definition statement

This place covers:

Logging, metering or counting, e.g. copy, usage, play, transfer, move, delete, modification or time.

Note:

License logging also falls under this definition, because for logging a license is considered as content.

G06F 21/1079

{Return}

Definition statement

This place covers:

The content or license is given back from the user or client, e.g. for floating licenses, check-in/check-out, or renting.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Arrangements for software licence management or administration	G06F 21/105

G06F 21/1082

{Backup or restore}

Definition statement

This place covers:

Techniques for allowing, supporting or preventing backup or restore specifically designed for DRM.

G06F 21/1083

{Partial license transfers}

Definition statement

This place covers:

Transferring fragments of content/license for:

- Payment: shareware, part of the content/license is sent after payment.
- Optimisation: incremental, differential or update. The fragment alone is not sufficient for rendering.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Payment processing for DRM	G06Q 20/1235

G06F 21/1084

{via third party}

Definition statement

This place covers:

Third party with special digital right management aspects, e.g. third party generates and stores part of the key. The third party is not only transferring data.

G06F 21/1085

{Content sharing, e.g. peer-to-peer [P2P]}

Definition statement

This place covers:

Digital right management systems especially adapted for content sharing, e.g. peer-to-peer solutions.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cryptographic mechanisms or cryptographic; Arrangements for secret or secure communications; Network security protocols	H04L 9/00
Network architectures or network communication protocols for network security	H04L 63/00
Network arrangements, protocols or services for supporting real-time applications in data packet communication	H04L 65/00
Network arrangements or protocols for supporting network services or applications	H04L 67/00

G06F 21/1086

{Superdistribution}

Definition statement

This place covers:

Permitting further distribution of digital content, e.g. from user to user, but still maintaining some control over re-distributed copies.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

License editing	G06F 21/1062

G06F 21/1087

{Synchronisation}

Definition statement

This place covers:

Synchronisation between:

- (License) servers: controller-subordinate
- Local and distant licenses

Comprises also offline usage.

G06F 21/1088

{by using transactions with atomicity, consistency, or isolation and durability [ACID] properties}

Definition statement

This place covers:

Atomic transaction in which a series of operations either all occur, or all do not occur (wish of content owners).

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G06F 21/109

{by using specially-adapted hardware at the client}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Restricting unauthorised execution of programs by using dedicated hardware	G06F 21/123

G06F 21/12

Protecting executable software

Definition statement

This place covers:

Protection is restricted to techniques specific to executables.

G06F 21/123

{by using dedicated hardware, e.g. dongles, smart cards, cryptographic processors, global positioning systems [GPS] devices}

Definition statement

This place covers:

Dedicated hardware is used for authorizing access to an executable program using techniques specific to executable programs (e.g. manipulation of the code, manipulation of the instruction flow or data flow, security routine in the program to verify a code in a dongle).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authenticating in combination with an additional device	G06F 21/34
If the program contains security routines acting after initial authorization	G06F 21/54
Location-sensitive	G06F 2221/2111

G06F 21/14

against software analysis or reverse engineering, e.g. by obfuscation

Definition statement

This place covers:

Be aware that the software generally stays unlocked. Obfuscation is primarily used to prevent reverse engineering but not to prevent copying.

Examples: Program code is altered at each execution, program flow is changed to mask calls to sensitive routines, data flow is changed, compiling techniques normally performed by code optimizers rolled back.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

If similar techniques as the ones used for obfuscation are used to restrict unauthorized usage and thus copy protection	G06F 21/125

G06F 21/16

Program or content traceability, e.g. by watermarking

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Digital watermarking on images	H04N 1/32

G06F 21/30

Authentication, i.e. establishing the identity or authorisation of security principals

References

Limiting references

This place does not cover:

If the network plays a role, e.g. secure socket layer, IPsec, Internet Key Exchange, or Extensive Authentication Protocol	H04L 63/08

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authentication using challenge-response	G06F 2221/2103
Bluffing e.g. pretending to have connected a user to a real node when in fact the connection is to a dummy node	G06F 2221/2127
Lost password, i.e. recovery of lost of forgotten passwords	G06F 2221/2131
Verifying human interaction, e.g. Captcha	G06F 2221/2133
Metering, i.e. counting events for security purposes	G06F 2221/2135
Time limited access e.g. to a computer	G06F 2221/2137
Recurrent verification	G06F 2221/2139
Clearing memory or data when detecting an attack e.g. to prevent the data from being stolen	G06F 2221/2143
Time stamp	G06F 2221/2151
One-time-passwords	H04L 63/0838
Time-dependent-passwords, e.g. periodically changing passwords	H04L 63/0846

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G06F 21/305

{by remotely controlling device operation}

Definition statement

This place covers:

Authentication is not triggered by a user but imposed/initiated by a third party.

References

Limiting references

This place does not cover:

If re-authentication is triggered after an intrusion	G06F 21/554

G06F 21/31

User authentication

Definition statement

This place covers:

Specific authentication aspect (e.g. initial authentication, regular authentications at predetermined time intervals, or re-authentication after logout or locking) or password design.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authentication mechanisms	H04L 63/08

G06F 21/313

{using a call-back technique via a telephone network}

Definition statement

This place covers:

Using characteristics specific to telephone lines.

Examples: Call-back to user phone number derived from phone network provider.

Particular cases: Authentication request triggered by server (no call-back) using phone number derived from phone network provider.

G06F 21/316

{by observing the pattern of computer usage, e.g. typical user behaviour}

Definition statement

This place covers:

Authentication succeeds only when secondary user-specific authorization criteria are fulfilled at login time.

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Examples: An example of secondary user-specific authorization criteria is the typing speed of the user; admit user only if this typing-speed corresponds to its normal one.

Particular cases: Maximum number of login attempts for a given user, login must be at predetermined time of day, remote login is restricted to specific computers.

References

Limiting references

This place does not cover:

If the typing speed is the primary authentication criteria	G06F 21/32
Observing the pattern of computer usage in order to trigger alarm and detect intrusion	G06F 21/554

G06F 21/32

using biometric data, e.g. fingerprints, iris scans or voiceprints

Definition statement

This place covers:

Using physiological data intrinsic to a principal and what a principal is able to do. Examples:

- Typing/mouse clicking frequency;
- Handwritten signature.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authenticating a user by observing the pattern of computer usage, e.g. typical user behaviour	G06F 21/316
Use of unusual or unconventional user registration	G06F 2221/2117
Authenticating a user by using biometrical features, e.g. fingerprint, retina-scan	H04L 63/0861

G06F 21/33

using certificates

Definition statement

This place covers:

All authentication mechanisms implying use of a ticket, token or certificate issued by a third party upon initial user authentication. The ticket contains a proof of the initial authentication which is accepted by all parties. Examples: Kerberos, OSF DCE.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authentication by using a single sign-on procedure provides access to a plurality of nodes	G06F 21/41
Verifying identity using certificates, signatures, hash functions and/or encryption	H04L 9/32
Authenticating by using tickets, e.g. Kerberos	H04L 63/0807
Authenticating by using certificates	H04L 63/0823

G06F 21/335

{for accessing specific resources, e.g. using Kerberos tickets}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authentication by using a single sign-on procedure provides access to a plurality of nodes	G06F 21/41

G06F 21/34

involving the use of external additional devices, e.g. dongles or smart cards

Definition statement

This place covers:

The additional device is used for authentication with the purpose of accessing a computer system.

Particular cases: The additional device is a cryptographic processor.

References

Limiting references

This place does not cover:

If the additional device is used to access a program	G06F 21/123
Using hardware token other than for authentication (e.g. storing secret data)	G06F 2221/2153

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authenticating by using an additional device, e.g. smartcard, SIM	H04L 63/0853

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G06F 21/35

communicating wirelessly

Definition statement

This place covers:

Examples: Continuous detection of wireless authentication token carried by user.Particular cases: Wireless presence detector, logout when not present.

References

Limiting references

This place does not cover:

If the additional device is used to access a program	G06F 21/123

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authenticating by using an additional device, e.g. smartcard, SIM	H04L 63/0853

G06F 21/36

by graphic or iconic representation

Definition statement

This place covers:

The graphical or iconic code is generated by a local system, a remote system or a principal.

Examples: The graphical code is used to challenge a principal and check something he should know, typically by manipulation of symbols or elements of a drawing or variation of key arrangement on a virtual keyboard.

References

Limiting references

This place does not cover:

Handwritten signature	G06F 21/32

G06F 21/41

where a single sign-on provides access to a plurality of computers

Definition statement

This place covers:

Using a third party performing a mapping of the credentials of the user for a first application to credentials valid for other applications.

Examples:

The third party is a password server.

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The third party is a smart card. Particular cases: The third party is the first application.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authentication using certificates	G06F 21/33

G06F 21/42

using separate channels for security data

Definition statement

This place covers:

Examples:

- Authentication with portable phone, receive sms with password, connect via fixed telephone line using password.
- Voice call for authentication, server calls back terminal.

G06F 21/44

Program or device authentication

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Device authentication, i.e. authenticate client device independently of the user	G06F 2221/2129

G06F 21/445

{by mutual authentication, e.g. between devices or programs}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mutual authentication	H04L 63/0869

G06F 21/50

Monitoring users, programs or devices to maintain the integrity of platforms, e.g. of processors, firmware or operating systems

Definition statement

This place covers:

Protecting computer platforms against harmful, malicious or unexpected behaviour or activities.

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This group is not strictly limited to software solutions.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Just-in-time application of countermeasures	G06F 2221/2125
Metering, i.e. counting events for security purposes	G06F 2221/2135
Clearing memory or data when detecting an attack e.g. to prevent the data from being stolen	G06F 2221/2143
Time stamp	G06F 2221/2151

Special rules of classification

The difference between G06F 21/56+ and the others groups G06F 21/50+ (namely G06F 21/51, G06F 21/52+, G06F 21/55+ and G06F 21/57+) may be formulated as:

- G06F 21/56+: we would trust the code or system if it were not infected (we look for the infection as such)
- other groups G06F 21/50+ (see definition above): we don't trust the code or system (we make an assessment of the global code or system; we don't look for an infection as such) G06F 2221/031 (Protect user input by software means) and G06F 2221/032 (Protect user output by software means) are additionally used to distinguish documents dealing with securing user input/output, e.g. in banking systems / applications

The subclasses G06F 2221/03+ are used in combination with this group.

G06F 21/51

at application loading time, e.g. accepting, rejecting, starting or inhibiting executable software based on integrity or source reliability

Definition statement

This place covers:

Accept / reject loading of application:

- onto platform for later execution.
- into memory for immediate execution.

from

- Loal storage
- Remove device (e.g. By downloading).

Based on static features of the application when not being executed e.g.:

- Signature or certificate provided by application creator, provider or tester
- Integrity.
- Capability list.
- capabilities of application determined by analysis.

An application is software distinct from firmware and os such as:

- Directly executable code (binary code)
- Interpretable programs (script language)
- Interpretable files such as html, word, etc. Documents

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Examples:

- Verify integrity or application origin (application creator, provider, or tester) by checking a signature, certificate, etc. of application.
- Verify integrity of application or application origin by transforming and reverse transforming the application:By analyzing user content, e.g. analyse relationship of websites referred to by a web page.
- Check application capabilities versus a predefined security policy.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authenticating web pages	G06F 2221/2119

G06F 21/52

during program execution, e.g. stack integrity {; Preventing unwanted data erasure; Buffer overflow}

Definition statement

This place covers:

Intrusion detection at the single program level, i.e. detect intrusion of:

- A system by a single program.
- A single program.

During execution of the single program e.g. by specifically monitoring execution of the single program at the single program level

Examples:

- Transform by obfuscation means which do not add code.
- Modify code to avoid security issue when fault injection.
- Modify code to enforce security policy.
- Detect code injection

References

Limiting references

This place does not cover:

Transformation by addition of security routines or objects to the program	G06F 21/54
Monitoring of the whole system running many programs	G06F 21/55

G06F 21/53

by executing in a restricted environment, e.g. sandbox or secure virtual machine

Definition statement

This place covers:

Intrusion detection at the environment level of the execution of the single program e.g.:

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- Run program in secure, isolated environment (VM, sandbox), e.g. by modifying VM or sandbox to include special security measures
- Provide security measures in interface (library, API, OS) of program with its Environment, e.g.:
- Provide secure library or API interfacing the program
- Modify library, API or OS to include security measures
- Have OS service or library making security checks or running in protected environment

Examples: by using virtual machine, sandbox, secure library or by isolating processes at operating system level

G06F 21/54

by adding security routines or objects to programs

Definition statement

This place covers:

- Transformation by addition of code to Source code
- Executable program to be loaded or already loaded in memory for execution to ensure proper execution of program
- Examples:
- Add / modify code to detect fault injection by enforcing proper execution sequence
- Modify code to detect improper execution flow when code error
- Add code to detect software attacks
- Modify code to enforce security policy
- Add code to detect code tampering in memory
- Add dummy instructions for obfuscation purposes

References

Limiting references

This place does not cover:

Modification of code to include some static feature (e.g. a checksum) to be checked prior to execution	G06F 21/51
Transformation of code not by addition, e.g. by obfuscation means	G06F 21/52

G06F 21/55

Detecting local intrusion or implementing counter-measures

Definition statement

This place covers:

Intrusion detection at the level of the system independently of execution of one single program e.g. by monitoring execution of the whole system while running many programs.

References

Limiting references

This place does not cover:

Intrusion detection at the single program level during execution of the single program	G06F 21/52

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G06F 21/552

{involving long-term monitoring or reporting}

Definition statement

This place covers:

Monitor the system, user actions within the system, etc., analyze the monitoring data gathered during long term and take action.

Examples:

- Determine normal user behaviour for later security issue detection
- Log security issue events for later action / risk assessment
- Collect system information and deduce security issue

G06F 21/554

{involving event detection and direct action}

Definition statement

This place covers:

Monitor the system, user actions on the system, etc., immediately analyze the monitoring data gathered and directly take action.

Examples: Detect abnormal user behaviour, security issue or physical attacks; and immediately react.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

If the monitoring and direct action is based on data obtained by long-term monitoring	G06F 21/552

G06F 21/556

{involving covert channels, i.e. data leakage between processes (inhibiting the analysis of circuitry or operation with measures against power attack G06F 21/755)}

Definition statement

This place covers:

A covert channel is defined as being a communication channel that allows a process to transfer information in a manner that violates the system's security policy.

E.g.: software measures against:

- Intended malevolent internal signalling or communication between processes on system.
- Intended malevolent external signalling or communication by process on system.
- Accidental internal leakage of data between processes on system by storage or communication
- Accidental external leakage of data of process on system by storage or communication
- Accidental internal or external leakage of system or process state or behaviour

Examples:

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- Protect against physical (e.g. electromagnetic; non power consumption) monitoring to obtain information on data manipulated by the system or code executed by the system.
- Protect against fault attacks
- Data leakage between processes via common / non secure memory Secure data transfer within processes
- Hidden communication between processes by one process observing other process behaviour
- External data leakage by hidden communication
- Unwanted data leakage in programs
- Modify code to avoid information exposure in memory

References

Limiting references

This place does not cover:

Inhibiting the analysis of circuitry or operation with measures against power attack	G06F 21/755

G06F 21/56

Computer malware detection or handling, e.g. anti-virus arrangements

Definition statement

This place covers:

Examples:

- Protection against root kits by scanning for malwares at boot.
- Virus resistant computer by booting from authenticated read-only boot device, transfer accepted file types only.
- Determine malicious (child) processes by file generation time changes
- Remote control upon virus detection (i.e. cut communications).
- Send executable email contents to sacrificial server to verify execution for virus activity.
- Analyze file with respect to virus families, family based extraction.
- Trojans.

References

Limiting references

This place does not cover:

If for avoiding or detecting spam. If for virus detection in network (system) or at network protocol level	H04L 63/00

Special rules of classification

- The difference between G06F 21/56 and the others subgroups under G06F 21/50 (namely G06F 21/51, G06F 21/52, G06F 21/55 and G06F 21/57) may be formulated as:
- G06F 21/56: we would trust the code or system if it were not infected (we look for the infection as such).
- Other groups under G06F 21/50 (see definition above): we don't trust the code or system (we make an assessment of the global code or system; we don't look for an infection as such).

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Virus	A malicious (i.e. intended to harm) executable code or script hidden or embedded in a normally non malicious data, code or system. It need not be self-replicating

G06F 21/561

{Virus type analysis}

Definition statement

This place covers:

Information relating to a specific type or family of viruses.

G06F 21/562

{Static detection}

Definition statement

This place covers:

Detect presence of virus without executing directly or by emulation, except emulation for the purpose of higher level analysis (control code, data flow)

Examples of such detections:

- Analyse source code or scripts.
- Execute intermediate compiled code and analyse.
- Compile and analyse.
- Disassemble binary code and analyse control flow or data flow and/or match execution code patterns without simulation of execution.
- Validate file formats.
- Verify based on file type.

G06F 21/563

{by source code analysis}

Definition statement

This place covers:

Starting point for analysis: source code, script or file type or format. The source code may be obtained by disassembly.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

If the source code is compiled and executed or emulated for analysis	G06F 21/566

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G06F 21/564

{by virus signature recognition}

Definition statement

This place covers:

Concerns virus detection by binary or source code pattern matching or the process of enhancing the signature recognition procedure.

Examples:

- By using virus binary code signature.
- By using a virus source code pattern.

G06F 21/565

{by checking file integrity}

Definition statement

This place covers:

Examples:

- Detect change of files.
- Detect change of file portions.

G06F 21/566

{Dynamic detection, i.e. detection performed at run-time, e.g. emulation, suspicious activities}

Definition statement

This place covers:

Examples:

- Execute directly or by emulation and observe effect by monitoring / limitation
- Emulation of code.
- Execution in sandbox / virtual machine.
- Monitoring / limiting Inputs/Outputs.
- Monitoring memory allocation / changes
- Encoding executable and decoding upon execution such that infection is detected at run time.
- Modifying execution such that infection is detected at run time.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Access rights if detection based on access right violation	G06F 2221/2141

Special rules of classification

Use additionally G06F 2221/033 (Test or assess a software) if detection at the level of execution of a single program.

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Use additionally G06F 2221/034 (Test or assess a computer or a system) if detection at system level (as opposed to the level of execution of a single program).

G06F 21/567

{using dedicated hardware}

Definition statement

This place covers:

Use hardware specifically dealing with virus detection or removal. The hardware may be general purpose.

Examples:

- Normal boot using a general purpose external storage means (e.g. USB stick) with anti-virus software.
- Use intermediate server for virus detection.
- Use dedicated, specialized hardware means for detecting virus.
- Use dedicated, specialized hardware means for detecting suspicious activity.
- Use dedicated, specialized hardware means for alerting user upon virus detection.
- Use dedicated, specialized hardware means for avoiding virus infection by e.g. write protection.
- Use dedicated, specialized hardware means for avoiding propagation by binary transmission.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

If carried out on a separate, remote device (third party)	G06F 2221/2115
Use of hardware tokens, smart cards or dongles	G06F 2221/2153

G06F 21/568

{eliminating virus, restoring damaged files}

Definition statement

This place covers:

Provision of software means to remove viruses or restore infected files. Examples:

- Restore system to earlier trustworthy state.
- Apply reverse behaviour of a detected virus in order to restore file/code.
- Observe potentially harmfull software on computer at runtime, remove its effects.
- Verify/scan files upon file access; replace file with clean file.
- Boot one OS to scan other OS for viruses and cleanup.

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G06F 21/57

Certifying or maintaining trusted computer platforms, e.g. secure boots or power-downs, version controls, system software checks, secure updates or assessing vulnerabilities

Definition statement

This place covers:

- Validate trusted platform configuration.
- Defeat computer security by installing software into RAM using peripheral DMA.
- Receive vulnerability alert, retrieve and install patch.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Non secure initialization, program loading or initiating without any security aspects	G06F 9/4401, G06F 9/445

G06F 21/572

{Secure firmware programming, e.g. of basic input output system [BIOS]}

Definition statement

This place covers:

Securely update, patch or load firmware or firmware modules.

Examples:

- Authenticate firmware updates, patches or modules.
- Authenticate configuration file listing updates, modules to load.
- Authenticate key to allow firmware update.
- Authenticate firmware / configuration update program / command.

G06F 21/575

{Secure boot}

Definition statement

This place covers:

Examples:

- Authenticate boot code(s) at start-up.
- Verify configuration at boot.
- Pre-boot authentication (user authentication or by using unlock code authentication).
- Disable boot device
- Boot read-only system.
- Security action (e.g. Malware scan) by booting safe system in dual boot system.
- Load high security barrier code.

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G06F 21/577

{Assessing vulnerabilities and evaluating computer system security}

Definition statement

This place covers:

Examples:

- Analyze or test a computer or a program against vulnerabilities or threats at computer level or at program level.
- Analyze or test a computer or a program for security relevant capabilities.

References

Limiting references

This place does not cover:

If assessing/evaluating the network per se	H04L 63/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Testing software	G06F 9/44589, G06F 11/3668

Special rules of classification

Use additionally G06F 2221/033 (Test or assess a software) or G06F 2221/034 (Test or assess a computer or a system) to distinguish between assessment of computer or software.

G06F 21/60

Protecting data

Definition statement

This place covers:

Authorizing access to an executable program using techniques specific to executable programs (e.g. manipulation of the code, manipulation of the instruction flow or data flow, security routine in the program to verify a code in a dongle) Protecting data in an environment substantially within the data owner's control (or in a non-hostile environment). The term "hostile environment" means data and operational environment of the data are controlled by different entities.

Example: non-hostile environment: FT(Financial Times) has a server where users who pay get a username+password to access FT-newspaper-articles on the server. FT has full control over the server, the data is stored on the server, and therefore the data is not in a hostile environment.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Recurrent verification	G06F 2221/2139

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Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Data	Also includes programs

G06F 21/602

{Providing cryptographic facilities or services}

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

For hardware details	G06F 21/72

G06F 21/608

{Secure printing}

Definition statement

This place covers:

The protection mostly relates to the secrecy, confidentiality and integrity of printed data.

Examples:

- Ensure a printed document is authentic copy of electronic document by protecting the transmission between the host and the printer. Selected for print is encrypted at the user's computer and decrypted at the printer upon user authentication at the printer, e.g. using a password or a badge.
- Ensure document can only be printed out by the intended user, e.g. by password input at printer or authentication using a smartcard containing the private key of the user.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Scanning, transmission or reproduction of documents	H04N 1/32144

G06F 21/62

Protecting access to data via a platform, e.g. using keys or access control rules

References

Limiting references

This place does not cover:

If the solution is achieved via the display or its driver.	G06F 21/84

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Informative references

Attention is drawn to the following places, which may be of interest for search:

File encryption, i.e. use of unusual or unconventional encryption techniques	G06F 2221/2107
Time limited access e.g. to data	G06F 2221/2137
Access rights	G06F 2221/2141
inheriting rights or properties, e.g. propagation of permissions or restrictions across a hierarchy	G06F 2221/2145
Locking files	G06F 2221/2147
Restricted operating environment, e.g. creating a user-specific working environment, parental control	G06F 2221/2149

G06F 21/6209

{to a single file or object, e.g. in a secure envelope, encrypted and accessed using a key, or with access control rules appended to the object itself}

Definition statement

This place covers:

Object access right control is performed by a dedicated application or function (separate from an optional access right control offered by the file system. Access control based on a file-system goes to G06F 21/6218 and subgroups). Access rights or keys, and a security function to apply the rights, are associated directly to an individual file.

References

Limiting references

This place does not cover:

For access control based on a file-system	G06F 21/6218+

G06F 21/6218

{to a system of files or objects, e.g. local or distributed file system or database}

Definition statement

This place covers:

Examples:

- Access rights in databases provided by user capability lists.
- How the file system or the operating system enforce access rights.

G06F 21/6227

{where protection concerns the structure of data, e.g. records, types, queries}

Definition statement

This place covers:

Examples:

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- The security is at the level of records in a structured file or database, there is a field for each record dedicated to protecting this record and containing for instance a security level, access rights or encryption keys.
- The structure of the database (tables, records, views, queries, stored procedures...) is the target of the security, and by doing this the data is protected.
- Particular case : if the protection is "outside" the database, e.g. rules stored outside the DB and enforced when the DB is queried, because "outside" becomes "inside" if the security is based on database-queries.

References

Limiting references

This place does not cover:

Data structures not related to security	G06F 16/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Information retrieval (from databases and internet)	G06F 16/00

G06F 21/6236

{between heterogeneous systems}

Definition statement

This place covers:

Problem to be solved: Maintain security when exchanging data between systems with different (heterogeneous) security architectures.

G06F 21/6245

{Protecting personal data, e.g. for financial or medical purposes}

Definition statement

This place covers:

Problem to be solved: Confidentiality of the personal data. General protection of personal data (e.g. encrypting all data, access rules, ...).

References

Limiting references

This place does not cover:

If just the link from the data to the person is protected	G06F 21/6254

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Personal data	any information relating to an identified or identifiable natural person

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G06F 21/6254

{by anonymising data, e.g. decorrelating personal data from the owner's identification}

Definition statement

This place covers:

Protecting where the data may be accessed without revealing the person's identity, e.g. by anonymising or decorrelating" Personal Data is related to a person via a link.

Without the link, the data is no longer personal private data, and needs no further protection. Decorrelating or anonymising means partly or completely removing the link.

Examples: A hospital-server with special techniques to protect the confidentiality of patient-data, where the patient data and the sickness data are stored separately.

G06F 21/629

{to features or functions of an application}

Definition statement

This place covers:

Protecting functions or features provided by specific software application like a word processor, an email client, a calendar application.

Examples: Restricting the printing function in a word processor based on access rights. Restricting entry editing in a shared calendar application.

References

Limiting references

This place does not cover:

If the protection is restricted to techniques specific to executables.	G06F 21/121

Informative references

Attention is drawn to the following places, which may be of interest for search:

For access to hardware functions	G06F 21/70

G06F 21/64

Protecting data integrity, e.g. using checksums, certificates or signatures

Definition statement

This place covers:

- Protection of the integrity of data only.
- Example: A contract between two individuals where the integrity of the contract is protected.
- Particular case : If the code is not executed but transferred for collaborative programming.
- Protection of the integrity of data only.
- Examples: A contract between two individuals where the integrity of the contract is protected.

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References

Limiting references

This place does not cover:

When code integrity is at stake or if the verification takes place in the context of protecting computer platforms against harmful, malicious or unexpected behaviour or activities	G06F 21/50

G06F 21/645

{using a third party}

Definition statement

This place covers:

Example: A notary certifies that the contract (file) is the original contract (file).

G06F 21/70

Protecting specific internal or peripheral components, in which the protection of a component leads to protection of the entire computer

Definition statement

This place covers:

The hardware itself of the component must be protected; Usage of dedicated hardware to secure an entire platform, authentication, a software or data is not enough to classify here; In most cases, it is particular hardware that is protected, but a hardware solution to protecting data would also be classified here; The protected asset and/or the countermeasure to be implemented in hardware.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Just-in-time application of countermeasures	G06F 2221/2125

G06F 21/74

operating in dual or compartmented mode, i.e. at least one secure mode

Definition statement

This place covers:

Two modes of operation at processor level.

Examples: 68020 supervisor mode / user mode.

References

Limiting references

This place does not cover:

When dual mode in not the main aspect is of the invention	G06F 2221/2105

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G06F 21/75

by inhibiting the analysis of circuitry or operation

Definition statement

This place covers:

Examples: to counter reverse engineering; Countermeasure against analyzing microprocessor or other components to infer which instructions are ran and retrieve statistical information about the arguments of the instructions.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Dummy operation e.g. a processor performs dummy operations as countermeasure to differential power analysis	G06F 2221/2123
Countermeasures at the cryptographic algorithm level against power analysis attacks, e.g. modifying the S-Box layout in a DES algorithm	H04L 9/003

G06F 21/755

{with measures against power attack}

Definition statement

This place covers:

Software and hardware measures against monitoring of power consumption to obtain information about the system such as differential power attack or simple power attack.

Examples:

- Hide boot order.
- Multiple processors to hide power consumption.
- Algorithm design for general purpose processor.
- Use special hardware logic.
- Execute dummy instructions.
- Randomize execution flow.
- Change instruction clocking.
- Hide memory / register accesses.

G06F 21/77

in smart cards

Definition statement

This place covers:

Only for protection of the smartcard as such.

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G06F 21/78

to assure secure storage of data (address-based protection against unauthorised use of memory G06F 12/14; record carriers for use with machines and with at least a part designed to carry digital markings G06K 19/00)

References

Limiting references

This place does not cover:

Protection of disk controllers (input/output device)	G06F 21/82

Informative references

Attention is drawn to the following places, which may be of interest for search:

Chip on media	G06F 2221/2121

G06F 21/79

in semiconductor storage media, e.g. directly-addressable memories

References

Limiting references

This place does not cover:

Address-based protection against unauthorised use of memory	G06F 12/14
Secure firmware programming	G06F 21/572
Record carriers for use with machines and with at least a part designed to carry digital markings	G06K 19/00

G06F 21/80

in storage media based on magnetic or optical technology, e.g. disks with sectors (preventing unauthorised reproduction or copying of disc-type recordable media G11B 20/00)

References

Limiting references

This place does not cover:

Preventing unauthorised reproduction or copying of disc-type recordable media	G11B 20/00
Usage of defectuous sectors for copy protection	G11B 20/00086

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G06F 21/805

{using a security table for the storage sub-system}

Definition statement

This place covers:

Examples: Access Control Lists stored in a disk controller.

G06F 21/83

input devices, e.g. keyboards, mice or controllers thereof

Definition statement

This place covers:

Examples: Keyboard with password locking mechanism embedded in the keyboard.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Biometric input devices	G06F 21/32

G06F 21/84

output devices, e.g. displays or monitors

Definition statement

This place covers:

Examples:

Protecting data shown on a display.

Hardware solution for protecting displayed data.

References

Limiting references

This place does not cover:

Use of password or smartcard to activate session of a printer	G06F 21/608

G06F 21/85

interconnection devices, e.g. bus-connected or in-line devices

Definition statement

This place covers:

Examples:

Encryption circuit between motherboard and hard-disk.

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Device between computer components allowing/banning interconnections therebetween in accordance with user IDs; user-specific hardware configuration.

G06F 21/86

Secure or tamper-resistant housings

Definition statement

This place covers:

Housing resisting tampering or housing with tamper detection means. The protection takes place at the housing level.

Examples:

- PC with housing-open detection switch.
- Tamper resistant circuit.

References

Limiting references

This place does not cover:

The protection takes place at the chip level	G06F 21/87
Secure enclosure, mechanical anti-theft mechanism if no computer component is protected	G08B 13/14

Informative references

Attention is drawn to the following places, which may be of interest for search:

Clearing memory, e.g. to prevent the data from being stolen	G06F 2221/2143

G06F 21/87

by means of encapsulation, e.g. for integrated circuits

Definition statement

This place covers:

The protection takes place at the chip level.

References

Limiting references

This place does not cover:

The protection takes place at the housing level	G06F 21/86

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G06F 21/88

Detecting or preventing theft or loss

Definition statement

This place covers:

Example: Hardware locks itself / is locked when outside of RF-field.

Particular cases: Send a hardware locking message to stolen device.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

If the sent message is not to trigger hardware lock but to force authentication	G06F 21/305

G06F 30/00

Computer-aided design [CAD]

Definition statement

This place covers:

- Arrangements and methods specially adapted for automated execution for design of technical entities
- Simulation for design purposes of technical entities

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Software design	G06F 8/20
Software simulation	G06F 9/455
Patterns for cutting-out; Methods of drafting or marking-out such patterns	A41H 3/00
Adaptive control systems involving the use of models or simulators	G05B 13/04
Three dimensional graphical modelling and manipulation	G06T 17/00, G06T 19/00
Simulation for teaching or training purposes	G09B 9/00
Arrangements for designing of test circuits for static stores	G11C 29/54

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

Design	Description of technical parameters or a virtual model of a technical arrangement; does not cover aesthetic aspects; not to be confused with the physical object.
Verification	Determining the correct functioning of a design; not to be confused with testing of a physical object.

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Simulation	Determining technical properties and behaviour of an entity by performing a virtual simulation of a model in a computer, possibly by using specifically adapted hardware.
Model	A computer readable description of an entity, defining or implying technical properties.

G06F 30/10

Geometric CAD

Definition statement

This place covers:

- Design of geometrical structures of technical entities, e. g. shape, dimensions, etc., using CAD
- Simulation for the design thereof

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Generation of images and models in computer graphics	G06T 11/00, G06T 15/00, G06T 17/00, G06T 19/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Layout of circuits; design at the physical level	G06F 30/347, G06F 30/39

G06F 30/12

characterised by design entry means specially adapted for CAD, e.g. graphical user interfaces [GUI] specially adapted for CAD

Definition statement

This place covers:

- Software-implemented user interfaces specially adapted for geometric CAD
- Hardware input/output means such as virtual reality, specially adapted for geometric CAD

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Input arrangements or combined input and output arrangements for interaction between user and computer	G06F 3/01
Interaction techniques based on graphical user interfaces [GUI]	G06F 3/048

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G06F 30/13

Architectural design, e.g. computer-aided architectural design [CAAD] related to design of buildings, bridges, landscapes, production plants or roads

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Design or layout of roads	E01C 1/00

G06F 30/15

Vehicle, aircraft or watercraft design

Definition statement

This place covers:

- Structural design of vehicles or components or systems thereof using CAD
- Simulation for the design thereof

Note: The term "vehicles" is to be understood broadly and covers land, air, space, naval or other types of vehicles.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Simulators for teaching control of vehicles or other craft	G09B 9/02

G06F 30/17

Mechanical parametric or variational design

Definition statement

This place covers:

CAD for the design of:

- entities comprising moving parts
- entities comprising alternative configurations
- engineering tolerances, e.g. mechanical component tolerance

Simulation for the design thereof

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G06F 30/23

using finite element methods [FEM] or finite difference methods [FDM]

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Picture mesh generation	G06T 17/20

G06F 30/27

using machine learning, e.g. artificial intelligence, neural networks, support vector machines [SVM] or training a model

Definition statement

This place covers:

Using machine learning for the purpose of CAD.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Machine learning per se	G06N 20/00

G06F 30/30

Circuit design

Definition statement

This place covers:

- Using CAD for the design of circuits
- Simulation of the design thereof
- CAD relating to superconducting circuits or circuits such as rapid single flux quantum (RSFQ) circuits or other circuits using Josephson junctions

Note: The term "circuit" is to be understood broadly and covers electric, electronic, and integrated circuits as well as circuits on a printed circuit board [PCB].

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Functional testing	G06F 11/26
Testing of electronic circuits	G01R 31/28

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G06F 30/36

Circuit design at the analogue level

Definition statement

This place covers:

CAD tools working at the analogue level.

Note:

The nature of the designed circuit (e.g. a digital circuit) is not decisive: if the CAD tool operates over continuous values (e.g. current, voltage, frequency), the subject-matter is to be classified here.

G06F 30/39

Circuit design at the physical level (physical level design for reconfigurable circuits G06F 30/347)

Definition statement

This place covers:

CAD tools operating over the physical parameters (geometry, routing, and sizing) of the circuit, considering the electrical characteristics of said circuit.

References

Limiting references

This place does not cover:

Physical level design for reconfigurable circuits	G06F 30/347

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Optical proximity correction [OPC] design processes	G03F 1/36

G06F 30/392

Floor-planning or layout, e.g. partitioning or placement

Definition statement

This place covers:

CAD tools for use during the floorplanning design stage of a circuit.

Note: The term "floorplan" is used here in the context of circuit design with its generally accepted meaning and covers an early stage in the hierarchical approach to integrated circuit design regarding optimally placing a given set of circuit modules.

Floorplanning covers taking in some of the geometrical constraints in a design such as

- bonding pads for off-chip connections
- line drivers which often have to be located as close to bonding pads as possible

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- minimum chip area needed to fit in the required number of pads; predetermined area blocks such as intellectual property blocks (IP-blocks)
- limitations such as permitting no routing of signals directly above an IP block

Floorplan optimisation subject to various constraints and requirements of optimisation, e.g. block areas, aspect ratios, estimated total measure of interconnects, etc.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

IP block, IP core	The terms IP block and IP core are used as synonyms and relate to reusable unit of logic, cell, or integrated circuit (commonly called a "chip") layout design that is the intellectual property of one party. The term is derived from the licensing of the patent and/or source code copyright that exist in the design. IP cores can be used as building blocks within application-specific integrated circuit (ASIC) designs or field-programmable gate array (FPGA) logic designs during the floorplanning design stage of a circuit.

G06F 40/00

Handling natural language data (speech analysis or synthesis, speech recognition G10L)

Definition statement

This place covers:

- Text and natural language processing,
- Natural language understanding and translation,
- Processing of markup language,
- Spreadsheets.

Relationships with other classification places

The mere use of XML or other markup language, e.g. as a file format for functional data such as configuration files, should not be classified here, but rather in the field in which the data is actually used.

References

Limiting references

This place does not cover:

Speech analysis or synthesis, speech recognition	G10L

Informative references

Attention is drawn to the following places, which may be of interest for search:

Input/output for Oriental characters	G06F 3/018
Predictive input	G06F 3/0237
Digital ink, low-level/hardware aspects thereof	G06F 3/04883
Printing (job control, etc.)	G06F 3/12
Parser generation for computer code	G06F 8/37

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Translation, e.g. compilation, of computer code	G06F 8/40
Parsing of computer code	G06F 8/427
Multilingual user interfaces	G06F 9/454
Text retrieval, creation of semantic tools	G06F 16/30
Thesaurus (creation for retrieval)	G06F 16/374
Retrieval of semistructured data	G06F 16/80
Website content management	G06F 16/958
Tape/Label printers (hardware)	B41J 3/4075
Translation to/from Braille or sign language	G09B 21/00
Character generators for displays	G09G 5/22
Compression/encoding of unstructured text	H03M 7/30

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

XML	Extensible Markup Language

G06F 40/12

Use of codes for handling textual entities

Definition statement

This place covers:

Manipulation of document(s) content or structure where the visual appearance or natural-language content does not play a role.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Compression	H03M 7/30

G06F 40/14

Tree-structured documents (parsing G06F 40/205; validation G06F 40/226)

Definition statement

This place covers:

Processing of tree-structured text documents, where the tree structure and the textual nature are both significant.

References

Limiting references

This place does not cover:

Parsing of natural language data	G06F 40/205

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Validation of natural language data	G06F 40/226

Informative references

Attention is drawn to the following places, which may be of interest for search:

Retrieval of semi-structured data	G06F 16/80
Compression	H03M 7/30

G06F 2115/08

Intellectual property [IP] blocks or IP cores

Definition statement

This place covers:

CAD tools specifically adapted for using IP blocks or IP cores.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

IP block, IP core	The terms IP block and IP core are used as synonyms and relate to reusable unit of logic, cell, or integrated circuit (commonly called a "chip") layout design that is the intellectual property of one party. The term is derived from the licensing of the patent and/or source code copyright that exist in the design. IP cores can be used as building blocks within application-specific integrated circuit (ASIC) designs or field-programmable gate array (FPGA) logic designs during the floorplanning design stage of a circuit.

G06F 2123/00

Data types

Definition statement

This place covers:

Data types on which pattern recognition is applied such as time-series data.

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Analysing medical signals, e.g. bioelectric signals or blood pressure	A61B 5/00
Analysis of chromatographic signals	G01N 30/86
Processing radar or similar signals	G01S
Processing seismic signals	G01V 1/28
Transmission systems for measured values, control or similar signals	G08C

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G06F 2201/815

Virtual

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Generic software techniques for error detection or fault masking by means of middleware or OS functionality involving virtual machines	G06F 11/1484

G06F 2201/82

Solving problems relating to consistency

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error detection using active fault masking where persistent mass storage functionality is redundant by mirroring while ensuring consistency	G06F 11/2064

G06F 2201/85

Active fault masking without idle spares

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Error detection or correction using active fault masking where processing functionality is redundant without idle spare hardware	G06F 11/2035

G06F 2207/382

Reconfigurable for different fixed word lengths

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multigauge devices, i.e. capable of handling packed numbers without unpacking them	G06F 2207/3828

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G06F 2221/03

Indexing scheme relating to G06F 21/50, monitoring users, programs or devices to maintain the integrity of platforms

Special rules of classification

This group and its lower subgroups are designed for use in combination with G06F 21/50.

G06F 2221/21

Indexing scheme relating to G06F 21/00 and subgroups addressing additional information or applications relating to security arrangements for protecting computers, components thereof, programs or data against unauthorised activity

Definition statement

This place covers:

Secondary and transversal aspects to G06F 21/00.

Special rules of classification

G06F 2221/03 Secondary and transversal aspects specific to G06F 21/50+

G06F 2221/2101

Auditing as a secondary aspect

Definition statement

This place covers:

Logging history of events.

References

Limiting references

This place does not cover:

When the main aspect of the invention is auditing or monitoring	G06F 21/552, G06F 21/554

G06F 2221/2103

Challenge-response

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Authentication	G06F 21/30

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G06F 2221/2105

Dual mode as a secondary aspect

Definition statement

This place covers:

Computer working in two or more modes, e.g. protecting platform using secure/non secure mode, user/administrator mode.

References

Limiting references

This place does not cover:

When the main aspect of the invention relates to protecting specific internal components or peripheral devices operating in dual or compartmented mode.	G06F 21/74

G06F 2221/2107

File encryption

Definition statement

This place covers:

Use of unusual or unconventional encryption techniques.

G06F 2221/2109

Game systems

Definition statement

This place covers:

Specific solutions for security of games within the context of G06F 21/00, e.g. special memory game cartridge, casino machines.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coin-freed apparatus for games, toys, sports or amusements	G07F 17/32

G06F 2221/2115

Third party

Definition statement

This place covers:

When the involvement of a third party is essential.

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G06F 2221/2117

User registration

Definition statement

This place covers:

Use of unusual or unconventional user registration.

G06F 2221/2119

Authenticating web pages, e.g. with suspicious links

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protecting computer platforms against harmful, malicious and unexpected behaviours or activities at application loading time	G06F 21/51

G06F 2221/2123

Dummy operation

Definition statement

This place covers:

e.g. a processor performs dummy operations as countermeasure to differential power analysis.

G06F 2221/2127

Bluffing

Definition statement

This place covers:

e.g. pretending to have connected a user to a real node when in fact the connection is to a dummy.

G06F 2221/2135

Metering

Definition statement

This place covers:

Counting events for security purposes.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Long-term monitoring or reporting	G06F 21/552
Monitoring involving event detection and direct action	G06F 21/554

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Auditing	G06F 2221/2101

G06F 2221/2139

Recurrent verification

Definition statement

This place covers:

Periodically carrying out authorization checks after initial installation or loading.

G06F 2221/2145

Inheriting rights or properties, e.g., propagation of permissions or restrictions within a hierarchy

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protecting data against unauthorised access or modification by protecting access to a system of files or objects	G06F 21/6218

G06F 2221/2147

Locking files

Definition statement

This place covers:

Concurrent access, collaborative control, e.g. when two users with different access rights concurrently edit the same document.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protecting data against unauthorised access or modification by protecting access	G06F 21/62

G06F 2221/2149

Restricted operating environment

Definition statement

This place covers:

E.g. creating a user-specific working environment, parental control.

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G06F 2221/2153

Using hardware token as a secondary aspect

Definition statement

This place covers:

Use of hardware tokens, smart cards or dongles.

References

Limiting references

This place does not cover:

When used for restricting or protecting executable software	G06F 21/123
When for purposes of authentication	G06F 21/34

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G02C

SPECTACLES; SUNGLASSES OR GOGGLES INSOFAR AS THEY HAVE THE SAME FEATURES AS SPECTACLES; CONTACT LENSES (trial frames for testing the eyes A61B 3/04; goggles or eyeshields not having the same features as spectacles A61F 9/00)

Definition statement

This place covers:

Ophthalmic devices intended to be worn or supported by the user, either in front of the eyes or placed in contact with the eyes: spectacles (eyeglasses), contact lenses, sunglasses, goggles insofar as they have the same features as spectacles.

Optical parts of eyewear and methods of their design, e.g. lenses, filters, polarizers, mirrors, prisms, obturators, shields, auxiliary lenses.

Mechanical parts of eyewear (Means to support the optical parts) e.g. spectacle frames, bridges, nose pads, side-members.

Means to attach auxiliary optical parts to eyewear.

Means for supporting eyewear e.g. retainers, headbands.

Non-optical adjuncts to eyewear, e.g. ornaments, illumination, hearing aids and other electronic means, anti-misting means.

Assembling, repairing and cleaning of spectacles and contact lenses.

Measuring geometrical parameters for fitting or during assembling spectacles.

Relationships with other classification places

This subclass concerns only extracorporal ophthalmic devices. Owing to their medical nature, implanted devices such as intraocular lenses and corneal implants are classified in A61F 2/00, as well as ophthalmologic instruments in A61B 3/00(diagnostic) and A61F 9/00(therapeutic).

This subclass covers spectacles or goggles insofar they have features of vision correction or protection. Sunglasses are covered by this subclass insofar they protect the eye against high levels of visible and ultraviolet light. Groups A61F 9/02 and A61F 9/04 cover goggles or eye-masks (eye-shields) as forms of protective eyewear worn to prevent particulates or chemicals from striking the eyes, and not having the features of vision correction or protection against high levels of visible and ultraviolet light, which are normally associated to spectacles. Typical examples of goggles covered by these groups are goggles worn while welding, drilling or sawing. Goggles for swimming are covered by A63B 33/00, whereas diving masks are covered by B63C 11/12.

References

Limiting references

This place does not cover:

Trial frames and lenses for testing the eyes	A61B 3/04
Lenses implantable into the eye	A61F 2/14, A61F 2/16
Optical elements characterized by their material	G02B 1/00
Using polarisation multiplexing	H04N 13/337

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Visors for helmets	A42B 3/22
Instruments for examining the eye	A61B 3/00
Lenses implantable into the eye	A61F 2/14, A61F 2/16
Instruments for treating the eye	A61F 9/00 - A61F 9/0136
Goggles not having the same features as spectacles	A61F 9/02
Swimming goggles	A63B 33/002
Diving masks	B63C 11/12
Instruments for testing optical devices	G01M 11/00
Optical systems in general	G02B
Simple or compound lenses	G02B 3/00

Special rules of classification

Generally, more than one subgroup should be assigned whenever applicable.

Further detail not provided for in any of the main groups is provided for in the subgroups of G02C 2200/00 representing information orthogonal to one or to more than one of the groups G02C 1/00 - G02C 13/00 and their subgroups

symbols of the type G02C 2200/00 cover mechanical features (frame)

symbols of the type G02C 2202/00 cover optical features (lenses).

G02C 1/00

Assemblies of lenses with bridges or browbars

Definition statement

This place covers:

All aspects of mounting the lenses to the frame front:

front portions of the spectacle frames to which the lenses are mounted;

assemblies of lenses with bridges or browbars and other fixing parts

Frame front types: rimless, half-rim, full-rim, split-rim.

Means for mounting: types of grooves, mounting threads, closure means of split frames.

Half lens spectacles.

Frame and lenses integrally formed .

Special rules of classification

Frame front portions enabling easy exchange of lenses: add G02C 2200/08

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G02C 1/02

Bridge or browbar secured to lenses without the use of rims

Definition statement

This place covers:

Rimless spectacles, e.g. with or without holes, recesses or slits in the lenses.

means for securing: screws, nuts, washers, stems, rods, dowels.

Holes or slits provided in axial direction or in the peripheral surface of the lens (recesses).

G02C 1/023

{with lenses secured to the fixing parts by clamping, luting, soldering, gluing without holes or recesses in the lenses (G02C 1/04 - G02C 1/08 take precedence)}

Definition statement

This place covers:

Rimless spectacles without holes, recesses or slits in the lenses.

References

Limiting references

This place does not cover:

Bridges and browbars secured or integral with partial rims	G02C 1/04
Bridge or browbar secured or integral with closed rigid rims	G02C 1/06
The rims being transversly split and provided with securing means	G02C 1/08

G02C 1/026

{with auxiliary bars (G02C 1/04 - G02C 1/08 take precedence)}

Definition statement

This place covers:

Rimless spectacles with additional bar not directly fixed to the lenses. e.g. second bridge

References

Limiting references

This place does not cover:

Bridges and browbars secured or integral with partial rims	G02C 1/04
Bridge or browbar secured or integral with closed rigid rims	G02C 1/06
The rims being transversly split and provided with securing means	G02C 1/08

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G02C 1/04

Bridge or browbar secured to or integral with partial rims, e.g. with partially-flexible rim for holding lens

Definition statement

This place covers:

Front frames having only an upper portion or only a lower portion.

Front frames having two halves of different material, frequently a rigid (upper) portion and a soft (lower) portion, the top portion frequently comprising a groove, the lower portion being constituted by a (nylon) thread.

G02C 1/06

Bridge or browbar secured to or integral with closed rigid rims for the lenses

Definition statement

This place covers:

Closed rims (frequently from plastics material) comprising a groove in which the lenses are held.

G02C 1/08

the rims being tranversely split and provided with securing means

Definition statement

This place covers:

Rims (frequently made from metal) split (opened) for inserting the lens,

frames split at temporal or nasal side or any other location,

means for closing the split frame portions for securing the lens:

- Blocks and screw.
- Split bridge.
- Combined closing means and front hinge element ("split hinge").
- Various special closing means.

Special rules of classification

Combined closing means and front hinge element: add G02C 5/22 or subgroup.

G02C 1/10

{Special mounting grooves in the rim or on the lens}

Definition statement

This place covers:

Groove profiles other than V-grooves such as (semi-) circular, rectangular, asymmetric.

Profile varying or being interrupted along the perimeter of the rim.

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G02C 3/00

Special supporting arrangements for lens assemblies or monocles (lenses therefor G02C 7/00; by walking-sticks A45B 3/00)

Definition statement

This place covers:

Supporting lenses, front frames or spectacles on the head by other means than temples, bridge or nose pads or in addition thereto.

Supporting lenses and spectacles by neck, headgear, garment or other articles (e.g. lorgnons).

Relationships with other classification places

G02C 3/00 and subgroups concern devices for supporting spectacles.

G02C 11/00 and subgroups concern devices supported by spectacles.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lenses therefor	G02C 7/00
Lens assemblies or monocles supported by walking-sticks	A45B 3/00

Special rules of classification

If specially adapted frame portions (e.g. temple ends) are required: add respective sub-group (e.g. G02C 5/143).

G02C 3/003

{Arrangements for fitting and securing to the head in the position of use}

Definition statement

This place covers:

Retainers (straps, cords, chains, bands) for spectacles in front of the eyes:

straps, cords, chains, bands replacing the temples or in addition to temples.

Lenses or spectacle parts fixed to the face by piercings.

Means for preventing spectacles from slipping.

Means for reducing weight or pressure on the nose or on the ears, balancing the weight of the spectacles.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Jewellery holding or retaining articles, e.g. spectacles	A44C 15/003
Piercing type jewellery	A44C 15/0035

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Straps, buckles, attachment of headbands for goggles	A61F 9/027

G02C 3/006

{Arrangements for fitting and securing to the head or neck not in the position of use}

Definition statement

This place covers:

Retainers for spectacles (straps, cords, chains, bands) to be worn around the neck when the spectacles are not in use.

Special rules of classification

Only if the retainer has a special (support) function when the spectacles are worn in front of the eyes: add G02C 3/003.

G02C 3/02

Arrangements for supporting by headgear

Definition statement

This place covers:

Devices for mounting spectacles to hats, caps, sun shields, helmets, etc.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Securing spectacles or goggles on helmet shells	A42B 3/185

G02C 3/04

Arrangements for supporting by hand, e.g. lorgnette, Arrangements for supporting by articles (by walking-sticks A45B 3/00)

Definition statement

This place covers:

Lorgnon, lorgnette.

Holding devices for spectacles e.g. on garment, clothes, in cars, on belts etc.

combination of spectacles and cases.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Support by walking sticks	A45B 3/00
Spectacle cases	A45C 11/04

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Fastening articles to the garment	A45F 5/02
Supporting spectacles in vehicles	B60R 7/082
(Hand held) magnifying glasses	G02B 25/002, G02B 25/008, G02B 25/02

G02C 5/00

Constructions of non-optical parts

Definition statement

This place covers:

Mechanical parts of spectacles such as bridges, nose pads, hinges, temples.

Frame (parts) made from special materials.

Frames having special properties or functions other than supporting lenses

mounting details.

References

Limiting references

This place does not cover:

Spectacle frame front portions	G02C 1/00

Special rules of classification

Modular frames or frames comprising easily exchangeable elements: add G02C 2200/08.

G02C 5/001

{specially adapted for particular purposes, not otherwise provided for or not fully classifiable according to technical characteristics, e.g. therapeutic glasses}

Definition statement

This place covers:

Frames having special properties or functions other or in addition to holding lenses.

Spectacle frames lacking conventional parts:

Spectacles having only one or no temple, having no bridge, only one rim.

Unconventional shape or use:

Asymmetric frames, attachment of the temples at the underside of the frame,

temple(s) pivotable to the front side of the frame front, convertible, reversible spectacles (front/back, up/down).

Spectacles for specially shaped faces (e.g. babies, Down-syndrome patients);

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Fully individual adaption of the shape of frame portion e.g. by molding etc.

Special construction to protect the lenses when laying down the glasses.

References

Limiting references

This place does not cover:

Half-lens spectacles and frames therefor	G02C 1/00
Lorgnons	G02C 3/04
Pince-nez	G02C 5/128

Special rules of classification

Add group symbol relating to the feature providing the unconventional function, e.g. G02C 5/12, G02C 5/14, G02C 5/22.

G02C 5/003

{Shooting or aiming glasses}

Definition statement

This place covers:

Spectacle frames for shooting glasses.

Glasses for sports requiring aiming, e.g. golf, frequently with means for adjusting the aiming elements (pin holes, cross lines).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lenses comprising markings	G02C 7/021
Shields, shades obturators	G02C 7/16

G02C 5/005

{Glasses allowing access to one eye, e.g. for make-up application}

Definition statement

This place covers:

Spectacles comprising individually pivotable (vertically, horizontally) rims.

References

Limiting references

This place does not cover:

Pivotally arranged auxiliary lenses, clipons	G02C 9/02

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G02C 5/006

{Collapsible frames}

Definition statement

This place covers:

Frames having multiple possibilities to be folded (other than just the conventional opening and closing of the temples or in addition thereto).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Hinges in the middle of the temple; or bridge	G02C 5/20 ; G02C 5/08

Special rules of classification

Add subgroup relating to the elements involved in the collapsing action, e.g. G02C 5/22, G02C 5/20, G02C 5/08.

G02C 5/008

{Spectacles frames characterized by their material, material structure and material properties}

Definition statement

This place covers:

Frames made from metal, polymers, horn, wood, shape memory alloy, superelastic materials, etc.

Structure of the material: layered, compound, wire, sheet type material, credit-card shaped spectacles, spectacles made from card board (e.g. polarizing stereo).

Properties of the frame resulting from materials (e.g. floating, particularly soft).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Production of spectacle frames from metal (wire)	B21F 45/002
Shape memory alloys, super elastic metals per se	C22C 19/00
Doublé, galvanic layers, corrosion resistance	C23, C25D

Special rules of classification

As for the material per se, use this sub-group only if the material is essential to achieve a particular functionality or property (e.g. floating spectacles, super elastic temples) or requires special assembly or treatment techniques (e.g. wood or horn frames).

Add one of G02C 2200/10 - G02C 2200/16 if applicable.

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G02C 5/02

Bridges; Browbars; Intermediate bars (nose engaging-surfaces G02C 5/12)

Definition statement

This place covers:

Elements joining the two rims or lenses.

Spectacles detachable or detached at the location of the bridge.

Double bridge, reinforced bridge.

Horizontally or vertically split bridge.

Special bridge for mounting nose-pad arms, pads or other nose engaging surfaces.

Bridge specially adapted for mounting decorative elements.

Bridge adapted for holding temples when closed, e.g. with magnetic means.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Nose engaging surfaces	G02C 5/12

Special rules of classification

Horizontally split bridges: add G02C 1/08.

Special bridge for mounting pad arms, pads etc.: add G02C 5/12 or subgroup.

G02C 5/08

foldable

Definition statement

This place covers:

Hinge or other element enabling folding on the bridge.

G02C 5/10

Intermediate bars or bars between bridge and side-members

Definition statement

This place covers:

Individual parts between front frame and hinge, not generally present in all kinds of frames.

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G02C 5/12

Nose pads; Nose-engaging surfaces of bridges or rims

Definition statement

This place covers:

Nose pads, elements for mounting and retaining nose pads.

Bridge type pads, bridge saddle, two individual pads, twinned pads

mounted to the bridge or to the rims.

Pads integral with rims.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protection of the nose	G02C 11/00
Paddings, cushions, fitting to the face for goggles	A61F 9/026

G02C 5/122

{with adjustable means}

Definition statement

This place covers:

Adjustable and resilient mounting of nose pads and other nose engaging elements.

G02C 5/124

{for vertically varying the position of the lenses}

Definition statement

This place covers:

Can be achieved by vertical or horizontal adjustment of the pads.

G02C 5/126

{exchangeable or otherwise fitted to the shape of the nose}

Definition statement

This place covers:

Exchangeable pads or pads providing particular fit and comfort.

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G02C 5/128

{Pince-nez}

Definition statement

This place covers:

Spectacles comprising a front frame only comprising clamping nose pads or other nose clamping functionality.

Special rules of classification

Use this class also in absence of (special) nose pads or pad mounting.

G02C 5/14

Side-members

Definition statement

This place covers:

Temples, rigid side members rearwards from the hinge or directly attached to the front frame (no hinge).

Special temples for receiving non optical adjuncts.

Special temples acting as case for the front and the lenses.

Adjustable, reinforced, resilient, shortened temples.

References

Limiting references

This place does not cover:

Side members other than temples, e.g. straps, head bands	G02C 3/003
Spectacles having only one temple	G02C 5/001

Informative references

Attention is drawn to the following places, which may be of interest for search:

Non-optical adjuncts: decorative, hearing aids, illumination, etc.	G02C 11/00

G02C 5/143

{having special ear pieces}

Definition statement

This place covers:

Special temple ends: individual, wired, securing means.

Temples having no ear piece (shortened temples).

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G02C 5/146

{having special front end}

Definition statement

This place covers:

Special temple front ends, e.g. split front ends requiring two hinges,

front end particularly constructed for fixing the hinge or a non-optical adjunct.

G02C 5/16

resilient or with resilient parts

Definition statement

This place covers:

Resiliently deformable temple or temple parts.

G02C 5/18

reinforced

Definition statement

This place covers:

Temple reinforced, e.g. by a metal core.

G02C 5/20

adjustable, e.g. telescopic

Definition statement

This place covers:

Temples having adjustable length, self adjusting length.

Temples having adjustable inclination and/or opening angle.

Foldable temples, temples having a hinge.

Temple rotatable about its longitudinal axis

Special rules of classification

If adjustable inclination and opening angle is enabled by features of the hinge, only use G02C 5/22 or subgroups.

Foldable temples having a hinge: add G02C 5/22 or subgroup.

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G02C 5/22

Hinges (pivotal connection in general F16C 11/00)

Definition statement

This place covers:

Junctions between elements of the spectacles frame:

(front frame - temple, rim - temple, intermediate portion - temple

bridge - bridge, temple - temple).

Pivotal junctions comprising or not comprising well-defined pivot axis

Elements combining hinge (front portion) and securing means for closing a rim of the front frame (split hinge).

Details of the pivot or bearing.

Special hinge screws.

Elastic hinges comprising coil springs or other springs.

Composite hinges allowing multiple axis rotation.

Hinges having an oblique axis.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Pivotal connection in general	F16C 11/00

Special rules of classification

Combined closing means and front hinge element ("split hinge"): add G02C 1/08.

G02C 5/2209

{Pivot bearings and hinge bolts other than screws}

Definition statement

This place covers:

Hinges comprising means for providing pivotal connections other than screws, screwless hinges.

G02C 5/2218

{Resilient hinges}

Definition statement

This place covers:

Hinge comprising elastic means urging the temple towards at least one predetermined angular position (opened and/or closed position), frequently following overextension beyond the normal open position of use.

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References

Limiting references

This place does not cover:

Resilient hingeless junctions	G02C 5/2272

Special rules of classification

If applicable add suitable subgroup of G02C 2200/00.

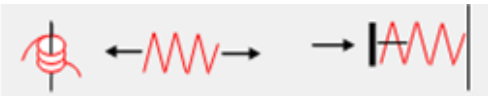
G02C 5/2227

{comprising a fixed hinge member and a coil spring}

Definition statement

This place covers:

Both hinge members are fixed with respect to the front frame and the temple; a coil is used for the overextension, the eyelets (or the coil) are fixed to front frame and temple. Illustrative example:



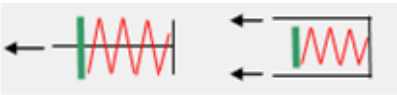
G02C 5/2236

{comprising a sliding hinge member and a coil spring}

Definition statement

This place covers:

At least one hinge member slidingly connected to temple or front frame, coil actuated by piston or housed in a sliding box. Illustrative example:



G02C 5/2245

{comprising a sliding box containing a spring}

Definition statement

This place covers:

Hinge comprising a slidingly arranged box shaped element housing (and actuating) a coil spring.

G02C 5/2254

{comprising elastic means other than coil spring}

Definition statement

This place covers:

Resilient part other than a coil spring generating an elastic effect

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e.g. leaf spring, rubber, elastic wire.

G02C 5/2263

{Composite hinges, e.g. for varying the inclination of the lenses}

Definition statement

This place covers:

Hinges allowing multiple axis rotation.

Hinges allowing variation of inclination of the front frame.

Hinges allowing 180° folding of temples.

Hinges allowing temples to be rotated about their longitudinal axis.

Connected hinges cooperating to open both temples using one hand only.

G02C 5/2272

{Hinges without well-defined pivot axis}

Definition statement

This place covers:

Pivotal movement of the temples achieved e.g. by a bending portion, "hingeless articulations".

G02C 5/2281

{Special hinge screws}

Definition statement

This place covers:

Special screws comprising e.g. blocking means, two (different) threads, special slit, cone-shape or otherwise varying cross-section, special nuts and other special elements cooperating with screws.

G02C 5/229

{Oblique hinge axis}

Definition statement

This place covers:

Hinge comprising an oblique (not vertical) axis for enabling special folding movement of the temples, e.g. to the top or bottom of the frame rather than to the rear side.

G02C 7/00

Optical parts (characterised by the material G02B 1/00)

Definition statement

This place covers:

Elements arranged in the optical path of the eye and serving for ophthalmic purposes:

Lenses, auxiliary lenses, light deflecting elements, filters, apertures, occluders.

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Design of optical elements.

Relationships with other classification places

Only optical elements worn in front of or on the eye are contained in this group. Optical elements implanted into the eye (intra-ocular lenses, corneal inlays) requiring surgical interventions are classified in A61F 2/14 and A61F 2/16.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Optical elements in general	G02B
Optical elements characterized by their material	G02B 1/00

G02C 7/02

Lenses; Lens systems {; Methods of designing lenses}

Definition statement

This place covers:

Ophthalmic lenses and their design, such as e.g.

spectacle lenses, contact lenses, multifocal lenses (including bifocal, trifocal and progressive power lenses).

Methods of designing ophthalmic lenses, e.g. individual lens design

high power ophthalmic lenses, lenticular lenses

high curvature lenses.

Lenses for correcting of higher order aberrations, e.g. spherical aberration

diffractive and Fresnel ophthalmic lenses.

Lenses for inhibiting myopia progression

Mislocation tolerant ophthalmic lenses.

Lenses comprising decentered structures.

Series of ophthalmic lenses.

Semifinished ophthalmic lenses, lens blanks.

Lenses for low vision and visual disorders other than refractive errors.

Individual lens design for impaired vision, e.g. macula degeneration.

Ophthalmic lenses having features achieved by their material or material Structure (only if specific to ophthalmic lenses):

laminated lenses, gradient index, hybrid material, photorefractive material;

mathematical description of lens surfaces e.g. spheric, aspheric, toric, atoric, by conicals, polynomials, Zernicke polynomials.

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Ophthalmic lenses having technical markings,

Patterned lenses (cosmetic contact lenses).

Ophthalmic lenses having special protective or antireflective coatings.

References

Limiting references

This place does not cover:

Specially edged lenses for half-lens spectacles	G02C 1/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Ophthalmic filters, sun protection	G02C 7/10
Polarizers	G02C 7/12
Edging of lenses, drilling holes, cutting recesses and instruments therefor	B24B 9/14
Positioning or marking of lenses (in preparation of grinding)	B24B 13/005
Tools for grinding lenses (surface)	B24B 13/02 - B24B 13/06
Manufacture of plastics lenses	B29D 11/00009
Applying coatings on optical elements	B29D 11/00865
Surface treatment of glass	C03C 15/00
Lenses made of organic material	G02B 1/041
Optical coatings	G02B 1/10
Anti-reflection coatings	G02B 1/11
Optical coatings by surface treatment	G02B 1/12
Simple lenses per se	G02B 3/00
Lenses per se defined by analytical functions	G02B 3/0081
Lenses per se having non-spherical surfaces	G02B 3/02
Lenses per se having cylindrical or toric surfaces	G02B 3/06
Lenses per se having discontinous surfaces, e.g. Fresnel	G02B 3/08
Diffractive elements per se	G02B 5/18
Optical systems for correcting aberrations	G02B 27/0025
Diffraction optics in general	G02B 27/42

Special rules of classification

Add suitable sub-group of G02C 2202/00

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G02C 7/021

{with pattern for identification or with cosmetic or therapeutic effects (methods and processes take preference, e.g. printing, marking or copying processes B41M; identification in general G09F 3/00; producing decorative effects in general B44C; surface treatment of glass C03C 15/00 - C03C 23/00; positioning or marking of lenses B24B 13/0055)}

Definition statement

This place covers:

Markings or patterns having no effect on spectral transmission or optical properties of the lens.

Markings for technical (identification or alignment) or non-technical (decorative) purposes.

Markings on progressive lenses, fitting cross, far-, near reference point

name or symbol of manufacturer, cross-hairs for aiming.

References

Limiting references

This place does not cover:

Contact lenses comprising iris pattern or (printed) pin hole	G02C 7/046

Informative references

Attention is drawn to the following places, which may be of interest for search:

Coloring having influence on spectral transmission, filters	G02C 7/10
Pin-holes and other kind of apertures formed on the lens	G02C 7/16
Positioning or marking of lenses	B24B 13/0055
Printing, marking or copying processes	B41M
Marking by laser	B41M 5/24, B41M 5/26
Producing decorative effects in general	B44C
Surface treatment of glass	C03C 15/00 - C03C 23/00
Identification in general	G09F 3/00

G02C 7/022

{Ophthalmic lenses having special refractive features achieved by special materials or material structures (G02C 7/049 takes precedence)}

Definition statement

This place covers:

Lenses essentially requiring particular materials and material structures to achieve their special refractive properties:

Locally varying refractive index (index gradient, GRIN-lenses),

photorefractive materials (refractive index can be modified by illumination),

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laminated lens structure.

Cellular lens surface structure.

References

Limiting references

This place does not cover:

Contact lenses having special fitting or structural features achieved by their material	G02C 7/049

Special rules of classification

Add one of G02C 2202/12 - G02C 2202/18 if applicable.

G02C 7/024

{Methods of designing ophthalmic lenses}

Definition statement

This place covers:

Methods of designing lenses:

For individuals or for standard user or standard situation,

considering conditions related to the viewed object, i.e. the environment in which the lenses are intended to be used,

considering conditions related to the user,

special mathematical methods and interactive techniques.

Special rules of classification

Add sub-group symbol relating to the specific type of ophthalmic lens to be designed (G02C 7/02, G02C 7/061, G02C 7/04 and sub-groups).

G02C 7/025

{considering parameters of the viewed object}

Definition statement

This place covers:

Adapting the design and optical properties of the lens to the environment in which the lenses are intended to be used such as office, car, outdoor, particular professional environments, etc.

Generalized definition of the viewed object by defining an object distance for each direction of gaze ("Ergorama", "Objektabstandsfunktion").

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G02C 7/027

{considering wearer's parameters}

Definition statement

This place covers:

- Considering wearing parameters determined by the spectacles frame used for mounting the lenses to be designed and by the position of the frame as worn by the user, such as pupillary distance, inclination, wrap angle, vertex distance, position on the face, centre of rotation, eye-length.
- User dependent determination of reference points (F, N, O) on the lens.
- Matching properties in corresponding points on the lenses in binocular use.
- Considering the user's eye and/or head movement, choice of design dependent thereon (e.g. hard/soft design in progressive lenses).
- Considering special ophthalmological conditions (not simple ametropia) such as higher order aberrations of the eye, visual performance, different cylindrical correction in far and near zones required (cylindrical addition and Listing's rule), magnification differences due to (considerably) different refraction of the two eyes, wearer's tolerance to imaging errors (distorsion, unwanted astigmatism, different magnification R/L).
- Considering different correction goals for the two eyes ("monovision") such as different correction far/near, different colour filters, arrangement of far and near zones different in left and right contact lenses.

G02C 7/028

{Special mathematical design techniques}

Definition statement

This place covers:

- Special mathematical tools and techniques:
- definition of boundary conditions for optimization and calculation,
- specific type of error function, choice of coordinate systems, superposition of surfaces and techniques therefor, power vector, mathematical representation of astigmatism, ray tracing and wavefront calculation techniques.
- Interactive design methods.
- Simulation of the view through lenses.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Optical design, e.g. procedures, algorithms, optimization	G02B 27/0012
Complex mathematical operations	G06F 17/10
Computer aided design	G06F 30/00
3D modelling, simulation	G06T 17/20, G06T 17/30

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G02C 7/04

Contact lenses for the eyes (disinfection or sterilisation of contact lenses A61L 12/00)

Definition statement

This place covers:

Lenses worn on the cornea or on the cornea and sclera of the eye,

corneal contact lenses (CLs), scleral contact lenses,

soft (including silicone hydrogels), rigid and combinations,

CLs for modifying the shape of the cornea, orthokeratology lenses,

CLs for inhibiting progression or development of myopia,

means for rotational and translational stability and control (ballast, slab-off),

Cls having decentered optical axis,

CLs having optical features providing tolerance to mislocation (angular),

CLs for imaging "around" a retinal skotom,

diffractive CLs,

CLs providing chromatic correction,

contact lenses suitable for containing (but not containing) medical preparations, drug delivery CLs,

cosmetic CLs,

CLs having grooves, holes for tear exchange,

CLs having specific optical or topological properties or features essentially achieved by their material.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Technical marks on CLs	G02C 7/021
Different correction for the two eyes, monovision	G02C 7/028
Cleaning devices for contact lenses	G02C 13/008
Cases for contact lenses	A45C 11/005
Diagnostic measuring using contact lenses (e.g. glucose sensors)	A61B 5/14532 , A61B 3/101
Therapeutic contact lenses without optical function (e.g. bandages)	A61F 2/14
Artificial corneae and corneal implants	A61F 2/142
Intraocular lenses (multifocal, diffractive, higher order etc.	A61F 2/16
Methods or devices for treatment of the eyes	A61F 9/00
Devices for treatment of the eyes, implantable or in contact with the eye	A61F 9/0017
Devices for putting in contact lenses	A61F 9/0061

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Refractive cornea treatment using laser (e.g. LASIK, ablation, disruption)	A61F 9/00804, A61F 9/00827
Refractive cornea treatment using other instruments	A61F 9/013
Ocular implants or inserts (e.g. CLs) containing (!) medical preparations to be delivered to the ocular tissue, e.g. in combination with orthokeratologic treatment, (galenics)	A61K 9/0048
Disinfection or sterilisation of contact lenses	A61L 12/00
Manufacture of contact lenses	B29D 11/00038
Packaging of contact lenses	B65B 25/008
Cleaning agents for contact lenses	C11D 3/0078
Contact lenses characterized by their material only	G02B 1/043

G02C 7/041

{bifocal; multifocal}

Definition statement

This place covers:

Contact Lenses providing bifocal, trifocal or progressively varying power:

- simultaneous or translating type.
- annular or sectorial configuration of the viewing zones.
- special transition zone between viewing zones.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Multifocal spectacle lenses	G02C 7/06
Intraocular lenses having special configuration, e.g. bifocal	A61F 2/1613

G02C 7/042

{Simultaneous type}

Definition statement

This place covers:

Multiple differently focussed images on the retina simultaneously formed by different regions (far/near/intermediate) of the lens.

G02C 7/043

{Translating type}

Definition statement

This place covers:

Lens translating on the cornea generating a single image pushed by the lid(s).

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Translating = bivisual = alternating.

G02C 7/044

{Annular configuration, e.g. pupil tuned}

Definition statement

This place covers:

Far and near portions annularly (concentrically) arranged, amount of light in near or far focus determined by pupil size (pupil tuning).

G02C 7/045

{Sectorial configuration}

Definition statement

This place covers:

Far and near portions shaped as sectors.

G02C 7/046

{Contact lenses having an iris pattern}

Definition statement

This place covers:

Contact lenses having a (cosmetic) iris pattern.

CLs having a pinhole ("artificial pupil").

Spectral transmission in the pupil area unaffected.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Technical markings on the lens	G02C 7/021
Coloring having influence on spectral transmission	G02C 7/10
Manufacture of marked or patterned contact lenses	B29D 11/00317

Special rules of classification

CLs having a pinhole: add G02C 7/16

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G02C 7/047

{Contact lens fitting; Contact lenses for orthokeratology; Contact lenses for specially shaped corneae}

Definition statement

This place covers:

Adaption of the posterior lens surface to the cornea, particular posterior surfaces, e.g. ellipsoid surfaces,

individually designed CLs, methods of fitting and designing CLs,

trial contact lenses,

CLs for keratoconus, flat and irregular corneae

orthokeratology contact lenses: CLs having a rear surface shaped for controllably deforming the cornea to reduce ametropia (frequently myopia) or inhibit its development or progression,

CL design processes considering shrink and dwelling after production.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Apparatuses and methods for measuring the topograpy (curvature) of the cornea	A61B 3/107

G02C 7/048

{Means for stabilising the orientation of lenses in the eye}

Definition statement

This place covers:

Means for stabilizing the angular position of the contact lens (rotational stabilisation) on the cornea:

prism, slab-off, particular thickness profile, ridge, etc.

particularly relevant in tranlslating bifocal CLs and toric CLs.

G02C 7/049

{Contact lenses having special fitting or structural features achieved by special materials or material structures}

Definition statement

This place covers:

CLs essentially requiring special (e.g. rigid or soft) material to achieve specific optical or topological properties or features.

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References

Limiting references

This place does not cover:

Contact lenses characterized by their material only	G02B 1/04

Informative references

Attention is drawn to the following places, which may be of interest for search:

Contact lens materials in general (polymers)	C08

G02C 7/06

bifocal; multifocal {; progressive (G02C 7/041 takes precedence)}

Definition statement

This place covers:

Spectacle lenses having more than one focal power, e.g. bifocal, trifocal, progressive lenses.

References

Limiting references

This place does not cover:

Bi- multifocal, progressive contact lenses	G02C 7/041

G02C 7/061

{Spectacle lenses with progressively varying focal power}

Definition statement

This place covers:

Lenses having a power varying (in vertical direction along a principal line) from a far vision zone along a progressive zone to a near vision zone.

Progressive lenses characterized by:

- The shape of the progressive surface (e.g. distribution of unwanted astigmatism),
- The properties on the principal line
- The particular shape and location of the viewing zones
- Special properties achieved by the cooperation of the two lens surfaces

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Methods for designing (progressive) lenses	G02C 7/024
Progressive contact lenses	G02C 7/041

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G02C 7/063

{Shape of the progressive surface}

Definition statement

This place covers:

Progressive lenses characterized by general aspects:

- Distribution of unwanted astigmatism in general (Minkwitz' rule).
- Distribution of other parameters (power, derivatives of astigmatism and spherical power, axis of astigmatism).
- Shape of zones such as channel length and width (in general) if not determined by particular viewing task.
- Properties on the principal line.
- Shape size and location of the viewing zones.
- Mutual dependence of the above properties.
- Combination (fusion) of progressive property with other corrective surface properties (e.g. toric) on the same (!) surfacec
- Hard / soft design and combinations, superpositions thereof on one lens surface.

G02C 7/065

{Properties on the principal line}

Definition statement

This place covers:

Progressive spectacle lenses characterized by properties on the principal line:

- Umbilic line.
- Non-umbilic principal line, astigmatism on principal line accepted.
- (mean spherical) power distribution on the principal line.
- Run of the principal line, nasal inset, unconventional run.
- Symmetry issues with respect to the principal line.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Astigmatism vertically changing for correction purposes (cylindrical addition, near astigmatism)	G02C 7/027

G02C 7/066

{Shape, location or size of the viewing zones}

Definition statement

This place covers:

Progressive lenses characterized by parameters related to their use:

- Shape, size and location of viewing zones for particular viewing tasks (car driver, golf, office, musician, ...).
- Special design for particular population (children, pre-presbyopes).

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G02C 7/068

{Special properties achieved by the combination of the front and back surfaces}

Definition statement

This place covers:

Progressive spectacle lenses characterized by combined effects of front and back surface other than combined spherical and astigmatic power:

- Special alignment or orientation e.g. for thickness reduction (prism), appearance.
- Lenses with progressive surface on the back side.
- Double progressive lenses, one surface regressive.
- Lens magnification determining the shape of both surfaces (at least one being progressive), magnification differences within lens or lens pair, choice of base curvatures dependent on magnification.
- Progressive surface in combination with other specific surfaces on different sides (progressive and toric, atoric, aspheric, etc.)

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Combination (fusion) with other (e.g. toric) corrective surface properties (on one surface!)	G02C 7/063

G02C 7/08

Auxiliary lenses; Arrangements for varying focal length

Definition statement

This place covers:

Lenses in addition to primary spectacles or contact lenses.

Spectacles comprising telescopes, loupes.

Lenses having variable focal length.

Telescopic systems comprising a positive spectacle lens + negative contact lens = Galilean telescope.

G02C 7/081

{Ophthalmic lenses with variable focal length}

Definition statement

This place covers:

Single or compound lens element exhibiting temporarily changeable and controllable lens power (mechanical, electrostatical, pneumatic actuation).

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G02C 7/083

{Electrooptic lenses}

Definition statement

This place covers:

Lenses of which the optical index and, thus, the power are controllable.

Frequently comprising liquid crystal material.

Frequently cellular structures.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Filter lenses having liquid crystal material acting as light valve:	G02C 7/101
Non-linear optical devices	G02F 1/29

Special rules of classification

Add G02C 2202/18 (cellular structures) if applicable.

G02C 7/085

{Fluid-filled lenses, e.g. electro-wetting lenses}

Definition statement

This place covers:

Lenses comprising a (deformable) cavity which can be filled by fluid by means of pumps, etc.

Lenses comprising two immiscible fluids, the curvature of their contacting surface being electrostatically controllable (electro-wetting lenses).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Fluid-filled lenses with variable focal length per se	G02B 3/14
Electrowetting lenses per se	G02B 3/14, G02B 2207/115

G02C 7/086

{Auxiliary lenses located directly on a main spectacle lens or in the immediate vicinity of main spectacles}

Definition statement

This place covers:

Auxiliary lenses (removably) attached to or adhered onto the surface of a spectacle lens or contact lens.

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Clip-on auxiliary lenses.

Optical elements provided on or in a lens serving as a part of a head up display.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mounting of auxiliary lenses	G02C 9/00

G02C 7/088

{Lens systems mounted to spectacles}

Definition statement

This place covers:

Magnifying and telescopic spectacles, spectacles for amblyopic persons

Spectacles providing enlarged filed of vision, e.g. by anamorphic lenses or lens elements.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Telescopes per se	G02B 23/00

Special rules of classification

For low vision devices add G02C 2202/10 if applicable.

G02C 7/10

Filters, e.g. for facilitating adaptation of the eyes to the dark; Sunglasses

Definition statement

This place covers:

Coloured ophthalmic lenses with or without optical power having particular spectral transmission properties serving for sun-protection in ultraviolet, visible and infrared wavelength ranges.

Filters having special spectral characteristics other than for sun protection.

Inhomogeneously tinted filters.

Special colouring materials.

Interference filters.

Filters having a coloured layer of constant thickness irrespective of the local thickness of the lens.

Electrooptic, photochromic filters.

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Lenses having technical markings	G02C 7/021
Contact lenses having an iris pattern	G02C 7/046
Optical filters per se	G02B 5/20

Special rules of classification

Filters having a coloured layer: add G02C 2202/16.

G02C 7/101

{having an electro-optical light valve (electro-optical elements per se G02F)}

Definition statement

This place covers:

Electrically controlled active filters: liquid crystal, electro-optical, electro-chromic.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Devices or arrangements, the optical operation of which is modified by changing the optical properties of the medium of the devices or arrangements for the control of the intensity, colour, phase, polarisation or direction of light	G02F
Liquid crystal filters in general	G02F 1/13
Their operation	G02F 1/133
Using temporal multiplexing	H04N 13/341

G02C 7/102

{Photochromic filters}

Definition statement

This place covers:

Filters reversibly changing their absorption upon light incidence (UV), photochromic (phototropic) filter lenses.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Photochromic filters in general	G02B 5/23

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G02C 7/104

{having spectral characteristics for purposes other than sun-protection}

Definition statement

This place covers:

Filters provided for medical reasons (e.g. age related macular degeneration, dyslexia).

Filters provided to enhance visibility of traffic lights and other optical signals.

Filters provided to enhance visibility of (particularly coloured) objects in (particularly coloured) environment, e.g. tennis or golf balls.

G02C 7/105

{having inhomogeneously distributed colouring}

Definition statement

This place covers:

Filters having only portions tinted or different colour in different portions, e.g. top dark - bottom light.

G02C 7/107

{Interference colour filters}

Definition statement

This place covers:

Spectral transmissivity achieved by interference layers.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Interference filters in general	G02B 5/28

G02C 7/108

{Colouring materials}

Definition statement

This place covers:

Ophthalmic filters characterized by their colouring material (dyes, pigments).

References

Limiting references

This place does not cover:

Photochromic filters	G02C 7/102

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Informative references

Attention is drawn to the following places, which may be of interest for search:

Dyes, pigments	C09

G02C 7/12

Polarisers

Definition statement

This place covers:

Polarizing filters for ophthalmic purposes, e.g. sun protection.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Testing stereoscopic vision	A61B 3/08
Optical elements made of polarizing materials	G02B 1/08
Polarizing elements per se	G02B 5/30
Optical systems for producing stereoscopic or other 3D effects involving polarizing means	G02B 30/25
Stereoscopic photography by simultaneous viewing using polarized or coloured light	G03B 35/26
Using polarisation multiplexing	H04N 13/337

G02C 7/14

Mirrors; Prisms

Definition statement

This place covers:

Prisms for treating/correcting strabismus.

Prisms, mirrors for deviating the line of sight, e.g. for looking rearwardly, for looking horizontally when lying in bed.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Mirrors per se	G02B 5/08
Mounts for prisms and mirrors	G02B 7/18

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G02C 7/16

Shades; shields; Obturators, e.g. with pinhole, with slot {(G02C 5/003 takes precedence)}

Definition statement

This place covers:

Shielding elements in the optical path.

Side and top shields only if arranged for limiting the field of view.

References

Limiting references

This place does not cover:

Shooting or aiming glasses comprising such elements	G02C 5/003

Informative references

Attention is drawn to the following places, which may be of interest for search:

Iris patterns and pin holes on contact lenses	G02C 7/041
Side shields for protection of the eyes (not in the optical path)	G02C 11/12
Diaphragms per se	G02B 5/005

Special rules of classification

Side and top shields if arranged for limiting the field of view: add G02C 11/00

pin holes (stenopaeic aperture) on contact lenses: add G02C 7/046.

G02C 7/165

{with stenopaeic apertures}

Definition statement

This place covers:

Aperture(s) producing a depth of field effect.

G02C 9/00

Attaching auxiliary optical parts (auxiliary optical parts per se G02C 7/08 - G02C 7/16)

Definition statement

This place covers:

Attachments of any auxiliary lens or system of G02C 7/086 or G02C 7/088

mounting corrective or protective lenses in goggles, diving masks, helmets,

attaching head mounted displays [HMD].

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References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Spectacles allowing access to the eye	G02C 5/003
Auxiliary parts per se	G02C 7/08 - G02C 7/16
HMDs per se	G02B 27/017

G02C 11/00

Non-optical adjuncts; Attachment thereof (G02C 7/16 takes precedence)

Definition statement

This place covers:

Specially adapted (parts of) spectacles for mounting or integrating or having mounted or integrated additional elements without optical function (for the eye):

- Protection for the ears (sound and sun), nose, mouth, protection against radio frequency radiation;
- Cameras mounted to the frame;
- Retroreflective elements;
- Devices for holding articles e.g. Pencil;
- Devices for retaining the hair;
- Devices for delivering air or medical gaseous compositions to the nose or the eyes;
- Devices for delivering ophthalmic solutions to the eyes;
- Tools, e.g. Bottle opener;
- Devices for dispensing perfumes, crèmes (cosmetic, medical), etc. To the face;
- Anti theft devices;
- Means for preventing wrinkles

Relationships with other classification places

G02C 3/00 and subgroups concern devices for supporting spectacles.

G02C 11/00 and subgroups concern devices supported by spectacles.

Whereas G02C 11/00 concerns specially adapted (parts of) spectacles for mounting or integrating or having mounted or integrated non optical adjuncts, the non optical adjuncts themselves are classified in their respectve groups (see e.g. the informative references in the subsequent sub-groups).

References

Limiting references

This place does not cover:

Shields, shades, obturators in the optical path of the eye	G02C 7/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Special temple ends, e.g. for providing improved fit	G02C 5/143
Protection for the ears per se	A61F 11/06

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Anti theft devices for spectacles per se	E05B 73/0035

Special rules of classification

This group is only used if the spectacles comprise particular features enabling the attachment or integration of the non-optical adjunct (exception G02C 11/08.

G02C 11/02

Ornaments, e.g. exchangeable

Definition statement

This place covers:

Specially adapted (parts of) spectacles for attaching or having attached decorative or ornamental elements (frequently exchangeably).

G02C 11/04

Illuminating means

Definition statement

This place covers:

Specially adapted (parts of) spectacles for attaching or having attached illuminating means or lasers for pointing and aiming.

References

Limiting references

This place does not cover:

(indicator) lights of electronic devices integrated in spectacles	G02C 11/06, G02C 11/10

G02C 11/06

Hearing aids (construction of electric hearing aids H04R 25/00)

Definition statement

This place covers:

Specially adapted (parts of) spectacles for attaching or having attached hearing aids.

References

Limiting references

This place does not cover:

Construction of electric hearing aids	H04R 25/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Microphone arrays	H04R 1/406

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G02C 11/08

Anti-misting means, e.g. ventilating, heating (H05B 3/84 takes precedence); Wipers

Definition statement

This place covers:

Specially adapted (parts of) spectacles for attaching or having attached:

- Means to prevent fogging.
- Means for cleaning the lenses during wearing.
- Means other than shields to protect the eyes from dust or pollen, e.g. By ventilating, sealing.
- Sealing means, attachments on the rear side of the frame front or the lenses.

References

Limiting references

This place does not cover:

Heating arrangements specially adapted for transparent or reflecting areas	H05B 3/84

Informative references

Attention is drawn to the following places, which may be of interest for search:

Wipers for helmets	A42B 3/26
Ventilation for goggles	A61F 9/028
Wipers for goggles	A61F 9/029

G02C 11/10

{Electronic devices other than hearing aids}

Definition statement

This place covers:

Specially adapted (parts of) spectacles for attaching or having attached any electronic device other than hearing aids, e.g. audio, radio, wireless devices, mp3, telephone, memory sticks, USB-devices, etc.

References

Limiting references

This place does not cover:

Electronic devices for controlling electro-optic elements used as auxiliary lenses and filters	G02C 7/08, G02C 7/101

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G02C 11/12

{Side shields for protection of the eyes}

Definition statement

This place covers:

Side shields, top shields for protection against sun, dust, wind, etc.

Integral with the frame or attached thereto.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Shields, shades, obturators in the optical path	G02C 7/16
Goggles, additional functions	A61F 9/029
Eye shades or visors for eye masks	A61F 9/045

Special rules of classification

If the side or top shields are (also) intended to limit the field of view, add G02C 7/16

G02C 13/00

Assembling (producing spectacle frames from plastics or from substances in a plastic state B29D 12/02); Repairing; Cleaning (disinfection or sterilisation of contact lenses A61L 12/00)

Definition statement

This place covers:

Assembling, repairing, cleaning, measurements required for fitting of spectacles.

Computer assisted measurements for fitting or selecting of spectacle frames.

Protecting spectacles or parts thereof during assembling, repairing, cleaning.

Protecting spectacles or parts thereof during other procedures(e.g. during hair colouring).

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Cases for contact lenses	A45C 11/005
Cases for spectacles	A45C 11/04
Show cases and stands for selling spectacles	A47F 7/021
Disinfection or sterilisation of contact lenses	A61L 12/00
Cleaning in general	B08B
Grinding, polishing, edging of lenses drilling holes in lenses and instruments therefor	B24B 9/14
Moulding of plastics lenses	B29D 11/00009

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Manufacture of plastics frames	B29D 12/02
Compositions for cleaning of contact lenses and spectacle lenses	C11D 3/0078
Cleaning of optical elements in general	G02B 27/0006

G02C 13/001

{Assembling; Repairing}

Definition statement

This place covers:

Maintenance, mounting tools.

Devices for supporting during assembling and repairing.

Apparatus for fitting eyewear (e.g heaters, tools).

G02C 13/003

{Measuring during assembly or fitting of spectacles}

Definition statement

This place covers:

Measuring geometrical and mechanical parameters required for fitting lenses:

instruments for measuring geometrical parameters of spectacles (length of temples, width of bridges, optometrists' ruler, etc.)

Centering of lenses in the frame

Testing spectacles without involving the designated wearer

Aids for trying spectacles, test lens holder used when trying spectacles

Measuring facial proportions

Measuring geometrical parameters for aligning the lenses in the frame

Computer assisted measuring and simulations for fitting (may additionally include remote selling, simulation of user's face wearing spectacles, computer assisted choice of frames, frame portions and lens colours

References

Limiting references

This place does not cover:

Instruments for determining the shape of frames	G01B 5/20, G01B 7/08

Informative references

Attention is drawn to the following places, which may be of interest for search:

Simulation of view through lenses	G02C 7/024
Testing optical elements	G01M 11/00

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Data processing for shopping, remote ordering	G06Q 30/0601
Combining figures (for overlaying images of face and spectacles frame)	G06T 11/60

G02C 13/005

{Measuring geometric parameters required to locate ophtalmic lenses in spectacles frames (apparatus for testing or instruments for examining the eyes per se A61B 3/00; machines or devices and accessories for grinding the edges of lenses using spectacles as a template B24B 9/144)}

Definition statement

This place covers:

Measuring geometrical, mechanical parameters of the human head and eyes with respect to the spectacles frame required for alignment of the lenses with respect to the eye:

Inclination, pantoscopic angle, wrap angle

Pupil position with respect to the frame

Direction of view, vertical, horizontal view angles

Measuring and calculating cornea-vertex, vertex-center of rotation distance

Photographic and related methods therefor

Measuring interpupillary distance

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measurements of geometric parameters of the spectacles frame	G02C 13/003
Measuring facial proportions	G02C 13/003
Testing eyes	A61B 3/00
Instruments for measuring the interpupillary distance	A61B 3/111
Instruments for measuring the diameter of the pupils	A61B 3/112
Measuring the human body	A61B 5/103
Devices for grinding the edges of lenses using a lens or a spectacle frame as a template	B24B 9/144
Positioning or marking of lenses (in preparation of edging)	B24B 13/005

Special rules of classification

Instruments for measuring the interpupillary distance are classified in G02C 13/005 as well as A61B 3/111

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G02C 2200/00

Generic mechanical aspects applicable to one or more of the groups G02C 1/00 - G02C 5/00 and G02C 9/00 - G02C 13/00 and their subgroups

Definition statement

This place covers:

Aspects relating to the spectacles frame occurring in various frame portions and/or not constituting per se an individual constructional concept

Special rules of classification

Do not use G02C 2200/00 but only its subgroups.

Do not use the subgroups of G02C 2200/00 alone but only in combination with at least one of groups G02C 1/00 - G02C 5/00 and G02C 9/00 - G02C 13/00 and their subgroups.

G02C 2200/02

Magnetic means

Definition statement

This place covers:

Magnetic element for connecting parts of a frame or for attaching auxiliary elements.

G02C 2200/04

Junctions between frame elements having a click function

Definition statement

This place covers:

Member providing the click function being part of one of the elements to be joined.

G02C 2200/06

Locking elements

Definition statement

This place covers:

Individual element for locking a junction of frame parts, the locking element not being a part or integral with the frame parts to be joined:

Locking element in elastic hinges;

Screw locking element;

Locking elements in modular frames.

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G02C 2200/08

Modular frames, easily exchangeable frame parts and lenses

Definition statement

This place covers:

Elements of the frame or lenses can easily be changed without requiring tools or special skills, kits of elements.

Frames or portions made of variably combinable modules.

G02C 2200/10

Frame or frame portions made from wire

Definition statement

This place covers:

Frequently metal.

G02C 2200/12

Frame or frame portions made from sheet type material

Definition statement

This place covers:

E.g. metal, card board.

G02C 2200/14

Laminated frame or frame portions

Definition statement

This place covers:

Frame portions or elements comprising laminated or layered structure.

G02C 2200/16

Frame or frame portions made from rubber

Definition statement

This place covers:

Frame or portions made from elastic (compressible or expandable) material such as rubber or other elastomer.

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G02C 2200/18

Adjustment ridges or notches

Definition statement

This place covers:

Moveable junctions between frame portions (e.g. hinges, telescopic temples, inclination adjustment) comprising ridges, notches, stripes, teeth, for temporarily locking the junction in at least two discrete angular or linear positions.

G02C 2200/20

Friction elements

Definition statement

This place covers:

Frame elements or portions (junctions) comprising frictionally cooperating features.

G02C 2200/22

Leaf spring

Definition statement

This place covers:

Leaf spring or bent coil in hinges, elastic hinges, nose pads, temples, front frames, bridges of clip-ons, etc.

G02C 2200/24

Coil spring pulled upon actuation

Definition statement

This place covers:

Coil spring extended when actuated, in elastic hinges (temple over-opened), adjustable temples, in bridges of clip-ons, closure of rims, non optical adjuncts.

G02C 2200/26

Coil spring pushed upon actuation

Definition statement

This place covers:

Coil spring compressed when actuated in elastic hinges (temple over-opened), adjustable temples in bridges of clip-ons, non optical adjuncts.

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G02C 2200/28

Coil spring twisted upon actuation

Definition statement

This place covers:

Coil spring twisted when actuated in elastic hinges (temple over-opened), bridges of clip-ons, bridges of pince-nez.

G02C 2200/30

Piston

Definition statement

This place covers:

Piston shaped element for actuating a coil spring, used in elastic hinges, collapsible frames, length adjustable temples.

G02C 2200/32

Oblong hole

Definition statement

This place covers:

Non-circular hole for particular function, for mounting ornaments, in hinges for displacing the hinge axis, etc.

G02C 2202/00

Generic optical aspects applicable to one or more of the subgroups of G02C 7/00

Definition statement

This place covers:

Aspects relating to the optical elements occurring in various types of lenses or other optical element and/or not constituting per se an individual constructional concept.

Special rules of classification

Do not use G02C 2202/00 but only its subgroups.

Do not use the subgroups of G02C 2202/00 alone but only in combination with at least one of the subgroups of G02C 7/00.

G02C 2202/02

Mislocation tolerant lenses or lens systems

Definition statement

This place covers:

Tolerance with respect to mutual misalignment of lens surfaces .

Tolerance with respect to lateral misalignment of contact lenses on the cornea.

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Tolerance with respect to astigmatism axis angular misorientation of contact lenses on the cornea.

G02C 2202/04

Lenses comprising decentered structures

Definition statement

This place covers:

Decentered front and back surfaces (e.g. contact lenses, progressive lenses).

Contact lenses decentered with respect to the eye.

Contact lenses having optical regions decentered with respect to the perimeter of the lens.

Contact lenses having mutually decentered optical regions.

G02C 2202/06

Special ophthalmologic or optometric aspects

Definition statement

This place covers:

Disclosure relating to ophthalmologic or optometric issues in general.

G02C 2202/08

Series of lenses, lens blanks

Definition statement

This place covers:

Series of lenses having a common concept, property or parameter, relations between such parameters.

Semi-finished lenses (blanks) from which representatives of such series can be maufactured.

G02C 2202/10

Optical elements and systems for visual disorders other than refractive errors, low vision

Definition statement

This place covers:

Lenses and lens systems particularly designed for vision impaired persons suffering from visual deficiencies other than those related to imaging: loss of field of view, macula degeneration, brain disorders, psychological disorders, etc.

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G02C 2202/12

Locally varying refractive index, gradient index lenses

Definition statement

This place covers:

Lenses having a permanent local index variation, in monofocal as well as (multifocal) progressive lenses.

G02C 2202/14

Photorefractive lens material

Definition statement

This place covers:

Lenses made from material the index of which is (permanently) adjustable by irradiation, light adjustable material.

G02C 2202/16

Laminated or compound lenses

Definition statement

This place covers:

Lenses having laminated or layered structure, compound lens elements.

G02C 2202/18

Cellular lens surfaces

Definition statement

This place covers:

Layer of cellular compartments (microcups) filled with substances having particular optical properties, e.g. liquid crystal material having electrically controllable optical index or photochromic material.

G02C 2202/20

Diffractive and Fresnel lenses or lens portions

Definition statement

This place covers:

Ophthalmic lenses having a diffractive or Fresnel structure on at least a portion of at least one of its surfaces or sandwiched between two lens elements.

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G02C 2202/22

Correction of higher order and chromatic aberrations, wave front measurement and calculation

Definition statement

This place covers:

Correction for higher order aberrations of the lens and/or of the eye (spherical aberration, koma, oblique astigmatism) description by conicals, polynomials, Zernicke polynomials, Seidl polynomials.

Correction of chromatic aberrations of the lens and/or of the eye.

G02C 2202/24

Myopia progression prevention

Definition statement

This place covers:

Lenses for inhibiting the progression of myopia or other ametropia.

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G10L

SPEECH ANALYSIS TECHNIQUES OR SPEECH SYNTHESIS; SPEECH RECOGNITION; SPEECH OR VOICE PROCESSING TECHNIQUES; SPEECH OR AUDIO CODING OR DECODING

Definition statement

This place covers:

- Processing of speech or voice signals in general (G10L 25/00).
- Production of synthetic speech signals, text to speech systems (G10L 13/00).
- Recognition of speech (G10L 15/00).
- Lyrics recognition from a singing voice (G10L 15/00).
- Speaker identification, authentication or verification (G10L 17/00).
- Singer recognition from a singing voice (i.e. speaker recognition on a singing voice) (G10L 17/00).
- Analysis of speech signals for bandwidth compression or extension, bit-rate or redundancy reduction (G10L 19/00).
- Coding/decoding of audio signals for compression and expansion using analysis-synthesis, source filter models or psycho-acoustic analysis (G10L 19/00).
- Modification of speech signals, speech enhancement, source separation (G10L 21/00).
- Processing of the speech or voice signal to produce another audible or non-audible signal, e.g., visual or tactile, in order to modify its quality or its intelligibility (G10L 21/00).
- Noise reduction or echo cancellation in an audio signal (G10L 21/00).
- Speech or voice analysis techniques specially adapted to analyse or modify audio signals, where the audio signals do not necessarily include speech or voice, are also covered in subgroups (G10L 21/00, G10L 25/00).

Relationships with other classification places

Classification should be generally directed to appropriate subclasses, e.g. G06F, H03M, for mathematical models for audio analysis in general.

Classification should be generally directed to appropriate subclasses, e.g. G10K, G10H, H04R, H04S when audio productions or general audio analysis or processing are of relevance.

Telegraphic communication is covered in subclass H04L.

Telephonic communication is covered in subclass H04M.

References

Limiting references

This place does not cover:

Devices for the storage of speech signals	G11B
Static stores	G11C
Encoding of compressed speech signals for transmission or storage	H03M 7/30

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Information retrieval of audio data	G06F 16/60

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Broadcasting arrangements of audio	H04H 60/58
Name dialling controlled by voice recognition	H04M 1/271
Automatic arrangements for answering calls	H04M 1/64

References out of a residual place

Examples of places in relation to which this place is residual:

Acoustics not otherwise provided for	G10K 15/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Larynxes or tracheae prosthesis implantable into the body	A61F 2/20
Input/output arrangements for on-board computers	G01C 21/36
Measurement of sound waves in general	G01H
Direction-finders for determining the direction from which infrasonic, sonic or ultrasonic waves, not having a directional significance, are being received	G01S 3/80
Systems using the reflection or reradiation of acoustic waves	G01S 15/00
Sound input/output for computers	G06F 3/16
Compilation or interpretation of high level programme languages	G06F 8/41, G06F 9/455
Information retrieval; Database structures therefor	G06F 16/00
Complex mathematical functions	G06F 17/10
General pattern recognition	G06F 18/00
Digital data processing methods or equipment specially adapted for handling, processing or translating natural language data	G06F 40/00
Image data processing	G06T
Arrangements for image or video recognition or understanding	G06V 10/00
Character recognition; Recognising digital ink; Document-oriented image-based pattern recognition	G06V 30/00
Recognition of biometric, human-related or animal-related patterns in image or video data	G06V 40/00
Individual entry or exit registers	G07C 9/00
Arrangements for influencing the relationship between signals at input and output, e.g. differentiating, delaying	G08C 13/00
Teaching speaking	G09B 19/04
Teaching or communicating with the blind, deaf or mute	G09B 21/00
Electronic musical instruments	G10H
Sound producing devices other than musical instruments or loudspeakers	G10K
Methods or devices for protecting against, or for damping, noise or other acoustic waves	G10K 11/16
Signal processing for recording	G11B 20/00
Error detection or correction in digital recording or reproducing; Testing involved in digital recording or reproducing	G11B 20/18

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Editing; Indexing; Addressing; Timing or synchronising; Monitoring	G11B 27/00
Electronic circuits for sound generation	H03B
Amplifiers	H03F
Amplifiers using amplifying element consisting of two mechanically- or acoustically-coupled transducers, e.g. telephone-microphone amplifier	H03F 13/00
Gain control in amplifiers or frequency changers	H03G 3/00
Electronic filters	H03H
Coding, decoding or code conversion, error protection in general	H03M
Transmission	H04B
Means associated with receiver for limiting or suppressing noise or interference	H04B 1/10
Details of transmission systems, not characterised by the medium used for transmission, for reducing bandwidth of signals	H04B 1/66
Transmission systems employing ultrasonic, sonic or infrasonic waves	H04B 11/00
Transmission systems not characterised by the medium used for transmission characterised by the use of pulse modulation	H04B 14/02
Broadcast distribution systems	H04H
Time-division multiplex systems in which the transmission channel allotted to a first user may be taken away and re-allotted to a second user if the first user becomes inactive	H04J 3/17
Secret communication	H04K 1/00
Transmission of digital information, e.g. telegraphic communication	H04L
Telephonic communication	H04M
Arrangements of transmitters, receivers or complete sets to prevent eavesdropping, to attenuate local noise or to prevent undesired transmission; Special mouthpieces or receivers therefor	H04M 1/19
Arrangements for preventing acoustic feedback in telephonic communication	H04M 1/20
Devices for calling a subscriber whereby a plurality of signals may be stored simultaneously	H04M 1/27
Substation equipment, e.g. for use by subscribers including speech amplifiers	H04M 1/60
Automatic arrangements for answering calls	H04M 1/64
Interactive information services, e.g. directory enquiries	H04M 3/493
Simultaneous speech and telegraphic or other data transmission over the same conductors	H04M 11/06
Systems for transmission of a pulse code modulated video signal with one or more other pulse code modulated signals, e.g. an audio signal, a synchronising signal	H04N 7/52
Switching systems	H04Q
Loudspeakers, microphones, gramophone pick-up or like acoustic electromechanical transducers; Deaf-aid sets; Public address systems	H04R
Stereophonic arrangements	H04R 5/00
Public address systems	H04R 27/00

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Stereophonic systems, e.g. spatial sound capture, matrixing of audio signals in the decoded state	H04S

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

speech	definite vocal sounds that form words to express thoughts and ideas.
voice	sounds generated by vocal chords or synthetic versions thereof.
audio signal	of or relating to humanly audible sound, meant to include speech, voice, music, silence or background noise, or any combinations thereof.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

AAC	Advanced Audio Coding
ACELP	Algebraic Code Excited Linear Prediction
ADPCM	Adaptive Differential Pulse Code Modulation
AMR, AMR-NB	Adaptive Multi-Rate
AMR-WB	Adaptive Multi-Rate Wideband
ANN	Artificial Neural Network
AR	Autoregressive
ASR	Automatic Speech Recognition
BLP	Backward Linear Prediction
BP	Back Propagation
BSAC	Bit Sliced Arithmetic Coding (audio coding from MPEG-4 Part 3)
CELP	Code Excited Linear Prediction
DCT	Discrete Cosine Transform
DFT	Discrete Fourier Transform
DPCM	Differential Pulse Code Modulation
DRM	Digital Rights Management
DTX	Discontinuous Transmission
EVRC, EVRC-B	Enhanced Variable Rate CODEC
FFT	Fast Fourier Transform
FIR	Finite Duration Impulse Response
FLP	Forward Linear Prediction
GMM	Gaussian mixture model
HMM	Hidden Markov model
HVXC	Harmonic Vector eXcitation Coding
IDCT	Inverse Discrete Cosine Transform
IVR	Interactive Voice Response

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LMS	Least Mean Square
LPC	Linear Predictive Coding
LSF	Line Spectral Frequencies
LSP	Line Spectral Pairs
LTP	Long Term Prediction
MBE	Multi-Band Excitation
MDCT	Modified Discrete Cosine Transform
MELP	Mixed Excitation Linear Prediction
MLP	Multi-Layer Perceptron
MP3	MPEG1 or MPEG2 audio layer III
MPEG	Motion Picture Experts Group
MPEG 1 audio	Standard ISO/IEC 11172-3
MPEG 2 audio	Standard ISO/IEC 13818-3
MPEG 4 audio	Standard ISO/IEC 14496-3
MPEG 21	Standard ISO/IEC 21000
MSE	Mean Square Error
NB – WB	Narrowband – Wideband
PARCOR	Partial Correlation
PWI	Prototype Waveform Interpolation
RELP	Residual Excited Linear Prediction
SBR	Spectral Band Replication
TDNN	Time Delay Neural Network
TTS	Text-to-Speech
USAC	Unified Speech and Audio Coding
VoIP	Voice over Internet Protocol
VLSR	Very Large Speech Recognition
VQ	Vector Quantization
VSELP	Vector Sum Excited Linear Prediction
V/UV	Voiced/Unvoiced
VXML or VoiceXML	W3C's standard XML format

G10L 13/00

Speech synthesis; Text to speech systems

Definition statement

This place covers:

- synthesis of speech from text, concatenation of smaller speech units, grapheme to phoneme conversion;
- modification of the voice for speech synthesis: gender, age, pitch, prosody, stress.
- hardware or software implementation details of a speech synthesis system

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References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Speech synthesis in games	A63F 9/24
Navigation systems for vehicles, guidance using speech synthesis.	G01C 21/3629
Electronic musical instruments	G10H
Sound producing other than musical instruments	G10K
Electric switches with speech feedback	H01H
Speech synthesis in mobile phones	H04M 1/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Excitation coding of a speech signal	G10L 19/08
Processing or translation of natural language	G06F 40/40

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

HMM	Hidden Markov Model
TTS	Text To Speech

G10L 13/027

Concept to speech synthesisers; Generation of natural phrases from machine-based concepts (generation of parameters for speech synthesis out of text G10L 13/08)

Definition statement

This place covers:

concepts used for speech synthesis can be linked to an emotion to be conveyed (US2010329505), a communication goal driving a dialogue (US2010241420), image-to-speech (US2010231752), native sounding speech (US2004030554)

References

Limiting references

This place does not cover:

Processing or translation of natural language	G06F 40/40

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G10L 15/00

Speech recognition (G10L 17/00 takes precedence)

Definition statement

This place covers:

- recognition of text or phonemes from a spoken audio signal;
- spoken dialog interfaces, human-machine spoken interfaces
- topic detection in a dialogue, semantic analysis, keyword detection, spoken command and control
- context dependent speech recognition (location, environment, age, gender, etc.)
- parameter extraction, acoustic models, word models, grammars, language models for speech recognition
- recognition of speech in a noisy environment
- recognition of speech using visual clues
- feedback of the recognition results, disambiguation of speech recognition results
- dedicated hardware or software implementations, parallel and distributed processing of speech recognition engines

References

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Spoken command and control of surgical instruments	A61B 17/00
Speech input in video games	A63F 13/00
Voice control for systems within a vehicle	B60R 16/0373
Speech input for vehicle navigation systems	G01C 21/3608
Sound input arrangements for computers	G06F 3/16
Teaching how to speak	G09B 19/04
Name dialling controlled by voice recognition	H04M 1/271
Speech interaction details in automatic or semi-automatic exchange systems for interactive information services	H04M 3/4936

Informative references

Attention is drawn to the following places, which may be of interest for search:

Information retrieval of audio data	G06F 16/60
Complex mathematical functions	G06F 17/10
Pattern recognition	G06F 18/00
Handling natural language data	G06F 40/00
Image or video recognition or understanding	G06V
Face recognition, lip reading without acoustical input	G06V 40/16
Educational appliances	G09B 5/06
Signal processing for recording	G11B 20/00

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Synonyms and Keywords

In patent documents, the following abbreviations are often used:

ANN	Artificial neural network
ASR	Automatic speech recognition
CSR	Continuous speech recognition
GMM	Gaussian mixture model
HMM	Hidden Markov model
IVR	Interactive voice response
MLP	Multi layer perceptron
VLSR	Very large speech recognition

G10L 17/00

Speaker identification or verification techniques

Definition statement

This place covers:

- Recognition, identification of a speaker
- Verification, authentication of a speaker
- Preprocessing operations, e.g. segment selection; Pattern representation or modelling, e.g. based on linear discriminant analysis [LDA], principal components; Feature selection or extraction
- Dialog, prompts, passwords for identification
- Training, model building or enrolment
- Decision making techniques, pattern matching strategies
- Multimodal identification including voice
- Hidden Markov Models
- Artificial neural networks, connectionist approaches
- Pattern transformations and operations aimed at increasing system robustness, e.g. against channel noise, different working conditions
- Identification in noisy condition
- Interactive procedures, man-machine interface, e.g. user prompted to utter a password or predefined text
- Recognition of special voice characteristics, e.g. for use in a lie detector; recognition of animal voices
- Imposter detection

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Information retrieval of audio data	G06F 16/60
Complex mathematical functions	G06F 17/10
Pattern recognition	G06F 18/00
User authentication in security arrangements for restricting access by using biometric data, e.g. voice prints	G06F 21/32
Machine learning	G06N 20/00

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Arrangements for image or video recognition or understanding	G06V 10/00
Recognition of biometric, human-related or animal-related patterns in image or video data	G06V 40/00
Individual entry or exit registers, access control with identity check using personal physical data	G07C 9/25
Secret secure communication including means for verifying the identity or authority of a user	H04L 9/32
Secret secure communication including means for verifying the identity or authority of a user	H04L 9/32
Centralised arrangements for answering calls; Centralised arrangements for recording messages for absent or busy subscribers	H04M 3/50

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

speaker verification or authentication	refers to verifying that the user claimed identity is real, he is otherwise an impostor. Speaker recognition, or identification, aims at determining who the user is among a closed (finite number) set of users. He is otherwise unknown.
impostor	someone actively trying to counterfeit someone else's identity.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

ANN	Artificial neural network
ASR	Automatic speech recognition
GMM	Gaussian mixture model
HMM	Hidden Markov model
IVR	Interactive voice response
MLP	Multilayer perceptron

In patent documents, the following words/expressions are often used as synonyms:

- "goat" and "sheep"
- "predator" and "wolf"

In patent documents, the following words/expressions are often used with the meaning indicated:

A goat or sheep	often refers to a person whose voice is easy to counterfeit.
A wolf or predator	often refers to a person who can easily counterfeit someone else's voice or is often identified as someone else.

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G10L 19/00

Speech or audio signals analysis-synthesis techniques for redundancy reduction, e.g. in vocoders; Coding or decoding of speech or audio signals, using source filter models or psychoacoustic analysis (in musical instruments G10H)

Definition statement

This place covers:

Techniques for the reduction of data from audio sources, i.e. compression of audio. These techniques are applied to reduce the quantity of information to be stored or transmitted, but are independent of the end-application, medium or transmission channel, i.e. do only exploit the properties of the source signal itself or the final receiver exposed to this signal (the listener).

Mainly two types of sources can be distinguished :

"speech only" encompass signals produced by human speakers, and historically was to be understood as mono-channel, single speaker "telephone quality" speech having a narrow bandwidth limited to max. 4kHz. Encoding of speech only sources primarily aim at reducing the bit-rate while still providing fair intelligibility of the spoken content, but not always fidelity to the original.

"Audio signal" is broader and comprises speech as well as background information, e.g. music source having multiple channels. Encoding of audio deals primarily with transparent, i.e. "high fidelity" reproduction of the original signal.

The compression techniques can also be distinguished as being :

Lossy or Lossless, i.e. whether a perfect reconstruction of the source is possible, or only a perceptually acceptable approximation can be done.

The techniques classified in this subclass are based either on modelling the production of the signal (voice) or the perception of it (general audio).

References

Limiting references

This place does not cover:

Coding of signals within electronic musical instruments	G10H

Informative references

Attention is drawn to the following places, which may be of interest for search:

Complex mathematical functions	G06F 17/10
Signal processing not specific to the method of recording or reproducing	G11B 20/00
Editing; Indexing; Addressing; Timing or synchronizing; Monitoring;	G11B 27/00
Compression	H03M 7/30
Detecting, preventing errors in received information	H04L 1/00
Quality monitoring in automatic, semi automatic exchanges	H04M 3/2236
Quality control of voice transmission between switching centres	H04M 3/2236
Simultaneous speech and data transmission	H04M 11/06
Transmission of audio and video in television systems	H04N 7/52

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Stereophonic arrangements	H04R 5/00
Stereophonic systems	H04S
Wireless communication networks	H04W

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

audio signal	is meant to include speech, music, silence or background signal, or any combinations thereof, unless explicitly specified

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

CELP	Code Excited Linear Prediction
CTX	Continuous transmission
DTX	Discontinuous transmission
HVXC	Harmonic Vector eXcitation Coding
LPC	linear prediction coding
MBE	Multiband Excitation
MELP	Mixed Excitation Linear Prediction
MOS	mean opinion score
MPEG	Moving Picture Experts Group
MPEG1 audio	Standard ISO/IEC 11172-3
MPEG2 audio	Standard ISO/IEC 13818-3
MPEG4 audio	Standard ISO/IEC 14496-3
MP3	MPEG 1 Layer III
PCM	pulse code modulation
PWI	Prototype Waveform Interpolation
SBR	Spectral Band Replication

In patent documents, the following words/expressions are often used as synonyms:

- " perceptual" and "psychoacoustic"

G10L 19/24

Variable rate codecs, e.g. for generating different qualities using a scalable representation such as hierarchical encoding or layered encoding

Definition statement

This place covers:

Coding of a signal with rate adaptation, e.g. adapted to voiced speech, unvoiced speech, transitions and noise/silence portions.

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Coding of a signal with a core encoder providing a minimum level of quality, and extension layers to improve the quality but requiring a higher bitrate. It includes parameter based bandwidth extension (i.e. SBR) or channel extension.

This group is in opposition to G10L 21/038 in which the bandwidth extension is artificial, i.e. based on the only narrowband encoded signal.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Artificial bandwidth extension, i.e. based on the only narrowband encoded signal	G10L 21/038
Spatial sound recording	H04R 5/00
Spatial sound reproduction	H04S

G10L 21/00

Speech or voice signal processing techniques to produce another audible or non-audible signal, e.g. visual or tactile, in order to modify its quality or its intelligibility (G10L 19/00 takes precedence)

Definition statement

This place covers:

The subgroup deals with speech or voice modification applications, but receives also applications for speech or voice analysis techniques specially adapted to analyse or modify audio signals not necessarily including speech or voice but which are not music signals (G10H).

- Speech or voice modification applications, but receives also applications for speech or voice analysis techniques specially adapted to analyse or modify audio signals, where the audio signals do not necessarily include speech or voice but which are not music signals (G10H).
- Bandwidth extension of an audio signal.
- Improvement of the intelligibility of a coded speech signal.
- Removal of noise from an audio signal.
- Removal of echo from an audio signal.
- Separation of audio sources.
- Pitch, speed modification of an audio signal.
- Voice morphing.
- Visualisation of audio signals (e.g. sonograms).
- Lips or face movement synchronisation with speech (e.g. phonemes - visemes alignment).
- Face animation synchronisation with the emotion contained in the voice or speech signal.

References

Limiting references

This place does not cover:

Speech or audio signal analysis-synthesis techniques for redundancy reduction, e.g. in vocoders; Coding or decoding of speech or audio signals, using source-filter models or psychoacoustic analysis	G10L 19/00

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References out of a residual place

Examples of places in relation to which this place is residual:

Electronic musical instruments	G10H
Loudspekers, microphones, gramophone pick-up or like acoustic electromechanical transducers; deaf-aid sets; public address systems	H04R
Stereophonic systems	H04S

Informative references

Attention is drawn to the following places, which may be of interest for search:

Direction finder	G01S 3/00
Complex mathematical functions	G06F 17/10
3D Animation	G06T 13/20
Animation based on audio data, talking heads	G06T 13/205
Signal processing not specific to the method of recording or reproducing	G11B 20/00
Signal processing not specific to the method of recording or reproducing, for reducing noise	G11B 20/24
Editing; Indexing; Addressing; Timing or synchronizing; Monitoring	G11B 27/00
Gain control in amplifiers where the control is dependent upon ambient noise level or sound level	H03G 3/32
Reducing echo effect or singing in line transmissions systems	H04B 3/20
Transmission systems not characterised by the medium used for transmission using pulse code modulation, e.g. for reducing noise or bandwidth	H04B 14/04
Reducing noise or bandwidth in transmission systems not characterised by the medium used for transmission	H04B 14/046
Echo suppression in hand-free telephones	H04M 9/08
Hearing aids	H04R 25/00
Public address systems	H04R 27/00

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

viseme	a visual representation of the mouth, lips, tongue and teeth corresponding to a phoneme.

Synonyms and Keywords

In patent documents, the following abbreviations are often used:

BSS	Blind source separation
LDA	Linear discriminant analysis
NB	Narrowband
PCA	Principal component analysis
SBR	Spectral Band Replication

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WB	Wideband

G10L 21/0356

for synchronising with other signals, e.g. video signals

Definition statement

This place covers:

Visemes are selected to match with the corresponding speech segment, or the speech segments are adapted/chosen, to match with the viseme. This symbol also encompasses the coarticulation effects as used in facial character animation or talking heads.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Facial character animation per se	G06T 13/205

G10L 21/038

using band spreading techniques

Definition statement

This place covers:

Bandwidth extension taking place at the receiving side, e.g. generation of artificial low or high frequency components, regeneration of spectral holes, based on the only narrowband encoded signal. This is in opposition with G10L 19/24 wherein parameters are computed during the encoding step to enable bandwidth extension at the decoding step.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Parameter based bandwidth extension (e.g. SBR)	G10L 19/24

G10L 25/00

Speech or voice analysis techniques not restricted to a single one of groups G10L 15/00 - G10L 21/00 (muting semiconductor-based amplifiers when some special characteristics of a signal are sensed by a speech detector, e.g. sensing when no signal is present, H03G 3/34)

Definition statement

This place covers:

- Processing of speech or voice signals in general, in particular detection of a speech signal, end points detection in noise, extraction of pitch, measure of the voicing, emotional state, voice pathology or other speech or voice related parameters.
- Extracted parameters, e.g. techniques for evaluating correlation coefficients, zero crossing, prediction coefficients or formant information.

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- Analysis technique, e.g. neural network, fuzzy, chaos, genetic algorithm or coding technique.
- Analysis window (window function).
- Specially adapted for particular use, e.g. for comparison and discrimination, evaluating synthetic and decoded voice signals, for transmitting result of analysis.
- Speech or voice analysis techniques specially adapted to analyse audio signals, where the analysed audio signals do not necessarily include speech or voice, such as audio scene segmentation, jingle detection, separation from music or noise or detection of particular sounds.
- Modeling vocal tract parameters.
- Detection of presence or absence of speech signals.
- Pitch determination of speech signals.
- Discriminating between voiced and unvoiced parts of speech signals.

References

Limiting references

This place does not cover:

Muting semiconductor-based amplifiers when some special characteristics of a signal are sensed by a speech detector, e.g. sensing when no signal is present	H03G 3/34

Informative references

Attention is drawn to the following places, which may be of interest for search:

Comfort noise	G10L 19/012
Karaoke or singing voice processing, parameter extraction for musical signal categorisation, electronic musical instruments	G10H
Gain or frequency control	H03G 3/342
DTX communication	H04J 3/175
Switching of direction of transmission by voice frequency in two-way loud-speaking telephone systems	H04M 9/10
Multiplex systems	H04Q 1/30

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

audio signal	of or relating to humanly audible sound, e.g. it comprises any combination of background noise or silence, voice or speech, music

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CLASS 381, ELECTRICAL AUDIO SIGNAL PROCESSING SYSTEMS AND DEVICES

SECTION I - CLASS DEFINITION

This class provides for: (a) wired one-way electrical transmission or processing systems for audio signals, (b) Stereophonic systems, which are not elsewhere classified, (c) instrument or process for converting an electrical audio information signal to or from humanly audible form.

(1) Note. A "system" is an assemblage of two or more elements having diverse functions.

(2) Note. An "audio" signal is an electrical signal which represents spoken or other sounds which vary with time, and may be in analog or digital form.

(3) Note. Combinations of a loudspeaker or microphone with another audio signal processing device (e.g., amplifier, filter, etc.) or other circuit (e.g., bias circuit) are classified herein even if the loudspeaker or microphone is included by name only.

(4) Note. Nominal recitation of "audio" is not sufficient to afford classification herein of an invention which would be otherwise classified elsewhere.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

A transducer for conversion of speech or similar sound (e.g., music) to or from a corresponding electrical signal, and the combination of such a transducer with acoustical structure is classified herein (see Subclass References to the Current Class, below). Note that transducer structure combined with circuitry, other than a lead or connector, is classified with the system, either in this class (381), or in an external class for processing an audio signal.

Excluded from this class are two-way wired electrical audio signal transmission systems which are classified elsewhere. Transmissions of pulse signals which do not represent audio signals is classified elsewhere. Multiplex Communication Systems (except stereophonic multiplex systems) are classified elsewhere. Modulated Carrier Wave Communication Systems and devices are classified elsewhere. Combinations of subject matter of this class with structure of a more comprehensive combination (e.g., Television Set) are classified with the combination. (See References to Other Classes, below.)

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

150+, for a transducer for conversion of speech or similar sound (e.g., music) to or from a corresponding electrical signal, and the combination of such a transducer with acoustical structure.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

27, Undertaking, subclass 31 for systems adapted for communication with entombed persons.

73, Measuring and Testing, subclasses 584+ for measuring sound waves, especially subclass 585 for audiometers (ear or hearing testing), and subclasses 646+ for measuring sound intensity.

84, Music, subclasses 600+ for electronic musical instruments.

178, Telegraphy, for transmissions of pulse signals which do not represent audio signals. (Lines With Other Classes and Within This Class).

181, Acoustics, appropriate subclasses for mechanical audio systems.

330, Amplifiers, for amplifiers not having specific input signals or specific loads.

340, Communications: Electrical, appropriate subclasses for electrical communications in general.

367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 132 for underwater speech transmission by an acoustic wave; subclasses 140+ for an acoustic transducer not related to speech signal conversion.

369, Dynamic Information Storage or Retrieval, appropriate subclasses for storing and retrieving sound signals.

370, Multiplex Communications, appropriate subclasses for multiplex communications and for multiplex communication systems (except stereophonic multiplex systems). (Lines With Other Classes and Within This Class).

375, Pulse or Digital Communications, for transmissions of pulse signals which do not repre-

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sent audio signals. (Lines With Other Classes and Within This Class).

379, Telephonic Communications, for two-way wired electrical audio signal transmission systems. (Lines With Other Classes and Within This Class).

455, Telecommunications, appropriate subclasses for modulated carrier wave speech communications, and for modulated carrier wave communication systems and devices. (Lines With Other Classes and Within This Class).

505, Superconductor Technology: Apparatus, Material, Process, subclasses 150+ for high temperature (T_c 30 K) superconducting devices, and particularly subclasses 202+ for electric communication system containing transmitter or receiver of pulse, digital, or electromagnetic radio, television, or radar wave form.

600, Surgery, subclass 559 for audiometers (ear or testing by auditory stimulus).

623, Prosthesis (i.e., Artificial Body Members), Parts Thereof, or Aids and Accessories Therefor, subclass 9 for mechanical artificial larynxes.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclasses 200+ for speech signal processing using a computer.

SUBCLASSES

1 BINAURAL AND STEREOPHONIC:

This subclass is indented under the class definition. Subject matter where there are two or more independent sound signals which are to be separately reproduced so as to create a sense of depth.

(1) Note. 'Sound signals' are electric signals representing sounds.

(2) Note. Stereophonic or pseudo stereophonic systems are classified here, not in Class 370.

SEE OR SEARCH CLASS:

360, Dynamic Magnetic Information Storage or Retrieval, for magnetically recording or reproducing stored stereophonic information.

369, Dynamic Information Storage or Retrieval, subclasses 85+ for recording or reproducing stored stereophonic information.

370, Multiplex Communications, appropriate subclasses for multiplex in general.

2 Broadcast or multiplex stereo:

This subclass is indented under subclass 1. Subject matter for the broadcasting or transmission of two or more independent sound signals which are to be reproduced so as to create a sense of depth.

SEE OR SEARCH CLASS:

360, Dynamic Magnetic Information Storage or Retrieval, for magnetically recording or reproducing stored stereophonic information.

369, Dynamic Information Storage or Retrieval, subclasses 85+ for recording or reproducing stored stereophonic information.

370, Multiplex Communications, appropriate subclasses for multiplex in general.

455, Telecommunications, appropriate subclasses for broadcast, nonstereo radio communications.

3 FM final modulation:

This subclass is indented under subclass 2. Subject matter where stereophonic signals are broadcast by means of a radio carrier wave which is only frequency modulated.

(1) Note. There may also be an amplitude modulated subcarrier.

SEE OR SEARCH CLASS:

455, Telecommunications, subclasses 42+, 93, 110+, and 205+ for frequency modulated carrier wave communications in general.

4 AM subcarrier:

This subclass is indented under subclass 3. Subject matter where a carrier wave is frequency modulated by a subcarrier which has been amplitude modulated by a signal.

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5 Four discrete channels:
This subclass is indented under subclass 4. Subject matter where the independent sound signals are four in number.

SEE OR SEARCH THIS CLASS, SUBCLASS:
19+, for quadrisonic sound systems in general.

6 Having transmitter:
This subclass is indented under subclass 5. Subject matter including means for generating and modulating a carrier wave by a stereophonic signal and usually including the coupling of the modulated carrier wave to the transmission medium.

SEE OR SEARCH CLASS:
455, Telecommunications, subclasses 39 through 129 for radio transmitters in general.

7 Switch-type detector or modulator:
This subclass is indented under subclass 4. Subject matter having a detector or modulator which extracts information from or adds information to an input waveform only at instants determined by a selector pulse.

8 Two diodes:
This subclass is indented under subclass 7. Subject matter in which the detector or demodulator is limited to containing, two diodes.

9 Four or more diodes:
This subclass is indented under subclass 7. Subject matter in which the detector or demodulator contains at least four diodes.

10 Channel separation control:
This subclass is indented under subclass 4. Subject matter where there is control over the electrical or acoustical difference between the independent sound signals.

11 Automatic switchover between mono and stereo modes:
This subclass is indented under subclass 4. Subject matter where a receiver is changed from a monaural receiver to a stereophonic receiver in response to the presence of a stereophonic signal at its input.

12 Stereo indicators (e.g., stereo presence):
This subclass is indented under subclass 4. Subject matter having an indicator which gives an indication in response to the presence of a stereophonic signal.

13 Antinoise:
This subclass is indented under subclass 4. Subject matter having provision for the reduction or elimination of an unwanted signal.

SEE OR SEARCH CLASS:
455, Telecommunications, subclasses 63.1 through 65, 222-224, 283-288, 296-312, and subclasses 501-506 for noise elimination in radio communications in general.

14 Having transmitter:
This subclass is indented under subclass 4. Subject matter including means for generating and modulating a carrier wave by a stereophonic signal and usually including the coupling of the modulated carrier wave to the transmission medium.

SEE OR SEARCH CLASS:
455, Telecommunications, subclasses 39 through 129 for radio transmitters in general.

15 AM or both AM and angle final modulation:
This subclass is indented under subclass 2. Subject matter having a carrier wave which is amplitude modulated and which may also be angle modulated.

16 Having transmitter:
This subclass is indented under subclass 15. Subject matter including means for generating and modulating a carrier wave by a stereophonic signal and usually including the coupling of the modulated carrier wave to the transmission medium.

SEE OR SEARCH CLASS:
455, Telecommunications, subclasses 39 through 129 for radio transmitter in general.

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17 Pseudo stereophonic:
This subclass is indented under subclass 1. Subject matter having a device or arrangement which transforms single channel audio signals into a plurality of channels of audio information to create a sense of depth.

SEE OR SEARCH THIS CLASS, SUBCLASS:
63+, for reverberators, which are often used to create a stereophonic effect.

18 Pseudo quadrasonic:
This subclass is indented under subclass 17. Subject matter where the plurality of channels are four in number.

19 Quadrasonic:
This subclass is indented under subclass 1. Subject matter in which four independent sound signals are to be reproduced.

20 Matrix:
This subclass is indented under subclass 19. Subject matter where the four independent sound signals are either (1) combined or coded to give one or more complex signals or (2) one or more complex signals are combined or decoded to recover the four independent sound signals.

21 4-2-4:
This subclass is indented under subclass 20. Subject matter where four quadrasonic signals are multiplexed into two more complex signals, then expanded back into four signals.

22 Variable decoder:
This subclass is indented under subclass 21. Subject matter where the two more complex signals are combined in variable ratios in order to recover the four independent sound signals.

23 With encoder:
This subclass is indented under subclass 21. Subject matter where the four independent sound signals are combined or coded to give two complex signals.

23.1 Hearing aid:
This subclass is indented under subclass 1. Subject matter having a small ambient sound reproducing system wherein two or mote output transducers transmit independent sound signals directly into the ear or skull for use by a hearing impaired individual to increase the sound level received by the ear (i.e., listening assistance.

SEE OR SEARCH THIS CLASS, SUBCLASS:
68+, and the search notes therein for hearing aids, in general.

26 Stereo sound pickup device (microphone):
This subclass is indented under subclass 1. Subject matter including a single transducer system for converting sound waves into two or more independent sound signals.

27 Center channel:
This subclass is indented under subclass 1. Subject matter where a third sound signal is derived from combination of two independent sound signals.

28 Amplifier:
This subclass is indented under subclass 1. Subject matter including a device to increase the amplitude of the independent sound signals.

SEE OR SEARCH CLASS:
330, Amplifiers, appropriate subclasses for an amplifier not having a specific source of input signals or a specific load.

54 HELIUM SPEECH:
This subclass is indented under the class definition. Subject matter where an output speech signal is of differing apparent predominant frequency but of the same duration as the input speech signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
29+, for bandwidth compression or expansion of a speech signal.

55 AUDIO TRANSDUCER PROTECTION CIRCUITRY:
This subclass is indented under the class definition. Subject matter where there is an audio transducer and circuitry to protect the transducer from damage due to abnormal operating conditions.

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SEE OR SEARCH THIS CLASS, SUBCLASS:
111+, for systems having specific audio transducers.

SEE OR SEARCH CLASS:
361, Electricity: Electrical Systems and Devices, subclasses 1+ for circuitry to protect other systems and devices in general from damage due to abnormal operating conditions.

56 MONITORING OF SOUND:
This subclass is indented under the class definition. Subject matter having a qualitative (yes-no) indication dependent upon a parameter of sound waves, e.g., loudness, quality, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
58+, for monitoring the operation of audio devices.
77+, for systems having a microphone at a location remote from a listening location (i.e., one-way intercoms).

SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 570+ for measuring and testing sound waves where a quantative (numerical) indication is given, especially 645+ for measuring an acoustic parameter.
367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 135+ for acoustic wave receiver circuitry.

57 Amplification control responsive to ambient sound:
This subclass is indented under subclass 56. Subject matter where the ambient sound level, at a place where sound is being reproduced, is evaluated and the result used to control the volume of the reproduced sound.

58 MONITORING/MEASURING OF AUDIO DEVICES:
This subclass is indented under the class definition. Subject matter having an indicator, measuring device, or eavesdropping means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
56+, for monitoring of sound waves.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclasses 500+ for condition responsive alarms.
714, Error Detection/Correction and Fault Detection/Recovery, subclasses 712+ for testing transmission facilities.

59 Loudspeaker operation:
This subclass is indented under subclass 58. Subject matter where an operating parameter of a sound reproducing transducer is measured or indicated.

60 Testing of hearing aids:
This subclass is indented under subclass 58. Subject matter in which at least part of a hearing aid is tested.

(1) Note. A hearing aid is a small audio reproducing system for the hard of hearing.

SEE OR SEARCH THIS CLASS, SUBCLASS:
68+, for hearing aids.

SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 570+ for measuring vibration including sound waves.
324, Electricity: Measuring and Testing, for electrical testing or measuring in general.
370, Multiplex Communications, subclasses 241+ for multiplex testing.
455, Telecommunications, subclasses 67.11 through 67.7 for modulated carrier system testing, subclasses 115.1-115.4 for transmitter testing; and subclasses 226.1-226.4 for receiver testing.

61 SOUND EFFECTS:
This subclass is indented under the class definition. Subject matter where the audio signal is selectively distorted.

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SEE OR SEARCH CLASS:
369, Dynamic Information Storage or Retrieval, subclasses 174+ for signal modification in a recording system.

62 Tremolo or vibrato effects:
This subclass is indented under subclass 61. Subject matter having means to produce a rapid variation in amplitude or pitch of a signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
63, for means to introduce echoes into a signal.

SEE OR SEARCH CLASS:
84, Music, subclass 1.25 for producing vibrato in an electronic musical instrument.
181, Acoustics, subclass 143 for a moving sound producer or deflector which can produce tremolo effects.

63 Reverberators:
This subclass is indented under subclass 61. Subject matter having a device for producing echoes in the audio signal.

SEE OR SEARCH CLASS:
84, Music, subclass 1.24 for reverberation production in electronic musical instruments, and digest 26 for musical reverberation.
181, Acoustics, subclasses 123+ for echo system.
333, Wave Transmission Lines and Networks, subclasses 138 through 164 for delay lines.
360, Dynamic Magnetic Information Storage or Retrieval, subclass 7 for recording for momentary delay to produce echoes.
369, Dynamic Information Storage or Retrieval, subclass 60.01 for using a recording system to delay a signal.

64 Mechanical (e.g., reverberation chamber):
This subclass is indented under subclass 63. Subject matter where the echoes are produced by other than electrical means.

65 Helical spring:
This subclass is indented under subclass 64. Subject matter where the echoes are produced by reflecting a compressional sound wave along a helical spring.

66 DEREVEBERATORS:
This subclass is indented under the class definition. Subject matter for removing echoes from a sound signal.

67 STETHOSCOPES, ELECTRICAL:
This subclass is indented under the class definition. Subject matter forming an instrument used to convey sounds to the ear of a user.

(1) Note. If the instrument is particularly adapted for use on or in a living body, classification is in Class 128, Surgery, but if the instrument can be used generally (e.g., to detect leaks or the internal sounds of machinery) classification is here.

SEE OR SEARCH CLASS:
181, Acoustics, subclass 131 for mechanical stethoscopes.
600, Surgery, subclass 528 for specific structure, adapted to be placed on or in a living body, for detecting sounds emanating from the heart.

70 ARTIFICIAL LARYNX, ELECTRICAL:
This subclass is indented under the class definition. Subject matter for replacing or supplementing the larynx and involving electrical actuation.

SEE OR SEARCH CLASS:
84, Music, subclass 375 for imitation trumpets, jew's harps, and reed horns of variable pitch.
116, Signals and Indicators, subclasses 137+ for horns, whistles and compressional wave generators.
128, Surgery, subclasses 207.14+ for tubes to be inserted into the trachea or larynx.
181, Acoustics, pertinent subclasses for sound amplifying and transmitting means and methods.

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446, Amusement Devices: Toys, subclasses 297+ for a toy having means to emit sound imitating a voice.

472, Amusement Devices, particularly subclass 64 for an illusion caused by sound imitation or effect.

623, Prosthesis (i.e., Artificial Body Members), Parts Thereof, or Aids and Accessories Therefor, subclasses 24+ for electrically actuated artificial body members other than a larynx and subclass 9 for nonelectrical artificial larynxes.

704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclasses 258+ for speech signal synthesis and subclass 271 for speech signal processing applied to a handicap aid.

71.1 ACOUSTICAL NOISE OR SOUND CANCELLATION:

This subclass is indented under the class definition. Subject matter, not elsewhere classifiable, comprising a noise cancellation system where audible noise is at least partially eliminated by generating and acoustically emitting an out-of-phase replica of an offending sound.

SEE OR SEARCH THIS CLASS, SUBCLASS:

73.1, for sound or noise masking.

94.1+, for suppression of the effects of unwanted signals on desired signals.

SEE OR SEARCH CLASS:

415, Rotary Kinetic Fluid Motors or Pumps, subclass 119 for noise elimination in fans, turbines, jet engines, etc.

71.11 Adaptive filter topology:

This subclass is indented under subclass 71.8. Subject matter having the functional interconnections between two or more transfer function models which make up an overall circuit or computational arrangement designed to generate a counterwave.

SEE OR SEARCH THIS CLASS, SUBCLASS:

71.13, for the generation of the out-of-phase replica using analog circuitry or nonadaptive filter.

SEE OR SEARCH CLASS:

708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 322+ for adaptive digital filter structures, per se.

71.12 Algorithm or formula (e.g., LMS, Filtered-X, etc.):

This subclass is indented under subclass 71.8. Subject matter having a specific computational sequence or a mathematical formula used in computation of a counterwave.

71.13 Analog or nonadaptive:

This subclass is indented under subclass 71.8. Subject matter in which the out-of-phase replica is generated using either analog circuitry or an electrical circuit having a fixed transfer function.

SEE OR SEARCH THIS CLASS, SUBCLASS:

71.11, for the generation of a counterwave using adaptive filter topology.

71.14 Tonal noise or particular frequency or band:

This subclass is indented under subclass 71.8. Subject matter in which the noise cancellation system is particularly designed to either eliminate noise having a high degree of underlying periodicity or process noise at a particular frequency or within a limited or particular frequency band.

71.2 Acoustic, nonairborne vibration sensing or counterwave emission:

This subclass is indented under subclass 71.1. Subject matter which senses vibration from or which imparts a cancelling wave directly to a solid or liquid medium or structure.

(1) Note. In order to be properly classifiable here, the primary object should be attenuation of acoustic sounds. In most cases, this will mean that a sensor such as a microphone will be needed to detect sound propagated through air, such as

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the residual sound after the counterwave source's output has been acoustically summed with the original noise.

SEE OR SEARCH CLASS:
52, Static Structures (e.g., Buildings), subclass 167.1 + for means compensating for an earth-transmitted force, i.e., earthquake.
267, Spring Devices, subclasses 136+ for resilient shock or vibration absorbers. See especially subclasses 140.14 and 140.15 for subject matter including electronic or magnetic control, or subclass 140.11 for subject matter having an energy absorbing feature.

71.3 From appliance:
This subclass is indented under subclass 71.1. Subject matter wherein the noise cancellation system cancels noise emanating from a device such as an air conditioner, refrigerator, vacuum cleaner, etc.

71.4 Within cabin or compartment of vehicle:
This subclass is indented under subclass 71.1. Subject matter wherein the noise cancellation system cancels noise within a humanly occupied space of an aircraft, automobile, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
86, for electrical audio systems combined with vehicles.

71.5 Within duct:
This subclass is indented under subclass 71.1. Subject matter wherein the noise cancellation system cancels noise propagating in a tube, canal, pipe, or similar conduit, including automobile inlet and exhaust pipes.

71.6 Adjacent ear:
This subclass is indented under subclass 71.1. Subject matter wherein the noise cancellation system is associated with a structure in a manner designed to cancel noise in the immediate vicinity of a person's ears.

(1) Note. Structures included in this subclass are headrests, hearing protectors, etc. Hearing protectors based on active noise cancellation are classified herein.

SEE OR SEARCH THIS CLASS, SUBCLASS:
72, for hearing protector without noise cancellation.

71.7 Particular transducer or enclosure structure:
This subclass is indented under subclass 71.1. Subject matter specifying details of an electro-acoustic energy converter or housing for use in an active noise cancellation system.

SEE OR SEARCH THIS CLASS, SUBCLASS:
88+, for enclosure or housing.
150+, for electro-acoustic audio transducer.

71.8 Counterwave generation control path:
This subclass is indented under subclass 71.1. Subject matter having either a feedback or feedforward circuit or a sequence of computations to generate the out-of-phase replica of the offending noise.

71.9 Non-acoustically derived reference signal:
This subclass is indented under subclass 71.8. Subject matter in which a transducer used to obtain a signal for processing detects a form of energy other than sound vibration.

(1) Note. Examples are spark timing, crankshaft position, manifold pressure of an engine, etc.

72 HEARING PROTECTORS, ELECTRICAL:
This subclass is indented under the class definition. Subject matter which provides a barrier to the transmission of at least some sounds to the ear.

SEE OR SEARCH THIS CLASS, SUBCLASS:
68+, for hearing aids, electrical.

73.1 SOUND OR NOISE MASKING:
This subclass is indented under the class definition. Subject matter which utilizes sound to reduce the distractive influences of unwanted sound or other audible noise.

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(1) Note. The unwanted sound may include intelligence bearing sound (e.g., conversation).

SEE OR SEARCH CLASS:
128, Surgery, subclass 1 for pain reducing or relaxation inducing sound.
380, Cryptography, subclasses 252 through 254 for an electrical audio signal masked for concealment by another signal.

74 HEADPHONE CIRCUITS:
This subclass is indented under the class definition. Subject matter having means to perform a desired electrical or electronic function in conjunction with a device held against the ear having a diaphragm which vibrates according to current variations.

SEE OR SEARCH THIS CLASS, SUBCLASS:
68, for electrical hearing aids.

75 MEGAPHONES:
This subclass is indented under the class definition. Subject matter for amplifying the human voice and which is capable of being carried.

SEE OR SEARCH THIS CLASS, SUBCLASS:
74, for headphone circuits.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 177+ for sound intensifying horns.

76 LECTERNS:
This subclass is indented under the class definition. Subject matter having an enclosure in the form of a reading desk.

(1) Note. Excluded from here are lecterns which have no electric audio signal processing circuitry.

SEE OR SEARCH CLASS:
312, Supports: Cabinet Structure, appropriate subclasses for lecterns, per se.
362, Illumination, appropriate subclasses of light sources for use with lecterns.

77 ONE-WAY AUDIO SIGNAL PROGRAM DISTRIBUTION:
This subclass is indented under the class definition. Subject matter for delivering the output of an audio signal source to a remote location, or to a plurality of electric-signal-to-sound transducers.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclasses 4.5 and 4.51 for stock quotation systems.
370, Multiplex Communications, subclasses 486+ for multiplex program distribution systems.
455, Telecommunications, subclasses 3.01 through 3.06 for radio program distribution systems.
725, Interactive Video Distribution Systems, subclasses 135 through 153 for one-way video program distribution.

78 Drive-in:
This subclass is indented under subclass 77. Subject matter for providing one-way communication between a central location and one or more stations accessible to occupants of automobiles.

SEE OR SEARCH THIS CLASS, SUBCLASS:
87+, for audio systems having nonelectrical features such as mountings, housings etc.

79 Near field:
This subclass is indented under subclass 77. Subject matter which is a near field or limited range system (i.e., field strength 1/d where d = distance from the transmitter to the receiver) where signal transfer from transmitter to receiver is inductive or capacitive rather wired.

SEE OR SEARCH CLASS:
455, Telecommunications, subclass 41.1 for near field modulated carrier wave systems.

80 Multiple channel:
This subclass is indented under subclass 77. Subject matter having more than one audio signal path.

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81 **With switching:**
This subclass is indented under subclass 80. Subject matter where there is the making, breaking or changing connections between audio signal paths.

82 **Public address system:**
This subclass is indented under subclass 77. Subject matter having an input transducer to convert sound into an electrical signal and an output transducer converting the electrical signal into sound so that the sound can be heard over a large area.

SEE OR SEARCH THIS CLASS, SUBCLASS:
75, for megaphones.

SEE OR SEARCH CLASS:
369, Dynamic Information Storage or Retrieval, subclasses 1+ for public address systems combined with recording reproducers.

83 **Feedback suppression:**
This subclass is indented under subclass 82. Subject matter having provision for preventing audio coupling from loudspeaker to microphone.

SEE OR SEARCH THIS CLASS, SUBCLASS:
93, for feedback suppression in audio systems in general.

84 **Spare amplifier substitution:**
This subclass is indented under subclass 82. Subject matter having provision for substituting one amplifier for another.

85 **Speaker or channel switching:**
This subclass is indented under subclass 82. Subject matter having provision for changing audio signal paths or audio reproducers.

86 **VEHICLE:**
This subclass is indented under the class definition. Subject matter with a vehicle.

(1) Note. Classified here are electrical audio systems combined with vehicles, other communication devices with vehicles are classified in Class 340, Communications: Electrical, subclasses 425.5+.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclasses 425.5+, note especially subclasses 460 and 474 for vehicle with horn, siren, or other electrical communication means not elsewhere provided for.
455, Telecommunications, subclasses 345+ for a vehicle mounted radio receiver.

87 **HAVING NON-ELECTRICAL FEATURE (E.G., MOUNTING):**
This subclass is indented under the class definition. Subject matter including a mechanical adjunct or device such as a mounting means or a specific container for electrical components.

SEE OR SEARCH THIS CLASS, SUBCLASS:
386+, for a mounting or support feature of a housed loudspeaker.

89 **Loudspeakers driven in given phase relationship:**
This subclass is indented under subclass 87. Subject matter where there are a plurality of loudspeakers in the specific container which are driven such as that their output sound has a particular phase relationship.

91 **Having microphone:**
This subclass is indented under subclass 87. Subject matter where the specific container holds a microphone.

(1) Note. There are both claimed electrical features in this subclass as well as non-electrical features.

SEE OR SEARCH THIS CLASS, SUBCLASS:
111+, for circuitry combined with a specific type of microphone.
122, for a microphone combined with an element having a diverse function, e.g., an amplifier.
355, for a housed microphone.
369, for a microphone capsule, per se.
375, for a microphone in particular support structure, wherein there is no claimed electrical feature of the transducer.

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92 DIRECTIVE CIRCUITS FOR MICROPHONES:
This subclass is indented under the class definition. Subject matter including a circuit for imparting directional pickup characteristics to microphones.

SEE OR SEARCH THIS CLASS, SUBCLASS:
155, for a directional microphone, per se.

93 FEEDBACK SUPPRESSION:
This subclass is indented under the class definition. Subject matter for prevention or reduction of an output signal from being returned to an input.

SEE OR SEARCH THIS CLASS, SUBCLASS:
83, for feedback suppression in a public address system.
95, for a microphone system having feedback.
96, for a loudspeaker system having feedback.

94.1 NOISE OR DISTORTION SUPPRESSION:
This subclass is indented under the class definition. Subject matter with provisions for reducing the effects of an unwanted signal on a desired signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
13, for antinoise means in broadcast or multiplex stereo systems.
71.1+, for acoustical noise or sound cancellation.
73.1, for audio masking.

SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 551+ for unwanted signal suppression.
708, Electrical Computers: Arithmetic Processing and Calculating, subclasses 300+ for digital selection or rejection of signal components and subclass 819 for filtering electrical signals by analog computation.

94.2 Spectral adjustment:
This subclass is indented under subclass 94.1. Subject matter in which the unwanted signal is either at least partially removed by processing a selected frequency or frequency band, such as by subtracting the contents of a particular frequency band from the input signal, or is overcome by preemphasis of a particular frequency or band to enhance the signal to noise ratio.

SEE OR SEARCH THIS CLASS, SUBCLASS:
83, for feedback elimination in a public address system (this is frequently done by spectral subtraction using notch filters, for example).
93, for feedback elimination in an audio system under the class definition.
94.7, for noise suppression using a signal channel and noise channel.
98+, for control of frequency characteristics in an audio signal in general, such as for equalization.
106, for compression/expansion ("compansion") systems, which achieve enhanced signal to noise ratio through compression. Preemphasis is often found with compression.

94.3 In multiple frequency bands:
This subclass is indented under subclass 94.2. Subject matter in which processing takes place in more than one spectral region, i.e., more than one frequency or frequency band is processed.

94.4 Interpolation:
This subclass is indented under subclass 94.1. Subject matter in which a segment of a desired signal which contains noise is replaced with an estimate of what it would or should have been in the absence of noise, the estimate being based on the desired signal"s values before or after, or before and after, the noise occurred.

SEE OR SEARCH CLASS:
702, Data Processing: Measuring, Calibrating, or Testing, subclasses 189+ for measured signal processing including weighting, averaging, and matrix operation.

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708, Electrical Computers: Arithmetic Processing and Calculating, subclass 290 for interpolation, per se.

94.5 Soft switching, muting, or noise gating:
This subclass is indented under subclass 94.1. Subject matter designed to prevent a momentary, sudden fluctuation of voltage or current (a "pop") in a circuit as a result of a sudden change of an operating parameter in the circuit, such as the application of power; or to attenuate or cutoff on a broad-band basis the audio output of a circuit when the audio signal does not contain intelligence; or to switch off the signal input to a system when the signal or noise level on the input is above a certain threshold (a condition which usually indicates that only noise is present).

SEE OR SEARCH THIS CLASS, SUBCLASS:
94.8, for peak limiting or pulsive noise compensation.

SEE OR SEARCH CLASS:
455, Telecommunications, subclasses 194.1+ for muting and subclasses 218+ for squelch.

94.6 Hum or ground loop:
This subclass is indented under subclass 94.1. Subject matter designed to eliminate frequency components generated as a result of AC power supply contamination, or compensate for noise transmission caused by currents flowing through an electrical conductor which connects two different circuit points, each of which is nominally at ground potential.

SEE OR SEARCH CLASS:
330, Amplifiers, subclass 149 for hum or noise or distortion bucking introduced into signal channel.
455, Telecommunications, subclasses 298+ for noise or interference elimination in the receiver power supply.

94.7 Using signal channel and noise channel:
This subclass is indented under subclass 94.1. Subject matter having separate inputs, each respectively containing primarily the desired and undesired signals, and which derives at least one "clean" output having the desired signal by utilizing both inputs, such as by subtracting one input from the other.

SEE OR SEARCH THIS CLASS, SUBCLASS:
94.2, for noise suppression using spectral adjustment.

94.8 Peak limiting or pulsive noise compensation:
This subclass is indented under subclass 94.1. Subject matter designed to restrict the amplitude of relatively short duration, high amplitude excursions of a desired signal to prevent distortion in a subsequent stage such as a modulator or amplifier, or compensate for the effects of sporadic or short duration undesired signals ("pulses").

SEE OR SEARCH THIS CLASS, SUBCLASS:
94.5, for soft switching, muting, or noise gating.

SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 310+ for limiting, clipping, or clamping lessens or eliminates an intermittent spuriously generated component from a signal.
455, Telecommunications, subclasses 223+ for noise blanking.

94.9 Feedforward circuitry for transducer compensation:
This subclass is indented under subclass 94.1. Subject matter having circuitry designed to compensate for distortion which is generated by a transducer itself (such as a loudspeaker or microphone), without using feedback.

SEE OR SEARCH THIS CLASS, SUBCLASS:
95, for microphones with feedback.
96, for systems which compensate for loudspeaker distortion using feedback.

95 MICROPHONE FEEDBACK:
This subclass is indented under the class definition. Subject matter having a microphone and a circuit and also having provision for returning a fraction of an output signal of the circuit to an input of the circuit.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

93, for feedback suppression in audio systems.

96, for a loudspeaker circuit with feedback.

168+, for a microphone, per se.

96 LOUDSPEAKER FEEDBACK:

This subclass is indented under the class definition. The mechanical or electromechanical coupling of a portion of a sound wave output of a system to a preceding part or input circuit of the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

93, for feedback suppression in audio systems.

95, for microphones with feedback.

150+, for a loudspeaker, per se.

97 INCLUDING PHASE CONTROL:

This subclass is indented under the class definition. Subject matter with means to vary or maintain the phrase of an electrical signal relative to either another signal or a standard.

98 INCLUDING FREQUENCY CONTROL:

This subclass is indented under the class definition. Subject matter with means to vary or maintain the frequency response of the system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

62, for vibrato effects.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclasses 165 through 212 for filters, per se.

455, Telecommunications, subclasses 255+, 266 and 268 for frequency response control in radio receivers.

99 Having crossover filter:

This subclass is indented under subclass 98. Subject matter that separates a signal into two or more separate frequency bands.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclasses 132+ for crossover networks, per se.

369, Dynamic Information Storage or Retrieval, subclass 175 for record players with frequency dependent signal separation.

100 With active device:

This subclass is indented under subclass 99. Subject matter having an electrical or electronic element capable of controlling voltages or currents to produce gain or switching action in a circuit (e.g., transistor, vacuum tube, or saturable reactor).

101 Automatic tone control:

This subclass is indented under subclass 98. Subject matter having a control used to alter automatically the frequency response of the system so that a listener can be provided the most pleasing sound.

SEE OR SEARCH CLASS:

333, Wave Transmission Lines and Networks, subclasses 28, and 167-212 for tone control, per se.

455, Telecommunications, subclass 267 for tone control in a radio receiver.

102 With amplitude control:

This subclass is indented under subclass 101. Subject matter including automatic tone control combined with means for adjusting or setting the signal level or for obtaining a substantially constant amplitude output signal for a range of variations of the amplitude of an input signal.

SEE OR SEARCH CLASS:

455, Telecommunications, subclass 233.1 for combined volume and tone control in a radio receiver.

103 Having automatic equalizer circuit:

This subclass is indented under subclass 98. Subject matter designed to compensate for an undesired amplitude-frequency and/or phase-frequency characteristic of the system.

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SEE OR SEARCH CLASS:
333, Wave Transmission Lines and Networks, subclass 28 for equalizers, per se.
369, Dynamic Information Storage or Retrieval, subclass 133 for recording with equalization.

104 INCLUDING AMPLITUDE OR VOLUME CONTROL:
This subclass is indented under the class definition. Subject matter including means for adjusting or setting the signal level or for obtaining a substantially constant amplitude output signal for a range of variations of the amplitude of an input signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
102, for amplitude control combined with automatic tone control.

SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 306+ for miscellaneous amplitude control circuits.
330, Amplifiers, subclasses 129+, 254 and 278+ for amplitude control for amplifiers.
338, Electrical Resistors, subclasses 13+ and 68+ for variable resistors.
455, Telecommunications, subclasses 232.1+ for amplitude control in a radio receiver.

105 Remote:
This subclass is indented under subclass 104. Subject matter where the amplitude or volume is controlled by at least one or more devices from a remote point.

SEE OR SEARCH CLASS:
340, Communications: Electrical, subclasses 1.1 through 16.1 for remote control, in general.
369, Dynamic Information Storage or Retrieval, subclasses 24.01 through 42.01 for remote control of a recording or reproducing device other than by a telephone system.
455, Telecommunications, subclass 355 for remote amplitude or volume control in a radio receiver.

106 With amplitude compression/expansion:
This subclass is indented under subclass 104. Subject matter having electrical audio signal system combined with provision for decreasing the amplitude range of an applied audio signal or for restoring the full amplitude range of an amplitude compressed audio signal.

SEE OR SEARCH CLASS:
333, Wave Transmission Lines and Networks, subclass 14 for amplitude compression/expansion, per se.
370, Multiplex Communications, subclass 202 for amplitude compression or expansion in a multiplex system.
455, Telecommunications, subclass 72 for amplitude compression/expansion in a radio system.
704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclasses 500+ for audio signal bandwidth compression or expansion and subclasses 503+ for audio signal time compression or expansion.

107 Automatic:
This subclass is indented under subclass 104. Subject matter having means to control the signal level adjusting means automatically as a function of some characteristic of an input signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:
22, for automatic gain control for decoding quadrasonic signals.

108 Including feedback:
This subclass is indented under subclass 107. Subject matter further having provision for returning a fraction of an output signal back to an input.

SEE OR SEARCH THIS CLASS, SUBCLASS:
83, for feedback suppression in a public address system.

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93, for feedback suppression in a audio systems in general.
95, for microphone circuits with feedback.
96, for loudspeaker circuits with feedback.

109 With manual volume control:
This subclass is indented under subclass 104. Subject matter wherein volume is controlled in accordance with the position of a device which is adjusted by hand.

110 VOICE CONTROLLED:
This subclass is indented under the class definition. Subject matter which is controlled in some manner in response to a voice signal.

SEE OR SEARCH CLASS:
367, Communications, Electrical: Acoustic Wave Systems and Devices, subclass 198 for speech responsive selective control in general.

111 CIRCUITRY COMBINED WITH SPECIFIC TYPE MICROPHONE OR LOUDSPEAKER:
This subclass is indented under the class definition. Subject matter combined with a specific audio-to-electrical signal or electrical-to-audio transducer.

(1) Note. Classified herein are microphone or loudspeakers combined with a diverse type of circuit (e.g., amplifier) or circuit element (e.g., resistor) other than a lead or connector.

SEE OR SEARCH THIS CLASS, SUBCLASS:
122, for audio signal systems having a generic microphone.
150+, for a specific type of microphone or loudspeaker.

112 With carbon microphone:
This subclass is indented under subclass 111. Subject matter where the transducer is a carbon microphone.

SEE OR SEARCH THIS CLASS, SUBCLASS:
180+, for a carbon microphone, per se.

113 With electrostatic microphone:
This subclass is indented under subclass 111. Subject matter where the transducer is an electrostatic microphone.

SEE OR SEARCH THIS CLASS, SUBCLASS:
173, for an electrostatic microphone, per se.

114 With piezoelectric microphone:
This subclass is indented under subclass 111. Subject matter where the transducer is a piezoelectric microphone.

SEE OR SEARCH THIS CLASS, SUBCLASS:
173, for a piezoelectric microphone, per se.

SEE OR SEARCH CLASS:
310, Electrical Generator or Motor Structure, subclasses 311+ for piezoelectric transducers.
367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 157+ for underwater type piezoelectric transducers.

115 With magnetic microphone:
This subclass is indented under subclass 111. Subject matter where the transducer is a magnetic microphone.

SEE OR SEARCH THIS CLASS, SUBCLASS:
176, for a magnetic microphones, per se.

116 With electrostatic loudspeaker:
This subclass is indented under subclass 111. Subject matter where the transducer is an electrostatic loudspeaker.

SEE OR SEARCH THIS CLASS, SUBCLASS:
191+, for an electrostatic loudspeakers, per se.

117 With magnetic loudspeaker:
This subclass is indented under subclass 111. Subject matter where the transducer is a magnetic loudspeaker.

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SEE OR SEARCH THIS CLASS, SUBCLASS:
192+, for a magnetic loudspeaker, per se.

118 WITH MUSICAL INSTRUMENT:
This subclass is indented under the class definition. Subject matter for amplifying or reproducing the sounds of musical instruments.

(1) Note. The subject matter classified herein merely receives, amplifies and/or reproduces signals representing musical sounds while the subject matter classified in Class 84 generates musical sounds.

SEE OR SEARCH CLASS:
84, Music, subclasses 1+ for musical instruments, especially subclasses 1.01+ for electronic musical instruments.

119 WITH MIXER:
This subclass is indented under the class definition. Subject matter including a circuit having two or more inputs and a common output which combines separate input signals linearly in desired proportions to produce an output signal.

120 WITH AMPLIFIER:
This subclass is indented under the class definition. Subject matter including a device for producing an output of greater amplitude than is applied at an input.

SEE OR SEARCH CLASS:
330, Amplifiers, appropriate subclasses for amplifiers not having specific input signals or specific loads.
379, Telephonic Communications, subclass 395 for amplifiers combined with telephone systems.

121 Feedback:
This subclass is indented under subclass 120. Subject matter where a fraction of an output signal is returned to an input.

SEE OR SEARCH THIS CLASS, SUBCLASS:
71.1+, for acoustical sound cancellation.
83, for public address systems with feedback suppression.
93, for feedback suppression for audio systems in general.
95, for microphone circuits with feedback.
96, for loudspeaker circuits with feedback.
108, for automatic amplitude control having feedback.

122 HAVING MICROPHONE:
This subclass is indented under the class definition. Subject matter including a generic microphone combined with an element having diverse function (e.g., a microphone and an amplifier).

(1) Note. Subject matter under the class definition having a specific microphone combined with a diverse element is found in subclasses 111+.

(2) Note. Microphones are also found in the subject matter of subclasses 26, 55-58, 64+, 67-69, 75-85, 91, and 95.

SEE OR SEARCH THIS CLASS, SUBCLASS:
168+, for a microphone, per se.

123 SWITCHING:
This subclass is indented under the class definition. Subject matter where there is the making, breaking or changing connections in an electrical circuit.

SEE OR SEARCH THIS CLASS, SUBCLASS:
7+, for switch type stereo modulators or detectors.
11, for switching between mono and stereo modes.
55, for audio transducer protection circuitry.
81, for switching in multiple channel program distribution.
85, for speaker or channel switching in a public address system.
110, for voice controlled switching of audio systems.

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SEE OR SEARCH CLASS:
200, Electricity: Circuit Makers and Breakers, for switches, per se.
307, Electrical Transmission or Interconnection Systems, subclasses 112+ for electrical transmission or interconnection switching systems.
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclasses 365+ for miscellaneous gating circuits including channel selection.
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets for magnetic switches.
340, Communications: Electrical, subclass 2.9 for spare channel switching.
361, Electricity: Electrical Systems and Devices, subclasses 139+ for relay or solenoid circuits.
370, Multiplex Communications, subclasses 357+ for multiplex switching circuit.
379, Telephonic Communications, subclasses 242+ for switching in telephone systems, and subclass 325 for telephone switches, per se.
455, Telecommunications, subclasses 78+ for transmitter-receiver switching.
714, Error Detection/Correction and Fault Detection/Recovery, subclasses 3+ for replacing a faulty apparatus with a spare.

124 MISCELLANEOUS:
This subclass is indented under the class definition. Subject matter not hereinabove classified.

150 ELECTRO-ACOUSTIC AUDIO TRANSDUCER:
This subclass is indented under the class definition. Subject matter having a structure or process for converting an information signal between audible sound vibrations and a corresponding time-varying electrical quantity.

(1) Note. Included herein are instruments such as microphones, speakers earphones, and housings or supports peculiar thereto. However, combinations with circuitry, other than leads, terminals, or connectors, are not classified herein, but are classified in the preceding subclasses of this class (381).

(2) Note. The audible sound vibrations are generally speech or music.

SEE OR SEARCH CLASS:
181, Acoustics, appropriate subclasses for an attachment to a casing of an audio transducer.
310, Electrical Generator or Motor Structure, subclasses 300+ for a piezoelectric transducer not limited to audio utility.
367, Communications, Electrical: Acoustic Wave System and Devices, subclasses 140+ for a nonaudio acoustical transducer.

151 Body contact wave transfer (e.g., bone-conduction earphone, larynx microphone):
This subclass is indented under subclass 150. Subject matter wherein sound vibrations are obtained from or imparted to a portion of a human body in direct contact with a vibrating component of an electroacoustical transducer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
68.3, for similar subject matter used in a hearing aid.

152 Driven diverse static structure (e.g., wall, sounding board):
This subclass is indented under subclass 150. Subject matter combined with a stationary structural element having a function independent of electricity-to-sound conversion and being driven to radiate sound waves by an audio transducer mounted thereon.

(1) Note. Devices which vibrate walls to emit intelligible sound are classified herein.

160 Reflecting element:
This subclass is indented under subclass 153. Subject matter having an element which reflects the sound waves.

161 With mechanical amplifier arrangement:
This subclass is indented under subclass 150. Subject matter having a vibrating solid element intermediate a conversion between mechani-

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cally increases the amplitude of the vibrations of the solid.

162 Detail of mechanical vibration coupling to transducer (e.g., tuned vibrating element):
This subclass is indented under subclass 150. Subject matter including a detail of a mechanical element which transfers sound vibrations to or from the audio transducer.

163 Having bi-directional transducer:
This subclass is indented under subclass 150. Subject matter having a single device which converts sound waves to electrical variations and electrical variations to sound waves.

(1) Note. For classification herein, conversion in both directions must be specifically included.

SEE OR SEARCH CLASS:
379, Telephonic Communications, subclass 420 for a loudspeaking type telephone set with a single bi-directional transducer; subclass 433 for a handset having a single bi-directional transducer.

164 Thermal response to, or generation of, sound vibration:
This subclass is indented under subclass 150. Subject matter where sound waves either modify or are emitted by a temperature effect on an element material, or area of the device.

165 By modifying fluid flow:
This subclass is indented under subclass 150. Subject matter having a source of gas flow which flow interacts with an electrical circuit to either (a) vary the current therein in accordance with incident sound waves, or (b) produce sound waves corresponding to an applied audio information signal in the electric circuit.

SEE OR SEARCH THIS CLASS, SUBCLASS:
166, for similar subject matter having a fluid electrical conducting element absent fluid flow.

166 Having fluid as a conducting element:
This subclass is indented under subclass 150. Subject matter wherein an electrically conductive element of the transducer is a fluid.

(1) Note. The fluid conducting element may be either the portion converting the signal between electrical variations and sound waves, or an electrode connecting the circuit to another transducer.

(2) Note. The fluid may include an ionized path between electrodes.

SEE OR SEARCH THIS CLASS, SUBCLASS:
165, for a fluid flow modifying transducer.

167 Ionized gap, spark, or flame:
This subclass is indented under subclass 166. Subject matter which ionizes the air or other gas or causes sparks across a gap.

(1) Note. Included herein are also plasma, glow discharge, or flame.

170 Compound:
This subclass is indented under subclass 168. Subject matter having a plurality of independent microphone devices in a single casing.

171 Micromagnetic:
This subclass is indented under subclass 168. Subject matter in which the incident sound vibrates a diaphragm so as to vary both the resistance of a microphone contact and magnetic induction means which reinforce each other to produce a combined affect on an electric current.

172 Light modifying:
This subclass is indented under subclass 168. Subject matter for converting an incident sound wave to an audio signal by means of a light modifying element.

SEE OR SEARCH CLASS:
455, Telecommunications, subclasses 618+ for a transmitter for light wave communication.

173 Piezoelectric or ferroelectric:
This subclass is indented under subclass 168. Subject matter having an element made of either (a) a material which produces a voltage when subjected to a mechanical stress or (b) a material having a spontaneous electrical polarization.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

190, and 191, for reproducer or generic transducer of the piezoelectric or ferroelectric type, respectively.

174 Capacitive:

This subclass is indented under subclass 168. Subject matter having an electrostatic capacitance element which varies in accordance with sound waves incident thereon.

SEE OR SEARCH CLASS:

361, Electricity: Electrical Systems and Devices, subclasses 283.1+ for pressure responsive electrostatic capacitors, per se.

175 Semiconductor junction microphone:

This subclass is indented under subclass 168. Subject matter having an element with conductivity intermediate that of a conductor and an insulator and having one region having predominantly electron conductivity (n-type) and another region having predominantly hole (p-type) conductivity forming a potential barrier layer therebetween.

SEE OR SEARCH CLASS:

257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 53+, 108, 225+, and 414+ for nonelectrical input devices, including subclasses 415+ for pressure sensors.

176 Conductive diaphragm (e.g., reed, ribbon):

This subclass is indented under subclass 168. Subject matter having an electrically conductive element as a portion of the diaphragm.

177 Dynamic (e.g., magnetic):

This subclass is indented under subclass 168. Subject matter including a diaphragm to which a current conducting element is attached and which is positioned in a fixed magnetic field.

178 Vibrating electrical contact:

This subclass is indented under subclass 168. Subject matter in which two elements have an area of intermittent electrical contact caused by oscillatory motion of an element in accordance with incident sound waves.

179 Resistive:

This subclass is indented under subclass 168. Subject matter having an element the resistance of which is varied by incident sound waves.

SEE OR SEARCH CLASS:

338, Electrical Resistors, appropriate subclasses for a condition responsive variable resistor.

180 Granular or carbon:

This subclass is indented under subclass 180. Subject matter having a sound responsive resistive element composed of either elemental carbon, or a mass of comminuted material.

181 Differential:

This subclass is indented under subclass 180. Subject matter having two sound responsive resistance elements one positioned on either side of a central diaphragm.

182 Plural or compound reproducers:

This subclass is indented under subclass 180. Subject matter having a plurality of sound producing transducer having two or more elements performing the same or similar functions.

184 Different types of diaphragms:

This subclass is indented under subclass 182. Subject matter having two or more flexible membranes which differ in size, shape or composition.

185 Having common voice coil:

This subclass is indented under subclass 182. Subject matter where two or more flexible membranes are driven by a common helix of conductive material carrying an electrical information signal.

186 Plural diaphragms:

This subclass is indented under subclass 182. Subject matter including a speaker having plural flexible membranes, for radiating sound waves.

189 Having protective or shielding feature:

This subclass is indented under subclass 150. Subject matter having structure for shielding a transducer from adverse environmental conditions or preventing undesired effects caused by an external magnetic field.

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(1) Note. Adverse conditions include moisture and impact.

190 Electrostrictive, magnetostrictive, or piezoelectric:
This subclass is indented under subclass 150. Subject matter including an element which expands or contracts in accordance with an applied electric or magnetic field, or which produces a mechanical stress tending to produce deflection, expansion, or contraction when subjected to an applied electrical voltage.

(1) Note. The term deflection covers both twisting and bending.

SEE OR SEARCH THIS CLASS, SUBCLASS:
173, for a piezoelectric microphone.

191 Having electrostatic element (e.g., electret, vibrating plate):
This subclass is indented under subclass 150. Subject matter including either a capacitor with a vibratable plate, or an element which has a spontaneous electrical field, one of which is caused to vibrate by an audio signal or incident sound.

SEE OR SEARCH THIS CLASS, SUBCLASS:
174, for a capacitive microphone.

SEE OR SEARCH CLASS:
307, Electrical Transmission or Interconnection Systems, subclass 400 for electrets.
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, subclass 516 for miscellaneous vibration sensitive circuits.
361, Electricity: Electrical Systems and Devices, subclasses 283.1+ for a pressure responsive capacitor, per se.

300 Stereo speaker arrangement:
This subclass is indented under subclass 1. Subject matter including transducers for reproducing the sound signals, and the spatial relationship of the transducers to their surroundings.

301 In furniture or clothing:
This subclass is indented under subclass 300. Subject matter in which the transducers are mounted on or within a pillow, headrest, couch, jacket, belt, etc.

(1) Note. A television set, computer monitor, etc. is considered to be an "image presentation means," and is not considered to be "furniture" for this class.

SEE OR SEARCH THIS CLASS, SUBCLASS:
306, for image projection means, i.e., a television set having stereo speakers.
333, for furniture, clothing, or image projection means combined with a monaural loudspeaker.
364, for clothing combined with a microphone.
388, for furniture or clothing combined with mounting or support feature of housed loudspeaker.

302 In vehicle:
This subclass is indented under subclass 300. Subject matter in which the transducers are mounted on or within an automobile, aircraft, motorcycle, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
365, for a housed microphone mounting or support in a vehicle.
389, for a mounting or support feature of a housed loudspeaker in a vehicle.

303 Optimization:
This subclass is indented under subclass 300. Subject matter in which steps are taken to enhance the stereo listening effect, such as by enlarging the area in which stereo audibility is satisfactory (i.e., the "sweet point").

304 Enclosure orientation:
This subclass is indented under subclass 303. Subject matter in which either a distance or relative angle between two or more transducer housings or baffles is adjusted or specified.

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305 Enclosure adaptation:
This subclass is indented under subclass 303. Subject matter in which a modification is made within single housing or baffle, such as by providing a directible or directional capability.

306 With image presentation means:
This subclass is indented under subclass 300. Subject matter in which the transducers are arranged to emit sound in conjunction with a television screen, computer monitor, motion picture screen, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
333, for image presentation means combined with a loudspeaker.
388, for image presentation means combined with a mounting or support feature of a housed loudspeaker.

SEE OR SEARCH CLASS:
353, Optics: Image Projectors, subclasses 15+ for sound accompaniment with an image projector.
359, Optics: Systems and Elements, subclass 444 for a projection screen with a sound producer.

307 Surround (i.e., front plus rear or side):
This subclass is indented under subclass 300. Subject matter in which, in addition to having at least one transducer arranged forward of a listening position, at least one transducer is arranged laterally or to the back of the listening position.

308 In single baffle:
This subclass is indented under subclass 300. Subject matter in which the two or more spatially related sounds are emitted from a only one transducer enclosure.

309 Stereo earphone:
This subclass is indented under subclass 300. Subject matter in which the transducers are intended to be placed in or over the user"s ears.

310 Virtual positioning:
This subclass is indented under subclass 309. Subject matter in which audio signals, prior to delivery to the earphone, are processed in order to give an illusion that the spatially related sounds are being emitted from physically distinct locations in the earphone user"s environment.

(1) Note. The orientation of earphones with respect to the room changes as the user moves his or her head. Virtual positioning when specifically used with an earphone is often done for the purpose of making the sounds appear to come from an invariant physical location in the environment, irrespective of the orientation of the user"s head. This is done to foster the illusion that the user is not in fact wearing headphones.

SEE OR SEARCH THIS CLASS, SUBCLASS:
17, for a device or arrangement which transforms single channel audio signals into a plurality of channels of audio information to create a sense of depth. Comprehended in subclass 17 is virtual positioning, typically used with loudspeakers.

311 Wireless or for use in diverse environment:
This subclass is indented under subclass 309. Subject matter in which a) audio signals are conveyed to the earphone without the use of conductors, such as by modulated RF or infrared carrier wave or b) the earphone is especially configured or adapted to be used in an unusual location, such as underwater or within a magnetic field such as Magnetic Resonance Imaging (MRI), etc.

SEE OR SEARCH CLASS:
398, Optical Communications, various subclasses for modulated wireless optical communications.
455, Telecommunications, for modulated wireless communications, generally.

312 HEARING AIDS, ELECTRICAL:
This subclass is indented under the class definition. Subject matter having a small ambient sound reproducing system wherein an output transducer transmits directly into the ear or skull for use by the hard of hearing to increase the sound level received by the ear (i.e., listening assistance).

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SEE OR SEARCH THIS CLASS, SUBCLASS:

23.1, for hearing aids in binaural and stereophonic circuits and systems.
60, for testing of hearing aids.
74, for headphone circuits.
75, for megaphones.
327, for hearing aids within the scope of this definition in combination with spectacle structure such as temples.
370, for a headphone.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclass 585 for ear or hearing testing, and subclasses 645+ for measuring acoustic parameters.
128, Surgery, subclass 746, for testing by auditory stimulus (e.g., audiology)
181, Acoustics, subclasses 126+ for mechanical hearing aids.
330, Amplifiers, particularly subclass 65 and 250+ for amplifiers involving structural details or elements, and transistor amplifiers.
351, Optics: Eye Examining, Vision Testing and Correcting, subclasses 41+ for spectacles and eyeglasses, and subclasses 111+ for spectacle temples.
600, Surgery, subclass 25 for a surgically implanted vibratory hearing aid.
623, Prosthesis (i.e., Artificial Body Members), Parts Thereof or Aids and Accessories Therefor, subclass 10 for artificial ears having electrical hearing aid as a subcombination.

313 Directional:

This subclass is indented under subclass 312. Subject matter where a response of an input transducer (i.e., microphone) to the ambient sound varies significantly with a location of a source relative to the transducer, the hearing aid, or the hearing aid user.

SEE OR SEARCH THIS CLASS, SUBCLASS:

356+, for a directional microphone.

314 Programming interface circuitry:

This subclass is indented under subclass 312. Subject matter including circuitry within the hearing aid or external to the hearing aid for connection to the hearing aid in order to program it.

SEE OR SEARCH THIS CLASS, SUBCLASS:

323, for programming interface terminals in a hearing aid, without circuitry,

315 Remote control, wireless, or alarm:

This subclass is indented under subclass 312. Subject matter allowing for a) parameters of the hearing aid to be altered from a location different from the location of the hearing aid itself, b) processed sound from an amplifier to be conveyed to the ear without the use of conductors or an acoustic tube, or c) a warning sensor or device to make its warning known to a hearing aid user through the hearing aid.

SEE OR SEARCH CLASS:

340, Communications: Electrical, subclasses 12.22, 12.3, and 12.5-12.53 for pulse responsive wireless remote control, subclasses 13.24-13.3 for frequency responsive wireless remote control, and subclasses 635 through 656 for alarms responding to condition changes in electrical apparatus.

316 Frequency transposition:

This subclass is indented under subclass 312. Subject matter in which some portion of a received audio signal is shifted in frequency prior to being delivered to the hearing aid's loudspeaker in order to enhance audibility.

SEE OR SEARCH THIS CLASS, SUBCLASS:

320, for spectral control in the hearing aid

317 Noise compensation circuit:

This subclass is indented under subclass 312. Subject matter including circuitry to ameliorate effects of undesired signals.

SEE OR SEARCH THIS CLASS, SUBCLASS:

94, for a device of this class including means for noise suppression.
322+, for subject matter in which amelioration of noise is accomplished using purely mechanical or acoustic means.

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SEE OR SEARCH CLASS:
327, Miscellaneous Active Electrical Nonlinear Devices, Circuits and Systems, subclasses 551+ for unwanted signal suppression generally.

318 Feedback suppression:
This subclass is indented under subclass 317. Subject matter in which the particular kind of undesired signal is howling or screeching caused by a return to the hearing aid's input of a sufficient fraction of its output to cause oscillation.

(1) Note. Hearing aid feedback normally occurs via an acoustic path.

SEE OR SEARCH THIS CLASS, SUBCLASS:
83, for feedback suppression circuitry in a public address system.
93, for generic feedback circuitry under the class definition.

319 With vacuum tube amplifier:
This subclass is indented under subclass 312. Subject matter including means using one or more devices in which electron flow takes place in an evacuated envelope.

SEE OR SEARCH CLASS:
330, Amplifiers, subclass 64 for vacuum tube amplifiers generally.

320 Spectral control:
This subclass is indented under subclass 312. Subject matter including a circuit to control the amplitude of a received audio signal in at least two separate frequency bands, i.e., to selectively amplify or attenuate two or more different frequencies or frequency bands.

(1) Note. Included herein are tone control and filtering. Note that subject matter which emphasizes one frequency band relative to another inherently results in different treatment of two bands, and is properly classified here.

SEE OR SEARCH THIS CLASS, SUBCLASS:
316, for frequency transposition in hearing aids.

321 Wideband gain control:
This subclass is indented under subclass 312. Subject matter having a circuit to regulate the amplitude of the entire frequency range of a received audio signal (i.e., broad band amplitude regulation).

(1) Note. The amount of amplification may be adjusted either manually or in response to a sound parameter, as in automatic gain or volume control (AGC, AVC).

SEE OR SEARCH THIS CLASS, SUBCLASS:
104+, for amplitude or volume control of an audio system.

SEE OR SEARCH CLASS:
330, Amplifiers, subclasses 278+ for gain control means using a transistor.

322 Specified casing or housing:
This subclass is indented under subclass 312. Subject matter including a specific container for the hearing aid components.

323 Power supply or programming interface terminals:
This subclass is indented under subclass 322. Subject matter including a) an energy source such as a battery, solar cell, etc., or structural detail to accommodate an energy source, such as battery compartment detail, including contacts or b) contacts used for programming the hearing aid when hooked up to an interface.

SEE OR SEARCH THIS CLASS, SUBCLASS:
314, for programming interface *circuitry*.

SEE OR SEARCH CLASS:
323, Electricity: Power Supply or Regulation Systems, for power supply or regulation systems generally.

324 Component mounting:
This subclass is indented under subclass 322. Subject matter including structural features designed for mounting or holding hearing aid parts and circuitry, including printed circuit boards.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

87+, for component mounting of this class wherein no electrical feature, is claimed.

325 Cerumen protection:

This subclass is indented under subclass 322. Subject matter having a barrier or means to prevent the hearing aid from being harmed by earwax.

326 Non-air-conducted sound delivery:

This subclass is indented under subclass 322. Subject matter in which sound is conducted to the inner ear through the cranial bones, the skin, or the nerves (i.e., bone conduction, tactile, transdermal, transcutaneous, etc.).

(1) Note. The nerves may be stimulated without direct contact therewith. While surgically implanted devices, such as cochlear implants (Class 600, subclass 25), stimulate the nerves through direct contact therewith, other devices stimulate the nerves indirectly with modulated electromagnetic fields. The latter type of device is properly classifiable here.

SEE OR SEARCH THIS CLASS, SUBCLASS:

151, for a bone conduction audio transducer of this class, generally.

327 Spectacle:

This subclass is indented under subclass 322. Subject matter in combination with an eyeglass frame.

SEE OR SEARCH CLASS:

351, Optics: Eye Examining, Vision Testing and Correcting, subclasses 41+ for spectacle and eyeglasses, and subclasses 111+ for spectacle temples.

600, Surgery, subclass 25 for surgically implanted hearing aids, such as cochlear implants, which stimulate the nerves through direct contact therwith.

328 Ear insert:

This subclass is indented under subclass 322. Subject matter which fits entirely within and is completely supported by the user's ear.

SEE OR SEARCH THIS CLASS, SUBCLASS:

380, for a sound reproducer element inserted in the ear.

SEE OR SEARCH CLASS:

623, Prosthesis (i.e., Artificial Body Members) Parts Thereof or Aids and Accessories Therefor, subclass 10 for an artificial ear having an electrical hearing aid as a subcombination.

329 Device for manipulation:

This subclass is indented under subclass 328. Subject matter including means for insertion, extraction, or parameter setting of an ear insert.

330 Hook over ear:

This subclass is indented under subclass 322. Subject matter including support structure which engages an exterior portion of the user's ear.

SEE OR SEARCH THIS CLASS, SUBCLASS:

381, for a hook over ear type headphone including a particular support structure.

331 Inductive pickup:

This subclass is indented under subclass 322. Subject matter including an inductor or coil connected to the hearing aid in order to detect an electromagnetic field from a telephone ear piece.

SEE OR SEARCH CLASS:

379, Telephonic Communications, subclass 52, for a telephone system including an aid for a handicapped user, such as a hearing aid; search subclass 55 for a telephonic device having a near field link (i.e., capacitive or inductive).

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332 And loudspeaker:
This subclass is indented under subclass 87. Subject matter where the specific container holds a transducer for converting an electrical signal into sound, e.g., a transducer baffle or housing.

SEE OR SEARCH THIS CLASS, SUBCLASS:
386, for a mounting or support feature of a housed loudspeaker wherein significant electrical features are not included.

333 With furniture, clothing, or image presentation means:
This subclass is indented under subclass 332. Subject matter in which an enclosure is part of, on, or within a) a couch, chair, headrest, etc., or b) a jacket, belt, etc., or c) a television set, computer monitor screen, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
301, for furniture or clothing in a stereo speaker arrangement.
306, for image presentation means in a stereo speaker arrangement.
388, for furniture, clothing, or image display in a mounting or support feature of a housed loudspeaker.

334 Portable or for use in diverse environment:
This subclass is indented under subclass 332. Subject matter in which an enclosure is a) readily movable from one location to another, or b) adapted for use in an unusual location such as underwater, within a magnetic field, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
311, for a stereo earphone that is wireless or for use in a diverse environment.

335 Plural diaphragms, compartments, or housings:
This subclass is indented under subclass 332. Subject matter in which there is a) more than one movable membrane within an enclosure, or b) an enclosure having more than one distinct volume, or c) more than one enclosure.

336 Curved or angled housing:
This subclass is indented under subclass 332. Subject matter in which an enclosure or some part of it (such as a reflex vent pipe) is non-linear, non-planar or constructed with faces which intersect at non-perpendicular angles.

337 Having acoustic wave modifying structure:
This subclass is indented under subclass 150. Subject matter having a passive element for changing a characteristic of audible sound vibrations produced or detected by an electro-acoustic transducer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
370, for acoustic wave modifying structures in combination with headphones.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 175+ forsound-modifying means in a mechanical acoustic device or system.

338 With tubular waveguide or resonant element:
This subclass is indented under subclass 337. Subject matter for conducting sound through either a) a hollow cylinder or b) one or more hollow, acoustically resonant means, such as a hollow reed.

SEE OR SEARCH THIS CLASS, SUBCLASS:
382, for sound conducting tube in a particular support structure.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 196+ for a mechanical acoustic sound modifying means within tubular means.

339 Sound intensifying or spreading element:
This subclass is indented under subclass 337. Subject matter wherein a) the amplitude of a sound wave is increased, or b) wherein the sound from the transducer is widely dispersed.

340 Horn:
This subclass is indented under subclass 339. Subject matter in which the intensifying element is a tubular element having a crossec-

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tional area which varies along the element's length.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 177+ fora mechanical acoustic, intensifying horn.

341 Inverted, folded, or curled:
This subclass is indented under subclass 340. Subject matter in which a) a crossectional area of the sound conducting element decreases as a distance from a diaphragm increases, or b) the sound path of the element has one or more sharp bends, or c) an entrance of the element is smoothly curved back toward an exit.

SEE OR SEARCH CLASS:
181, Acoustics, subclass 194 for mechanica acoustic, intensifying horn having a doubly folded sound path.

342 Plural horns or diaphragms:
This subclass is indented under subclass 340. Subject matter in which there are either a) two or more tubular elements with varying crossectional areas, b) or a single tubular element with varying crossectional area which is fed from two or more vibrating membranes.

343 Phase plug:
This subclass is indented under subclass 340. Subject matter having an element placed within the throat of the horn to optimize the sound propagation.

(1) Note. A phase plug is usually placed in the throat adjacent the diaphragm.

344 Mouthpiece:
This subclass is indented under subclass 339. Subject matter wherein the modifying element is designed for use close to the mouth of a person speaking into a microphone.

345 Acoustic enclosure:
This subclass is indented under subclass 337. Subject matter including a housing surrounding the electro-acoustic transducer wherein the housing is specifically configured to modify characteristics of sound emitted or received by the transducer.

(1) Note. Electrical circuitry means amplifiers, filters, etc.; terminals, leads, and so forth are not considered to be significant electrical circuity in this context.

SEE OR SEARCH THIS CLASS, SUBCLASS:
332+, for the combination of a loudspeaker in a housing is claimed with significant electrical circuity.
386+, for the combination of a loudspeaker in a housing in which details other than acoustic properties are claimed.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 198+, for housing or enclosure for a mechanical acoustic sound modifying means.

346 Acoustic resistance:
This subclass is indented under subclass 345. Subject matter further including a material such as foam, wool, fiberglass, etc. or other sound absorbing means.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 284+ for sound absorbing panels in sound modifying means.

347 On front side of diaphragm:
This subclass is indented under subclass 346. Subject matter in which an acoustic resistance is placed within a primary sound radiation path of a vibrating membrane of a transducer.

348 On rear side of diaphragm:
This subclass is indented under subclass 346. Subject matter in which an acoustic resistance is placed within a non-primary sound radiation path of a vibrating membrane of a transducer.

349 Bass reflex (e.g., rear wave):
This subclass is indented under subclass 345. Subject matter in which a non-primary sound radiation path from the transducer's diaphragm is vented to ambient through the housing or cavity.

(1) Note. The length of the rear wave sound propagation path of a bass reflex enclosure is generally designed so that the rear wave is in phase with the front wave

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when the two meet in the ambient atmosphere.

350 Front wave:
This subclass is indented under subclass 345. Subject matter in which a primary sound radiation path from a transducer's diaphragm is vented to ambient through the housing or cavity.

351 Plural chambers:
This subclass is indented under subclass 345. Subject matter wherein there is more than one physically distinct compartment space within the housing.

352 Having internal wave reflecting means:
This subclass is indented under subclass 345. Subject matter wherein the cavity or housing contains means to redirect a direction of travel of a sound wave.

353 Acoustic damping or attenuating resonator:
This subclass is indented under subclass 345. Subject matter in which a) the acoustic properties of a cavity are used to compensate for mechanical shock, i.e., to effectively cancel transmission of the shock to the transducer's output, or b) the resonant property of a cavity is used to absorb or attenuate sound at a particular frequency or over a band of frequencies.

(1) Note. A 'quarter wave' Helmholtz resonator is a typical example of the subject matter included under definition (b) above.

354 Absorbing or attenuating element:
This subclass is indented under subclass 337. Subject matter wherein undesired sound intensity or vibration is lessened.

SEE OR SEARCH THIS CLASS, SUBCLASS:
355, for housed microphone.
372, for mechanical or acoustic sound attenuation in combination with headphones.
375, for a microphone in a particular support structure, wherein there is no claimed electrical feature of the transducer, but there is an electrical feature of the support.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 284+ forsound-absorbing means in a mechanical acoustic device or system.

355 Housed microphone:
This subclass is indented under subclass 150. Subject matter having either a capsule supported within an enclosure, or a diaphragm and motor means supported relative to one another in order to convert sound waves into a varying electrical voltage, further including structure beyond that necessary to merely support the diaphragm and motor means relative to one another.

(1) Note. A microphone capsule is generally housed within a larger, unitary structure to provide protection, electrical connections, adequate size to be handled, acoustic properties, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
91, for a microphone in a mounting wherein there is no claimed electrical feature.
111+, for circuitry combined with a specific type of microphone.
122, for a microphone combined with an element having a diverse function, e.g., an amplifier.
369, for a microphone capsule, per se.
375, for a microphone in a particular support structure, wherein there is no claimed electrical feature of the transducer, but there is an electrical feature of the support.

356 Directional:
This subclass is indented under subclass 355. Subject matter acoustically or mechanically configured to have a different response to sounds emanating from different locations in an environment.

SEE OR SEARCH THIS CLASS, SUBCLASS:
92, for a circuit for imparting directional pickup characteristics to a microphone.
313, for directional hearing aids.

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357 With plural sound ports (e.g., pressure gradient):
This subclass is indented under subclass 356. Subject matter having two or more openings within the housing for the purpose of providing multiple sound paths leading to a transducer.

358 Plural or variable characteristics:
This subclass is indented under subclass 357. Subject matter having a) two or more switchable discrete directional response patterns, or b) a single response pattern which is continuously variable.

359 Windscreen:
This subclass is indented under subclass 355. Subject matter including structure to ameliorate the effects of rapidly moving air or breath on a microphone.

360 Cavity:
This subclass is indented under subclass 355. Subject matter including a resonant acoustic space or similar structure designed to affect the acoustic characteristics of a microphone.

SEE OR SEARCH THIS CLASS, SUBCLASS:
345, for acoustic enclosure in acoustic wave modifying structure.

361 Mounting or support:
This subclass is indented under subclass 355. Subject matter having a) details of how a microphone capsule is supported within a housing, or b) a structure designed to hold a housed microphone for or during use.

SEE OR SEARCH THIS CLASS, SUBCLASS:
91, for microphone in support or housing.

362 Boom (other than on headset):
This subclass is indented under subclass 361. Subject matter including a generally horizontally projecting beam, pole, rod, or spar which supports a microphone.

SEE OR SEARCH THIS CLASS, SUBCLASS:
363, for a stand or goose neck in a mounting or support.
367, for a headgear in mounting or support.
375, for a microphone in particular support structure.
390, for a boom or support arm in a mounting or support feature of a housed loudspeaker.

363 Stand or gooseneck:
This subclass is indented under subclass 361. Subject matter in which the microphone is supported a) at the end of a beam, pole, rod, or spar which has a generally upright position, or b) on one end of a flexible, tube-like structure which will generally retain a certain shape or position when adjusted.

SEE OR SEARCH THIS CLASS, SUBCLASS:
362, for a boom (other than on headset)in mounting or support of housed microphone.

364 On body or clothing:
This subclass is indented under subclass 361. Subject matter in which the mounting or support secures the microphone to a human being's person or garments.

SEE OR SEARCH THIS CLASS, SUBCLASS:
367, for a microphone in headgear.

365 In electronic apparatus or vehicle:
This subclass is indented under subclass 361. Subject matter in which the mounting or support means secures the microphone a) to a walkie-talkie, video camera, transceiver, etc., or b) to or in an automobile, aircraft, motorcycle, etc.

366 Detachable from support:
This subclass is indented under subclass 361. Subject matter in which the microphone is designed to be readily removed from its support.

367 In headgear:
This subclass is indented under subclass 361. Subject matter wherein the microphone is mounted or supported in or on a helmet or breathing mask or similar structure.

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SEE OR SEARCH THIS CLASS, SUBCLASS:
364, for microphone attached to a person`s body or clothing.

368 On shock absorbing support:
This subclass is indented under subclass 361. Subject matter in which the mounting means is particularly adapted to lessen the effects of mechanically coupled vibration to the microphone.

SEE OR SEARCH THIS CLASS, SUBCLASS:
353, for an acoustic damping or attenuating resonator in an acoustic enclosure.

369 Microphone capsule only:
This subclass is indented under subclass 150. Subject matter for converting a sound wave into a corresponding time variation of an electrical signal, in which the claimed subject matter consists essentially of a diaphragm and motor means to convert sound-induced movement of the diaphragm into an electrical signal, and any minimal chassis or housing components necessary to hold the diaphragm and motor means together or in proper relative position.

(1) Note. This basic combination is sometimes referred to as a 'capsule',or a 'cartridge', or a 'button'. This is essentially the 'smallest' combination of elements which can be said to comprise a transducer.

370 Headphone:
This subclass is indented under subclass 182. Subject matter including a head-engaging element which holds a transducer for reproducing sound signal, against an ear of a user.

SEE OR SEARCH THIS CLASS, SUBCLASS:
74, for headphone circuits.

371 Particular cup:
This subclass is indented under subclass 370. Subject matter having particular structural features relating to enclosures designed to fit over or on a user's ear.

372 Having mechanical or acoustic sound attenuation:
This subclass is indented under subclass 371. Subject matter in which the particular feature of a cup is designed to reduce noise.

SEE OR SEARCH THIS CLASS, SUBCLASS:
354, for an absorbing or attenuating element in acoustic wave modifying structure.

373 Openable to ambient:
This subclass is indented under subclass 371. Subject matter in which the space within the cup is ventable to the atmosphere.

374 Particular support structure:
This subclass is indented under subclass 370. Subject matter having a specific means for maintaining a trans-ducer on the user's head.

375 And microphone:
This subclass is indented under subclass 374. Subject matter in combination with a means for converting sound waves into a varying electrical current or voltage.

(1) Note. A typical example is a microphone supported from the headphone by a boom, often found on telephone operator's headsets.

SEE OR SEARCH THIS CLASS, SUBCLASS:
355, for a housed microphone.
362, for a microphone on a boom.
369, for a microphone capsule.

376 Headgear:
This subclass is indented under subclass 374. Subject matter in which the support structure is a helmet, hat, breathing mask, or similar structure.

377 Plural bands:
This subclass is indented under subclass 374. Subject matter having two or more belts or straps.

378 Single band:
This subclass is indented under subclass 374. Subject matter including one belt or strap.

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379 Adjustable:
This subclass is indented under subclass 374. Subject matter in which some characteristic of a support structure may be altered in length or size to ensure a proper fit of a transducer to the user's head.

SEE OR SEARCH THIS CLASS, SUBCLASS:
383, for a collapsible feature in particular support structure.

380 Ear insert or bone conduction:
This subclass is indented under subclass 374. Subject matter which a) fits entirely within a user's ear or is completely supported within the outer auditory meatus of a user's ear, or b) is designed to transmit sound to a user's inner ear by vibration of a user's skeletal structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:
326, for a hearing aid that uses a non-air-conducted sound delivery to inner ear in a specified casing or housing.
328, for a hearing aid comprising an ear insert in a specified casing or housing.

381 Hook over ear or spectacle:
This subclass is indented under subclass 374. Subject matter including support structure which a) engage's the exterior of the user's ear, e.g., the pinna, or b) in which the support structure is an eyeglass frame.

SEE OR SEARCH THIS CLASS, SUBCLASS:
327, for a hearing aid mounted in a spectacle.
330, for hook over ear type hearing aid in a specified casing or housing.

382 Sound conducting tube:
This subclass is indented under subclass 374. Subject matter in which the support structure comprises a hollow cylindrical element acoustically connecting two earcups.

SEE OR SEARCH THIS CLASS, SUBCLASS:
338, for a tubular waveguide or resonant element in acoustic wave modifying structure.

383 Collapsible:
This subclass is indented under subclass 374. Subject matter in which the support structure can be reduced in size for ease of carrying through folding or bending.

SEE OR SEARCH THIS CLASS, SUBCLASS:
379, for adjustable feature in particular support structure.

384 Electrical hardware feature:
This subclass is indented under subclass 370. Subject matter with particular connections or connectors, such as jack, plug, terminals, cord details, etc.

(1) Note. Headphones in combination with electrical circuitry such as amplifiers, filters, and so on are generally classified elsewhere.

SEE OR SEARCH THIS CLASS, SUBCLASS:
74, for headphone circuits.
309+, for stero earphones with circuitry.
394, for electrical hardware in mounting or support feature of housed loudspeaker.

385 Having body supported structure other than on head:
This subclass is indented under subclass 150. Subject matter having a means to support a transducer on the neck, shoulders, chest, abdomen, arms, hands, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:
376, for a headgear for supporting a headphone.

386 Mounting or support feature of housed loudspeaker:
This subclass is indented under subclass 150. Subject matter having a) a transducer for converting a time varying electrical signal into sound combined with an enclosure, casing, shell, or baffle, or b) details of the fastening of such a transducer to or within an enclosure, casing, shell, or baffle, or c) means to hold an enclosed transducer for or during use.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

87, for a device of this class having electrical features in addition to mounting features.

332+, for loudspeaker in an enclosure or housing wherein electrical features are also claimed.

387 Directional, directible, or movable:

This subclass is indented under subclass 386. Subject matter in which a) the housing and transducer together radiate sound with different strengths toward different locations in an environment, or b) the enclosure or a portion thereof is aimable or steerable toward different locations in an environment, or c) means are provided to enable a housed transducer to be readily relocated to different positions in an environment.

388 With furniture, clothing, or image display:

This subclass is indented under subclass 386. Subject matter wherein the particular support or mounting feature of the transducer involves furniture such things as a headrest, couch, chair, jacket, hat, belt, harness, etc., or a television, computer monitor, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

301, for stereo speakers mounted in furniture or clothing.

306, for stereo speakers arranged to emit sound in conjunction with an image presentation means.

333, for a loudspeaker mounted in furniture, clothing, or image presentation means, wherein no electrical feature is claimed.

389 In vehicle:

This subclass is indented under subclass 386. Subject matter wherein the support or mounting is in an automobile, aircraft, motorcycle, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

365, for mounting or support means securing a microphone in a vehicle or electronic apparatus.

390 Boom or support arm:

This subclass is indented under subclass 386. Subject matter including a) a generally horizontally projecting beam, pole, rod, or spar which maintains the position of a housed transducer for or during use, or b) a hand-held support comprising a beam, pole, rod, or spar.

SEE OR SEARCH THIS CLASS, SUBCLASS:

362, for boom used in mounting or support of a housed microphone.

391 Grille:

This subclass is indented under subclass 386. Subject matter including a mesh or grating covering the transducer or a sound path leading to the transducer.

392 Resilient:

This subclass is indented under subclass 386. Subject matter including a vibration or shock damping means, cushioning means, springs, etc.

SEE OR SEARCH THIS CLASS, SUBCLASS:

346+, for acoustic damping of a transducer in an acoustic enclosure, as in an acoustic resistance (foam, wool, fiberglass, etc.) in an acoustic path.

353, for acoustic damping or attenuating in an acoustic enclosure.

354, for acoustic damping in combination with a transducer.

393 Electrical insulation feature:

This subclass is indented under subclass 386. Subject matter in which the housing or components within it do not conduct electricity.

SEE OR SEARCH CLASS:

174, Electricity: Conductors and Insulators, for insulators, generally.

394 Electrical hardware:

This subclass is indented under subclass 386. Subject matter including circuit boards, terminals, terminal blocks, signal conductors (i.e., wires, leads, or cords), etc.

(1) Note. Subject matter involving circuitry which filters, amplifies, etc., in combina-

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tion with a loudspeaker in a housing is classified in this class, subclasses 332+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

332+, for subject matter involving circuitry which filters, amplifies, etc., in combination with loudspeaker in a housing.

384, for a headphone including an electrical hardware feature.

395 Mechanical detail:

This subclass is indented under subclass 386. Subject matter involving the details of how the support or mounting is achieved, such as using clips, screws, tabs, detents, bonding, etc.

SEE OR SEARCH CLASS:

411, Expanded, Threaded, Driven, Headed, Tool-Deformed, or Locked-Threaded Fastener, for mechanical mounting details, generally.

396 Electromagnetic (e.g., dynamic):

This subclass is indented under subclass 150. Subject matter wherein an information varied electrical signal produces a similarly varying magnetic field which causes motion in a sound radiating device to produce a corresponding acoustical wave.

SEE OR SEARCH THIS CLASS, SUBCLASS:

117, for circuitry combined with a magnetic loudspeaker.

SEE OR SEARCH CLASS:

335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, for electromagnetic circuits and devices, generally.

336, Inductor Devices, for inductor devices, generally.

397 Cooling feature:

This subclass is indented under subclass 396. Subject matter including a feature designed to remove heat from the transducer.

SEE OR SEARCH CLASS:

165, Heat Exchange, for heat exchange, generally.

361, Electricity: Electrical Systems and Devices, subclasses 688+ for cooling means in electronic systems and devices.

398 Having diaphragm support feature:

This subclass is indented under subclass 396. Subject matter having specific structure to maintain a sound radiating flexible membrane in a specified position relative to other parts of the transducer.

399 Conductive diaphragm (e.g., ribbon):

This subclass is indented under subclass 396. Subject matter in which at least a portion of a sound radiating membrane *itself* conducts the information varied electrical signal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

176, for a microphone with a conductive diaphragm.

400, for a coil or other conductor path mounted directly on the diaphragm.

400 Movable voice coil:

This subclass is indented under subclass 396. Subject matter having a spiral shaped conductor attached to a flexible membrane and positioned in an air gap in a magnetic circuit, so as to drive the membrane in accordance with an applied current.

401 Multiple voice coils:

This subclass is indented under subclass 400. Subject matter in which there is more than one spirally wound conductor.

402 For different frequencies:

This subclass is indented under subclass 401. Subject matter in which at least two separate voice coils receive signal currents having distinct spectral content.

403 Centering from outside bobbin or diaphragm:

This subclass is indented under subclass 400. Subject matter for the adjustment of voice coil position in an air gap so that the coil and gap axes coincide, in which the means for accomplishing this lies outside a cylindrical means holding the voice coil, or outside the volume contained by a moving membrane.

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404 Spider:
This subclass is indented under subclass 403. Subject matter including a concentrically-waved membrane or sheet which readily flexes in the direction of motion of the diaphragm, but resists motion perpendicular to the diaphragm's motion, and which typically surrounds the diaphragm or bobbin in an annular manner.

405 Centering from within bobbin or diaphragm:
This subclass is indented under subclass 400. Subject matter for adjustment of voice coil position in the air gap so that the coil and gap axes coincide in which the means for accomplishing this lies within the volume enclosed by a vibrating membrane, or within the volume enclosed by a cylindrical form on which the voice coil is wound.

(1) Note. An example is a flexible disk attached to the inner side of the diaphragm with a number of flexible arms or leaves, with the center of the disk attached by screw to a center pole or stud.

406 Field coil:
This subclass is indented under subclass 400. Subject matter including a spirally wound conductor which receives a current designed to generate a static field against which the signal-related electromagnetic field of the voice coil will react to generate motion.

(1) Note. A field coil generally substitutes for or augments a permanent magnet.

407 Particular bobbin structure:
This subclass is indented under subclass 400. Subject matter specifying particular details about a cylindrical form or member on which the voice coil is wound.

SEE OR SEARCH CLASS:
242, Winding, Tensioning, or Guiding, subclasses 118+ for a winding bobbin or spool, generally.

408 Pattern:
This subclass is indented under subclass 400. Subject matter where the voice coil comprises a particular configuration of conductive material applied directly to the diaphragm.

(1) Note. The diaphragm is usually flat.

SEE OR SEARCH THIS CLASS, SUBCLASS:
410, for coil structure in a cylindrically wound coil (e.g. on a bobbin).

409 Wiring structure:
This subclass is indented under subclass 400. Subject matter specifying detail of the manner in which the signal conductors (i.e., voice coil) are mechanically or electrically attached, fastened, connected, etc.

410 Coil coating, winding layer structure, or wire:
This subclass is indented under subclass 400. Subject matter specifying details of a cylindrically wound voice coil (e.g., on bobbin), such as 1) insulation or wire covering, 2) manner in which wire is wound on bobbin, or 3) details of the conductor per se, such as crossection (e.g., square, etc.) or wire material (copper, silver,etc.).

SEE OR SEARCH CLASS:
174, Electricity: Conductors and Insulators, for conductors.
336, Inductor Devices, subclasses 222+ for winding an inductor device.

411 Including adjustment mechanism:
This subclass is indented under subclass 396. Subject matter including means to alter some aspect or physical parameter of the electromagnetic transducer, such as the air gap size.

412 Magnetic circuit:
This subclass is indented under subclass 396. Subject matter including a path of magnetic flux from north pole to south pole of a magnet (or electromagnet) through a magnetic material.

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413 Having damping:
This subclass is indented under subclass 412. Subject matter including a sound or vibration absorbing means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
353, for acoustic damping or attenuating resonator in acoustic enclosure.
354, for absorbing or attenuating element in acoustic enclosure.
372, for mechanical or acoustic sound attenuation in headphone.

414 Flux modifying means:
This subclass is indented under subclass 412. Subject matter which shapes or alters the magnetic flux in the air gap in order to enhance its effectiveness in reacting with a voice coil or diaphragm.

415 Magnetic liquid:
This subclass is indented under subclass 412. Subject matter having a colloid containing magnetic particles in a region unoccupied by solid members of the magnetic circuit, such as the air gap.

416 Inverted (e.g., within cone):
This subclass is indented under subclass 412. Subject matter in which the elements of the magnetic circuit (e.g., magnets and pole pieces) lie substant-ially entirely within the volume enclosed by an axially extending, e.g., conical diaphragm.

(1) Note. The diaphragm is usually conical, and thus the magnetic circuit lies within the cone, and the voice coil bobbin also projects toward the cone rather than away from the cone.

417 Armature diaphragm:
This subclass is indented under subclass 412. Subject matter in which the voice coil is stationary and a moving membrane itself is made of magnetic material and vibrates within the fluctuating electromagnetic field of the voice coil.

SEE OR SEARCH THIS CLASS, SUBCLASS:
419, for an electromagnetic transducer not having a central magnetic portion in the magnetic circuit.

418 Armature linked to diaphragm:
This subclass is indented under subclass 412. Subject matter in which a magnetic member separate from a moving membrane vibrates within a stationary voice coil's electromagnetic field and its motion is mechanically linked to the moving membrane.

419 Not having central magnetic portion:
This subclass is indented under subclass 412. Subject matter in which the magnetic circuit lacks an innermost magnet or pole piece.

(1) Note. This configuration usually lacks a central annular air gap, and it is often associated with an armature diaphragm. Typical shapes include annular, horseshoe, or U-shaped.

SEE OR SEARCH THIS CLASS, SUBCLASS:
417, for an armature diaphragm in a magnetic circuit.

420 Having central magnetic portion:
This subclass is indented under subclass 412. Subject matter in which there is an innermost magnet or pole piece around which other parts of the magnetic circuit are symmetrically located.

(1) Note. This configuration is most often associated with the standard conically-shaped diaphragm with cylindrical bobbin and centrally located annular air gap.

421 Plural magnets:
This subclass is indented under subclass 420. Subject matter having more than one permanent magnet or one permanent magnet and an electromagnet generated by a field coil.

422 Like poles adjacent:
This subclass is indented under subclass 421. Subject matter in which respective regions of either north magnetic polarity or south magnetic polarity of two magnets are juxtaposed.

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423 Specified diaphragm shape or structure:
This subclass is indented under subclass 396. Subject matter including a flexible membrane with a particular geometrical contour or made of a specified material.

SEE OR SEARCH CLASS:
181, Acoustics, subclasses 167+ or 173+ for critically defined acoustic diaphragm structure or shape, generally.

424 Plural portions or sections:
This subclass is indented under subclass 423. Subject matter specifying that a diaphragm has more than one distinct area with respect to construction or function.

425 Honeycomb:
This subclass is indented under subclass 424. Subject matter in which the diaphragm is composed of two or more sheets or layers of material connected with a corrugated, web-like structure.

426 Critically defined material or lamination:
This subclass is indented under subclass 423. Subject matter specifying the use of a particular substance or a layered structure.

427 Metal
This subclass is indented under subclass 426. Subject matter in which the particular material is a metallic substance.

SEE OR SEARCH CLASS:
181, Acoustics, subclass 168 for metallic material in diaphragm in acoustic devices generally.

428 Fibrous
This subclass is indented under subclass 426. Subject matter in which the particular material is comprised of slender, elongated structures, such as threads, filaments, etc.

(1) Note. Paper and cardboard are materials made from cellulose fibers.

SEE OR SEARCH CLASS:
181, Acoustics, subclass 169 for fibrous material in diaphragm in acoustic devices.

429 Apertures in surface
This subclass is indented under subclass 423. Subject matter in which a diaphragm is perforated or has holes or openings therein.

430 Dome or round
This subclass is indented under subclass 423. Subject matter in which a diaphragm has the shape of a hemisphere or a sphere, or a similarly curved surface.

431 Flat:
This subclass is indented under subclass 423. Subject matter in which a diaphragm has a substantially planar surface.

432 Conical:
This subclass is indented under subclass 423. Subject matter where a diaphragm has a configuration of at least a portion of a regular solid joining the circumference of a circle in a plane with a point along its axis of symmetry outside the plane.

(1) Note. This encompasses conical and frusto-conical shapes.

433 Basket detail:
This subclass is indented under subclass 396. Subject matter specifying a frame-like structure which supports both a diaphragm and a magnetic circuit means.

FOREIGN ART COLLECTIONS

The definitions for FOR 100-FOR 122 below correspond to the definitions of the abolished subclasses under Class 381 from which these collections were formed. The definitions for FOR 123-FOR 124 below correspond to the definitions of the abolished subclasses under Class 381 from which these collections were formed. The definitions for FOR 125-FOR 139 below correspond to the definitions of the abolished subclasses under Class 381 from which these collections were formed. See the Foreign Art Collection schedule for specific correspondences. [Note: The titles and definitions for *indented* art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 AUDIO BANDWIDTH COMPRESSION OR EXPANSION:
Foreign art collection where there is either an expansion or reduction of the bandwidth

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required for transmission of a sound signal using analog techniques or elements.

FOR 101 With content reduction encoding:
Foreign art collection where redundant information is discarded and replaced by a code indicating what has been discarded.

FOR 102 Delay line:
Foreign art collection having means to cause a time delay of a sound signal.

FOR 103 TIME COMPRESSION OR EXPANSION (E.G., RUN LENGTH CODING):
Foreign art collection where there is either an expansion or reduction of the time required for transmission of a sound signal using analog techniques or elements.

FOR 104 With content reduction encoding:
Foreign art collection where redundant information is discarded and replaced by a code indicating what has been discarded.

FOR 105 SPEECH ANALYSIS AND SYNTHESIS COMBINED:
Foreign art collection where signals representing the component parts of an input speech wave are generated and then the signals representing the component parts are used to produce a synthetic speech wave using analog techniques or elements.

FOR 106 Using frequency:
Foreign art collection where the signals represent the value of a function of a component frequency.

FOR 107 Pitch:
Foreign art collection where the signal represents the amplitude or frequency of the apparent predominant frequency of the speech wave.

FOR 108 Formants:
Foreign art collection where the signals represent the amplitude or frequency values of any of several resonance bands which determine the phonetic quality of a vowel sound.

FOR 109 Using time:
Foreign art collection where the signals represent the value of a function of time.

FOR 110 SPEECH ANALYSIS (E.G., PHONEME RECOGNITION):
Foreign art collection where an input speech signal is separated into its component parts using analog techniques or elements.

FOR 111 Voice recognition:
Foreign art collection which discriminates between different voices.

FOR 112 Word recognition:
Foreign art collection which discriminates between different sounds or words.

FOR 113 Phonetic typewriters:
Foreign art collection where the output is typescript.

FOR 114 Frequency domain:
Foreign art collection where the component parts are functions of frequency.

FOR 115 Detection of speech in noise:
Foreign art collection where an output is generated in response to the presence of a voice or speech signal input which may be obscured by noise.

FOR 116 Signal to noise ratio enhancement:
Foreign art collection where there is noise present along with the speech signal and the amplitude of the speech wave is increased relative to the amplitude of the noise.

FOR 117 Speech parameter display:
Foreign art collection where there is an output signal perceptible by the eye which represents one of the component parts of the input speech signal.

FOR 118 Speech pitch fundamental frequency:
Foreign art collection where the component part is the apparent predominant frequency of the input speech wave.

FOR 119 Speech formant frequencies:
Foreign art collection where the components parts are any of several resonance bands which determine the phonetic quality of a vowel sound.

FOR 120 SPEECH SYNTHESIS:

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Foreign art collection where the component parts of a speech signal are combined to produce a synthetic speech wave using analog techniques or elements.

FOR 121 Speech from printed matter:
Foreign art collection where the synthetic speech wave is generated according to a written or printed text.

FOR 122 Vocal tract model:
Foreign art collection having an analog of a human vocal tract.

FOR 123 ACOUSTICAL NOISE OR SOUND CANCELLATION
Foreign art collections including subject matter where audible noise is at least partially eliminated by generating an out-of-phase replica of the offending sound.

FOR 124 NOISE SUPPRESSION
Foreign art collections including subject matter with provision for reducing the effects of unwanted signals upon desired signals.

FOR 125 Speaker arrangement:
Subject matter including transducers for reproducing the sound signals, and the spatial relationship of the transducers to their surroundings.

FOR 126 Earphone:
Subject matter where the transducers are intended to be placed in or over the ear.

FOR 127 HEARING AIDS, ELECTRICAL:
Subject matter under the class definition having a small ambient sound reproducing system wherein the output transducer transmits directly into the ear or skull for use by the hard of hearing to increase the sound level received by the ear (i.e., listening assistance).

FOR 128 Directional:
Subject matter where the response of an input transducer (i.e., microphone to the ambient sound varies significantly with the direction of incidence of the sound.

FOR 129 Frequency control:
Subject matter including a circuit to control the amplitude of the hearing aid as a function of the frequency.

FOR 130 Bone conduction:
Subject matter in which sound is conducted to the inner ear through the cranial bones.

FOR 131 Gain control:
Subject matter for varying the amount of amplification of the output signal.

FOR 132 Spectacle:
Subject matter in combination with an eyeglass frame.

FOR 133 Ear insert:
Subject matter which fits entirely within and is completely supported by the user's ear.

FOR 134 Hook over ear:
Subject matter including support structure which engages the exterior of the user's ear.

FOR 135 Specified casing or housing:
Subject matter including a specific container for the hearing aid components.

FOR 136 Having vacuum tube amplifier:
Subject matter including an amplifier which uses one or more electron tubes.

FOR 137 Having battery:
Subject matter including at least one battery used as a power source.

FOR 138 Having enclosure or housing:
Subject matter where the mechanical adjunct or device is a specific container for electrical components.

FOR 139 With loudspeaker (e.g., baffle, spatial orientation, etc.):
Subject matter where the specific container holds a loudspeaker.

FOR 140 With acoustic wave modifying structure:
Subject matter having a passive element for changing a characteristic of audible sound vibrations produced or detected by an electro acoustic transducer.

FOR 141 Including sound conducting tube:

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Subject matter including a tubular element through which sound is conducted.

FOR 142 Directional:
Subject matter wherein a characteristic of emitted or received sound is varied externally of the transducer in accordance with the direction of the sound path.

FOR 143 Sound intensifying of spreading element (e.g., horn):
Subject matter wherein the intensity of a sound wave is modified.

(1) Note. The intensity is generally modified by an increase or decrease of cross-section are of the sound path.

FOR 144 Mouthpiece:
Subject matter wherein the modifying element is designed for use close to the mouth of a person speaking into a microphone.

FOR 145 Absorbing or attenuating element (e.g., baffle, obstruction, damping):
Subject matter wherein the sound intensity is lessened.

FOR 146 Enclosure of resonant cavity:
Subject matter wherein the acoustic structure includes either (a) a chamber having a particular resonant characteristic, or (b) a housing surrounding the electro acoustic transducer.

(1) Note. Any housing or enclosure will modify acoustic energy incident upon or radiated from a transducer and this type of combination will be classified herein unless the enclosure is specifically recited as transparent to or not affecting, acoustic waves.

FOR 147 Microphone:
Subject matter for converting an audible sound wave into a corresponding time variation of an electrical signal.

(1) Note. This and its indented subclasses specify sound to audio signal conversion. Generic audio transducers and signal to sound conversion (i.e., reproduction) are classified in subclasses 183 and the following subclasses.

FOR 148 With mounting or support feature:
Subject matter wherein a microphone is combined with positioning, placement, *or* holding structure.

FOR 149 Headphone:
Subject matter including a head engaging element which holds the transducer against the ears of a user.

FOR 150 Having body supported structure (e.g., earphone):
Subject matter including an element engaging either the body or clothing *of* the user and which supports and positions the transducer.

FOR 151 With mounting or support feature:
Subject matter combined with a positioning, placement, or holding structure.

FOR 152 Electromagntic (e.g. Dynamic):
Subject matter wherein an information varied electrical signal produces a similarly varying magnetic field which causes motions a sound radiating device to produce a corresponding acoustical wave.

FOR 153 Having feature of edge-supported diaphragm:
Subject matter having structure for supporting a sound radiating flexible membrane along its periphery.

FOR 154 Movable voice coil:
Subject matter having a spiral shaped conductor attached to *a.* flexible membrane and positioned in an air gap in a magnetic circuit, so as to drive the membrane in accordance with an applied current.

FOR 155 Multiple (e,g., double):
Subject matter having more than one voice coil.

FOR 156 Pattern:
Subject matter where the voice coil comprise a particular configuration of conductive material applied directly to the diaphragm.

FOR 157 Centering:

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Subject matter adjustment of voice coil position in the air gap so that the coil and air gap axes coincide.

FOR 158 Including adjustment mechanism:
Subject matter which varies a physical parameter of an electromagnetic transducer.

FOR 159 Magnetic circuit or core structure:
Subject matter including either a path of magnetic flux from north pole to south pole of a magnet or electromagnet through a magnetic material, or a detail of a magnetizable core element.

FOR 160 Armature:
Subject matter wherein the magnetic circuit includes a movable element.

FOR 161 Magnet configuration (e.g., tubular or u-shaped):
Subject matter including a magnet having a particular shape.

FOR 162 Specified diaphragm-shape or structure:
Subject matter including a flexible membrane with a specified shape or made of a specified material.

FOR 163 Flat:
Subject matter where the diaphragm has a substantially planar car surface.

FOR 164 Conical:
Subject matter where the diaphragm has a configuration of at least a portion of a regular solid joining the circumference of a circle in a plane with a point along *its* axis of symmetry outside the plane.

(1) Note. The term at least a portion- is intended to encompass both conical and frustra-conical configurations.

FOR 165 Electro-acoustical transducer mounting or support:
Subject matter including structure for positioning, placement, or holding a transducer.

END

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CLASS 351, OPTICS: EYE EXAMINING, VISION TESTING AND CORRECTING

SECTION I - CLASS DEFINITION

This class corresponds generally in subject matter to optometry, and includes eye examining and vision testing instruments. These instruments must include some optical structure or they must operate in conjunction with the optical or vision path of the eye. Included also are these instruments combined with eye exercising and/or training devices. Included also are certain accessories such as test charts and/or targets which may involve projection, illuminators and supports which are peculiar to these instruments. Included also are methods of operating or using these instruments and not generally classifiable.

Included also are spectacles and eyeglasses, which may include the frames or mountings, per se, or the frames or mountings with fitted opthalmic lenses. Included also are spectacles and eyeglasses combined with other structural elements when not otherwise classifiable, such as spectacles combined with holders for microphotographs, telescopes or face protecting masks.

Included also are perfecting features with these spectacles and eyeglasses such as antiglare or light absorption, rear view reflectors, decorations moisture prevention or absorption, and supports or holders. Included also are parts of spectacles and eyeglasses when not otherwise classifiable, such as temples, bridges, connectors, lens linings or rims, and nose pads or cushions.

Included also are opthalmic lenses or blanks, including the eye-contact type. Included also are perfecting features in these lenses such as with light filtering or with protecting layers. Included also are methods of making the spectacles and eyeglasses and the opthalmic lenses. Included also are lens repair devices.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

A. EYE EXAMINING AND TESTING INSTRUMENTS CLASSIFIED ELSEWHERE

Eye testing instruments and such instruments combined with eye training devices are classified here as a residual home. Eye treatment appliances and methods intended to aid in the diagnosis of diseased eyes or during surgical operations of the eye are elsewhere. (See References to Other Classes, below.

B. SPECTACLE AND EYE GLASS MOUNTINGS COMBINED WITH OTHER STRUCTURE

This class provides for opthalmic lenses combined with the mountings or frames; and also provides residually for such mountings or frames, per se, even when the sole indicated use is to mount nonopthalmic lenses or other structure which may be nonoptical. Examples of such nonopthalmic lenses are in telescopes, microscopes, and general magnifiers; and examples of this other structure are eye shades and goggle components (such as cups, masks, or shields), artificial body members, and electrical hearing aids. However, when these nonopthalmic lenses or other structures are claimed either broadly or specifically with the mounting, classification is not here, but in the class providing for the particular lens or other structure. See References to Other Classes, below.

As between this class, Class 2, and Class 623 the claiming of opthalmic structure in such example terms as "opthalmic lens", "correcting lens" and "astigmatic lens" is sufficient for classification in this Class 351 regardless of any eye shielding or artificial body structure included. However, as between this Class 351, Class 381, and Class 359 the inclusion of opthalmic structure together with other structure, per se, classifiable in Class 381 and Class 359 is not sufficient to classify in this Class 351.

The term "lens" due to its wide use is not sufficient to control classification. The combination of the lens broadly claimed together with the spectacle- type frame is classifiable in this Class 351 regardless of the indicated use of the lens.

C. GOGGLES

Goggles, which may include frames similar to the opthalmic lens mountings as classified with spectacles, but which in addition, have some structure whose purpose is protection of the wearer from mechanical injury such as cups, masks, shields, or hoods are classified elsewhere (see References to Other Classes). When this goggle structure includes lenses or transparent elements with some optical limitation such as vision correcting or light intensity modifying opthalmic elements, curved, spherical or meniscus lenses, light filters or polarizing lenses, classification is with the spectacles in this Class 351. However the broad recitation of a lens or transparent element is not sufficient to include otherwise goggle structure in this Class 351.

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Goggles with no optical limitations but formed as spectacle lens mountings, but omitting any body protection structure, are classified in this Class 351. Where both the optical and body protecting structure are claimed classification is with the spectacles in this Class 351.

D. LENSES

Single lenses or lens combinations are classified elsewhere, and are primarily used in the category of optical instruments such as cameras, binoculars, magnifiers, telescopes, microscopes and oculars, principally for the purpose of forming or projecting a real or virtual image or images. (See References to Other Classes, below.)

In contrast to the above lenses used in instruments the opthalmic lenses including contact lenses classified in this Class 351 act as vision correcting organs and are specially adapted for use in spectacles or eyeglasses for the purpose of producing a clear image in conjunction with the eye lens on the sensitive screen in the eye known as the retina. For example, if the eye is myopic (near-sightedness) a negative lens is necessary to produce a proper image on the retina, and if the eye is hyperopic (far-sightedness) a positive lens is added to bring the light rays into correct focus on the retina. If the eye is astigmatic a cylindrical lens is added. These opthalmic lenses are essentially useful with the eye lens for aiding and correcting any visual defects of the eye lens.

SECTION III - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

2, Apparel, appropriate subclasses for goggles including eye shields, bridges, rims and fasteners as component parts thereof. See Lines With Other Classes and Within This Class, C, "Goggles", above, for the line between spectacles and goggles.

2, Apparel, subclass 13 for spectacle attached eye shades and subclasses 10, 11, 12, and 15 provide for other eye shields. (Lines With Other Classes and Within This Class, B, "Spectacle and Eye Glass Mountings Combined with Other Structure").

2, Apparel, subclasses 426+ provides for goggles, which may include frames similar to the opthalmic lens mountings as classified with spectacles, but which in addition, have some structure whose purpose is protection of the wearer from mechanical injury such as cups, masks, shields, or hoods. (Lines With Other Classes and Within This Class, C, "Goggles").

16, Miscellaneous Hardware (e.g., Bushing, Carpet Fastener, Caster, Door Closer, Panel Hanger, Attachable or Adjunct Handle, Hinge, Window Sash Balance, etc.), subclass 228 for an eyeglass hinge, per se.

24, Buckles, Buttons, Clasps, etc., subclass 265 for connectors and attaching devices useable between component parts of spectacle frames.

29, Metal Working, subclass 20 for machines and processes for making spectacle-frames, temples, bridge pieces etc.

33, Geometrical Instruments, subclass 200 for spectacle gauges such as used for measuring pupillary distances.

65, Glass Manufacturing, subclasses 36 through 39 for fusion bonding of lenses and reshaping of lens parts during bonding.

70, Locks, subclasses 229 and 230 for bolt or screw locking means as for preventing the loosening of screws which interconnect various frame parts or secure rimless lenses in the frame structure.

206, Special Receptacle or Package, subclasses 5+ for cases or covers for eyeglasses and spectacles which may comprise hinged parts.

248, Supports, appropriate subclasses, especially subclasses 121+ for brackets, stands or uprights which may support ophthalmic test devices and which may have provisions to move an ophthalmic device relative to the support.

252, Compositions, subclasses 299.01+ for liquid crystal-containing optical filter compositions, and subclasses 582+ for other optical filter compositions which change their light and visible solar radiations transmittance properties when exposed to emergy and for corresponding filters defined solely in terms of their composition with no claimed significant filter structure.

285, Pipe Joints or Couplings, subclasses 51 and 54 for joints between members of ophthalmic mountings wherein the joint comprises a socket type or a ball and socket joint.

315, Electric Lamp and Discharge Devices: Systems, subclasses 291+ for illuminating means having electric current and/or voltage regulation.

359, Optical: Systems and Elements, subclass 465 for light polarizing devices, as used in stereoscopic viewing, subclasses 642+ for lenses as used in photography, binoculars and tele-

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scopes; subclasses 409+ for opera glass holders; subclass 481 for binocular loupes; subclass 816 for monocular loupes, subclasses 880+ for mirrors mounted before the eye; and subclasses 350+ and 885+ for optical filters.

359, Optical: Systems and Elements, subclasses 409+ for opera glass holders, subclass 481 for binocular loupes, and subclass 816 for monocular loupes. (Lines With Other Classes and Within This Class, B, "Spectacle and Eye Glass Mountings Combined with Other Structure").

359, Optical: Systems and Elements, subclasses 642+ for single lenses or lens combinations, primarily used in the category of optical instruments such as cameras, binoculars, magnifiers, telescopes, microscopes and oculars, principally for the purpose of forming or projecting a real or virtual image or images.

362, Illumination, subclasses 103+ for spectacles combined with illumination means, and subclasses 109+ for ophthalmic instruments comprising illuminating devices.

381, Electrical Audio Signal Processing Systems and Devices, subclasses 68+ for electric hearing aids in spectacle-type mountings, especially subclass 68.5 for spectacles or ophthalmic mountings combined with electrical hearing aid devices. (Lines With Other Classes and Within This Class, B, "Spectacle and Eye Glass Mountings Combined with Other Structure").

403, Joints and Connections, for joints and connections of general application.

411, Expanded, Threaded, Driven, Headed, Tool-Deformed, or Locked-Threaded Fastener, subclasses 378+ for screws and bolts of general application; and subclasses 531+ for washers of general application.

427, Coating Processes, subclasses 162+ for coating processes, per se, wherein the product is an electrical element.

451, Abrading, subclasses 42+ for an ophthalmic lens abrading process and subclasses 57+ for an abrading process for plural distinct areas.

501, Compositions: Ceramic, subclasses 11+ for glass composition; especially subclasses 60+ for lead containing glass composition.

520, Synthetic Resins or Natural Rubbers, for synthetic resins or natural rubbers, per se, or compositions containing same.

523, Synthetic Resins or Natural Rubbers, subclasses 105+ for contact lens compositions and for certain other compositions containing a synthetic resin or natural rubbers designed to come into contact with living tissue.

600, Surgery, subclasses 398+ and 558 for surgical devices used in the diagnosis of the eye generally and not involving conventional eye testing instruments, or for devices counteracting muscular eye imbalances, or for devices such as moving targets for exercising eye muscels. See Lines With Other Classes and Within This Class, above, for the line between the eye testing instruments of this Class 351 and the surgical instruments of another class of Surgery.

600, Surgery, subclasses 398+ for eye treatment appliances and methods intended to aid in the diagnosis of diseased eyes or during surgical operations of the eye. See Lines With Other Classes and Within This Class, A, "Eye Examining and Testing Instruments Classified Elsewhere", above.

SECTION IV - GLOSSARY

ANISEIKONIA

The inequality in shape and size between the two ocular images seen in binocular vision.

ASTIGMATISM

Defect of vision caused by unequal curvature of the refracting surfaces of the eye.

BINOCULAR COORDINATION

Fusion of the sight responses of both eyes, or correct space perception.

BRACE ARM

A relatively long and slender temple supporting arm or arc substantially identical to the shape of the upper contour edge of a lens.

BRIDGE

The connecting part between the lens supporting members of spectacles or eyeglasses.

CATARACT CORRECTION LENS

A lens, usually with cylindrical correction, to optically compensate for diminution of vision or opacity of the lens of the eye.

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CHARTS

A light reflecting or transmitting panel with symbols or pictures of varying size for testing the refraction of the eye.

CHROMATICITY TEST

Determination of the visual sensitivity or adaptation to color.

ELEMENT

Component part of an optical instrument unless otherwise indicated.

EYEGLASSES

Spectacles, pince-nez or other mountings with lenses to correct defects of vision of the human eye.

EYE CONTACT LENSES

Opthalmic lenses that fit over the cornea of the eye and which float on the tear of the eye or are held in place by the eyelids.

FRAME

Mechanical parts, not including lenses, which serve to surround or support or which serve to interconnect elements of the frame.

INTERPUPILLARY DISTANCE

The distance between the centers of rotation of a pair of human eyes.

LENS

Ophthalmic lens or transparent material in goggles unless otherwise indicated.

LENS REPAIR DEVICES

Structure embracing the broken portion of a lens by a metal or plastic strip so that the lens can be restored to the mounting.

LIGHT POLARIZING LENSES

Lenses comprising a polarizing element which reduces light losses due to reflection.

MOUNTING

A frame structure completely or partially surrounding a lens or utilizing a bridge and nose pads for supporting vision-aids in front of the eyes of a user. This term is broader than "frame", in that it includes the pince-nez type.

MULTIFOCAL LENSES

Fused or onepiece lenses having areas of different refracting powers, usually one area part being intended for distant vision and the other for close work.

MUSCULAR IMBALANCE

Abnormal eye muscle functioning, tending the eyes to cross or diverge.

OPTHALMIC LENSES

Lenses usually mounted in spectacle frames, in eyeglass mountings or in trial frames having cylindrical, spherical or prismatic power for testing or correcting visual deficiencies of the eye. These lenses cooperate with the refracting medium of the eye to form on the retina a clear image of the object viewed, or in strabismus to modify the imbalanced visual axis of the eye to make the eye gradually resume normal status to correctly superimpose deviated images. The lenses may be spherical (plus or minus) to correct for fairly simple defective near or far sightedness, or they may be cylindrical to correct for astigmatism, or they may be prismatic to correct for strabismus, or they may be any of these in combination. The magnification or minification power of these lenses serves primarily to produce clear images on the retina of an eye with poor vision rather than to produce any telescopic, microscopic or pictorial effects.

OPTICS, OPTICAL

The science of light and vision and the construction of optical instruments.

OPTICAL PATH

Imaginary lines passing on the principal and secondary axes from the center of the retina to the object viewed.

OPTOMETRY

The art of investigating vision defects such as refraction and ocular muscle function-defects and correcting or

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aiding them by optical means such as opthalmic lenses, prisms, muscle training and other optical measures.

PRISMATIC LENS

A light-deflecting medium which diverges or converges the lightrays entering the eyes.

RIM

A grooved-optical element made from metal or plastic material for framing lenses.

SPECTACLES

Instruments for aiding vision consisting of lenses and supports therefor.

STEREOSCOPIC VISION

The ability to perceive distance and the three dimensional properties of a viewed object.

TEMPLES

The parts of a spectacle which are secured to the end of lenses or the frame and maintain the glasses on the user's head.

TRIAL FRAME

Adjustable lens holding frames for supporting lenses interchangeably during vision testing.

VISION CORRECTING

Remedying vision defects by means of sight correcting lenses, eye muscle training devices, etc.

SUBCLASSES

41 SPECTACLES AND EYEGLASSES:
This subclass is indented under the class definition. Subject matter including an ophthalmic element or elements such as a spherical or cylindrical lens, a filter, polarizing element, or prism interposed in the path of vision of one or both eyes for correcting vision defects or abnormalities or protecting the eyes from undesired rays together with structure for positioning or supporting these elements from or on the head of the user in correct operative position.

(1) Note. The lenses of this subclass give usually a particular ophthalmic result in cooperation with the eye as opposed to lens systems such as used in cameras, microscopes or telescopes which may operate independently and without producing a corrective reaction in the eye or its element.

SEE OR SEARCH THIS CLASS, SUBCLASS:
227, for trial frames.

SEE OR SEARCH CLASS:
2, Apparel, subclass 13 for spectacle attached shades, and subclasses 426+ for goggle-type spectacles. See the class definition for the line between spectacles as classified here and goggles as classified in Class 2.
359, Optical: Systems and Elements, subclass 465 for light polarizing devices as used in stereoscopic viewing, subclasses 466+ for stereoscopic viewers; subclasses 642+ for lenses as used in photography, binoculars and telescopes; subclasses 409+ for opera glass holders; subclass 481 for binocular loupes; subclass 816 for monocular loupes, and subclasses 350+ and 885+ for optical filters.

42 Lens repair devices:
This subclass is indented under subclass 41. Subject matter limited to eyeglass repairing devices whereby a broken lens of a pair of eyeglasses may be temporarily repaired until a new lens is available, as for example a metal member or a transparent wafer strongly clamped onto or cemented to the broken lens parts.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.73 through 159.81 and 178, for methods of making spectacle lenses and spectacles not otherwise classifiable.

43 Floating or underwater type:
This subclass is indented under subclass 41. Subject matter wherein a light-weight float is removable attached to a spectacle frame for recovering glasses accidentally dropped into

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the water, or wherein the spectacles are especially adapted for underwater use as to enable the human eye to accommodate for distortionless viewing of objects under water.

SEE OR SEARCH THIS CLASS, SUBCLASS:
62, for spectacles with moisture prevention as absorption.

SEE OR SEARCH CLASS:
2, Apparel, subclasses 426+, and particularly 428+ and 440+ for goggles which protect the eyes from the water.

44 With antiglare or shading:
This subclass is indented under subclass 41. Subject matter including light absorbing lenses such as polarizing or colored lenses either framed or rimless, to shield the eyes of a wearer from the glare of the sun or from other undesirable or harmful light rays.

(1) Note. For classification here the lenses need not have diopter characteristics, but only general light modifying characteristics such as light filtering, polarizing, or absorbing.

SEE OR SEARCH CLASS:
2, Apparel, subclasses 10 through 15 for eye shades and subclasses 426+ for goggles. See Lines With Other Classes and Within This Class in the Class Definition of this class (351) for the line between the subject matter classified here and in subclasses 426+ of Class 2.
359, Optical: Systems and Elements, subclasses 483.01 through 494.01 for polarizers, subclasses 601+ for optical elements and systems for reducing glare and subclasses 885+ for optical filters.

45 Partially occluding the light-path area:
This subclass is indented under subclass 44. Subject matter wherein antiglare spectacles are provided with lenses having combined a clear-glass section and a section or sections of different light absorption, the latter covering only a part of the field of sight, so that without imparting the general vision the eyes may be screened from an undesirable light source by a slight movement of the head.

SEE OR SEARCH THIS CLASS, SUBCLASS:
49, for eye protection devices utilizing polarizing lenses.

46 Perforated opaque plates or shields:
This subclass is indented under subclass 44. Subject matter wherein antiglare spectacles comprise semitransparent or opaque plates having adjustable or fixed perforations or slits therein.

SEE OR SEARCH CLASS:
2, Apparel, subclass 433 for eye protecting goggles, which may include apertured opaque members, having no significant optical characteristics but being solely for providing mechanical eye protection.

47 Removable and/or adjustable filters or screens (e.g., clip-on type):
This subclass is indented under subclass 44. Subject matter including colored or other antiglare filter screens removably or adjustably connected with spectacle frames of various styles or sizes.

(1) Note. The filters or shades may be rimmed or rimless and they may cover portions of the glasses only or the entire glasses. The filters or screens classified here are usually combined with the spectacles. Subclass 13 of Class 2 provides for eye shades, per se, which are attachable to spectacles. Semiopague or tinted transparancies which swing selectively between the shading and viewing position are classified in this subclasses 47+.

SEE OR SEARCH CLASS:
2, Apparel, subclass 13 for spectacle attached shades. See also (1) Note above.

48 Spring biased:
This subclass is indented under subclass 47. Subject matter wherein the filters or screens are securely mounted on or readily attached to spectacles by integral or bridge-type spring means which hold the light absorbing mediums

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in different operative positions desired by the wearer.

(1) Note. See (1) Note under subclass 47 above.

49 Polarizing:
This subclass is indented under subclass 44. Subject matter wherein variable density lenses or viewing screens comprise fixed or adjustable superimposed light polarizing bodies which may be adjusted to filter any amount of light from a predetermined maximum to a predetermined minimum.

(1) Note. The above noted lenses with light polarizing characteristics may be rotatably mounted in one frame of the general shape of a conventional spectacle frame, or may be in a submounting held detachably adjacent and overlying lenses fixed in an ordinary spectacle frame.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclass 465 for polarizing device used in viewing stereoscopic pictures; and subclasses 483.01 through 494.01 for polarizing devices generally.

50 With rear-view reflectors:
This subclass is indented under subclass 41. Subject matter including one or more mirrors together with structure for supporting or attaching the mirror or mirrors on a part of the spectacle to provide rear vision for the spectacle wearer.

(1) Note. For classification here the spectacle must be claimed broadly or specifically with the mirror. For mirrors which are adapted for use with spectacles as by being supported thereon, or attached thereto, no spectacle structure being positively claimed, see Class 248, subclasses 466+.

SEE OR SEARCH CLASS:
2, Apparel, subclasses 426+, and particularly 438 for goggles which may include rear vision mirrors.
248, Supports, subclasses 466+ for mirrors generally with supports.

51 With decoration or ornamentation:
This subclass is indented under subclass 41. Subject matter wherein a spectacle frame or its ophthalmic lens is ornamented with decorative attachments or inserts.

(1) Note. The above noted ornamental attachments may be colored stripes, decorated plates, pendant jewels or imitations thereof, and may be placed on any selected portion of the spectacle frame or lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:
105, for brace arm mountings with detachable brace arm.

SEE OR SEARCH CLASS:
63, Jewelry, subclasses 1.1 and 2, for combination articles and various jewelry articles.
428, Stock Material or Miscellaneous Articles, subclasses 3 through 32 for miscellaneous ornamented articles and subclass 67 for a element embedded in a substrate (e.g., spectacle frame) and visible.

52 Detachably secured:
This subclass is indented under subclass 51. Subject matter wherein the decorative devices are so attached to the various frame or lens parts as to be readily removable therefrom.

53 Shooting type:
This subclass is indented under subclass 41. Subject matter is limited to spectacles peculiarly adapted for the aiming of firearms.

(1) Note. Included here are “shooting” spectacles having screens with slots or diaphragms, discs with rotatably and movably arranged openings, adjustable aiming lenses or stenopaic disc apertures.

54 Invertible or reversible multifocal type:
This subclass is indented under subclass 41. Subject matter wherein spectacles with multifocal lenses may be inverted or turned upside down as a unit, or in which the lenses, per se, may be revolved inside the frame so that bifo-

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cal segments may stand at the top or bottom of the lenses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
115, for reversible or axially rotatable temples.

55 With vertical adjustment of multifocal lenses:
This subclass is indented under subclass 41. Subject matter wherein the mounting is adjustable to permit vertical movement of multifocal lenses to selectively position the near and distance vision portions in the line of vision.

(1) Note. The adjustment of the lenses may be made by changing the position of the nose pads on their supporting arms or by varying the distance between the pads by moving rotatable portions of the bridge to adjusted positions.

SEE OR SEARCH THIS CLASS, SUBCLASS:
54, for spectacles whose lenses are inverted by rotation.
107, for adjustable brace or mountings.
137, for adjustable nose pads or cushions.
148, for adjusting or slidable connectors.

56 Lorgnette type:
This subclass is indented under subclass 41. Subject matter including an elongated handle attached to the frame for holding the glasses in the viewing position, the handle constituting the sole support for the glasses in this viewing position.

(1) Note. The eyeglasses of this type are usually folding.

SEE OR SEARCH THIS CLASS, SUBCLASS:
63+, for foldable spectacles and eyeglasses.
155+, for eyeglass supports or holders.

57 With auxiliary lenses movable in and out of the optical path (e.g., clip-on type attachments):
This subclass is indented under subclass 41. Subject matter wherein supplemental lenses or glasses without temples are movably attached to permanent reading or farsight main spectacles.

(1) Note. The above noted supplemental glasses may comprise U-shape or half moon lenses below eye level. They may be pivotable or magnetically attached to normal spectacles. The subject matter does not include supplemental glasses attached to frames without permanent lenses. See subclass 59 for this subject matter. The lenses may be plain glass as for protecting purposes.

SEE OR SEARCH THIS CLASS, SUBCLASS:
44+, for eyeglasses and spectacles with antiglare or shading structure.
61, for spectacles with U-shape or half-moon lenses below eye level.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclass 481 for binocular loupes and subclass 816 for monocular loupes.

58 Spring biased or secured by friction members:
This subclass is indented under subclass 57. Subject matter wherein the supplemental lenses or glasses are retained on the main eyeglasses by spring loaded clamping members or by circumferentially secured friction clips.

SEE OR SEARCH THIS CLASS, SUBCLASS:
47+, for clip-on antiglare or shading spectacles.

59 Lens pivots in and out of optical path:
This subclass is indented under subclass 41. Subject matter wherein mounted or rimless lenses are movably connected to glassless spectacle frames or glassless support rods to swing from an operative position in the line of vision to an inoperative position above the eyes.

SEE OR SEARCH THIS CLASS, SUBCLASS:
57+, for spectacles including lenses with additional lenses which pivot in and out of the optical path.

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60, for spectacles whose lenses are mounted on or suspended from rods or bars, and which may be adjusted along the rod or bar.

60 With lens suspension bar (e.g., torsion bar):
This subclass is indented under subclass 41. Subject matter wherein rimless or rimmed lenses are suspended from or mounted on a usually rectilinear rod, or are suspended from or mounted on oppositely extending bars embodying nose engaging means.

(1) Note. The lenses in the above structure may be adjustable in various spaced relations to each other. The points of connection of the lenses and temples with the bar or rod are generally outside of the range of vision.

SEE OR SEARCH THIS CLASS, SUBCLASS:
57+, for spectacles with auxiliary lenses movable in and out of the optical path.
107, for brace-arm-type mountings with adjustable lenses.
133+, for bridges with connectors or straps.

61 U-shape or half-moon lens below eye level:
This subclass is indented under subclass 41. Subject matter having lenses of narrow vertical dimension which lie well below the horizontal line of vision and provide unobstructed vision over the top of the lenses.

(1) Note. This subject matter is distinct from and does not include eyeglasses with conventional full size area or multifocal lenses. The lenses here are of approximately one-half or one-third normal lens area and are without lenses at the top.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.41 through 159.48 for multifocal lenses generally.

62 With moisture prevention or absorption:
This subclass is indented under subclass 41. Subject matter wherein lens retaining rims are provided with moisture reducing and air-ventilating openings, or wherein a sweat or moisture absorbing cushion is mounted between the lens rims.

SEE OR SEARCH THIS CLASS, SUBCLASS:
43, for floating or underwater spectacles.
154, for lens linings or rims.

63 Folding:
This subclass is indented under subclass 41. Subject matter in which the frame of the spectacles (usually in the central part of the bridge or temple) may be folded or otherwise adjusted so that portions of the frame, usually the lens portions are superposed to lie one upon the other, but which are in the same plane and alignment when unfolded and opened for use.

(1) Note. The temples in the above folding spectacles may each consist of two pivotally connected folding portions, or may be made of one short piece generally not longer than the spaced lens rims. However, spectacles where the temples fold on their hinges to lie along the remaining frame structure is not provided for here but in the particular mounting subclasses below.

64 Pince-nez type:
This subclass is indented under subclass 63. Subject matter limited to folding eyeglasses of the pince-nez-type.

SEE OR SEARCH THIS CLASS, SUBCLASS:
65+, for pince-nez-type glasses generally.

65 Pince-nez type (including pince-nez bridges, nose grips and nose pads therefor):
This subclass is indented under subclass 41. Subject matter limited to eyeglasses which are provided with nose gripping means for supporting the lenses before the user's eyes.

(1) Note. The subject matter here is distinct from and does not include eyeglasses where the support is by temples bearing upon the ears or sides of the user's head. See the indented subclass 66 for pince-nez-type glasses with a temple.

(2) Note. This and the indented subclasses provide for bridges, nose grips, and nose

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pads which are intended for use with pince-nez eyeglasses as indicted for example by the pince-nez background of the patent.

SEE OR SEARCH THIS CLASS, SUBCLASS:
64, for folding pince-nez-type glasses.
124+, for bridges generally, subclasses 131 and 132 for bridges with nose grips or guards; and subclass 132 for bridges with nose pads or cushions.
136+, for nose pads or cushions generally.

66 With ear chain or temple:
This subclass is indented under subclass 65. Subject matter wherein a temple or a chain with a hook is attached to the lens or rim, as for steadying the pince-nez in position or for preventing the glasses from falling.

SEE OR SEARCH THIS CLASS, SUBCLASS:
111+, for temples generally.
155+, for spectacles generally with supports or holders.

67 Plural bridges:
This subclass is indented under subclass 65. Subject matter wherein rimless or rimmed lenses are connected by a bridge (usually spring) and by a supplemental bridge.

(1) Note. The subject matter here may provide proper adjustment of the tension of the spring bridge, may serve for setting the lenses at the correct pupillary distance, or may be used for shifting the lenses in a vertical plane.

SEE OR SEARCH THIS CLASS, SUBCLASS:
68, for a pince-nez having a resiliently extensible bridge.
124+, for bridges generally.
227, for bridges in trial frames.

68 With resilient extensible bridge:
This subclass is indented under subclass 65. Subject matter wherein the lenses are connected by a bridge which may be extended in length against the biasing action of a spring as where the bridge comprises two arms sliding one beside or within the other together with an expandable spiral spring around the arms to force the lenses nearer together and the nose grips into contact with each side of the nose.

(1) Note. The bridge may extend tangentially along the top edges, behind, or in the plane of the lenses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
65, for pince-nez eyeglasses with flexible bridges or bow springs as where the bridge itself is made from flexible material.

69 Lens and nose grip movable on flexible bridge:
This subclass is indented under subclass 65. Subject matter including a resilient bridge or a bridge having resilient portions, the lenses being capable of swinging movement so that a separating motion of the nose grips is produced.

(1) Note. The above noted spring-bridges may have loops arranged in front or in the rear of the lens planes whereby the elasticity of the bridge material produces pressure on the nose grip to retain the glasses in position.

SEE OR SEARCH THIS CLASS, SUBCLASS:
126+, for flexible bridges generally.

70 Posts or studs connecting bridge and nose grip:
This subclass is indented under subclass 65. Devices wherein the bridge or bow spring, the lens connectors or holders, and the nose guards have a common junction, as by being interconnected within a box by a screw or pin.

(1) Note. In the embodiment here a fastener or locking device may be inserted or forced into the stud-box to prevent loosening or displacement of the frame members.

SEE OR SEARCH THIS CLASS, SUBCLASS:
140+, for connectors generally.

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71 With spring biased nose grip:
This subclass is indented under subclass 65. Subject matter wherein the nose grips or guards are formed of resilient material or are combined with a spring to bias the guards with respect to the bridge to properly engage the nose and retain the glasses thereon.

(1) Note. In the modification here the guards may be actuated by flexible portions in the bow springs, by coil springs interposed between lens mountings and the nose-engaging member, or by moving the lenses forwardly against the resiliency of a bridge portion. However, for classification in this subclass the nose guards must be biased with respect to at least a portion of the bridge which remains rigid. A mere bridge of resilient material and flexible over its length is not provided for here but in the generic subclass 65 above.

SEE OR SEARCH THIS CLASS, SUBCLASS:
88, for continuous rim mountings with adjustable nose guards.

72 With pivoting levers:
This subclass is indented under subclass 71. Subject matter wherein the nose grips include two finger-engaging lever portions, both being biased as by helical or leaf springs.

SEE OR SEARCH CLASS:
267, Spring Devices, for spring structures generally.

73 With flat spiral springs:
This subclass is indented under subclass 72. Devices wherein the grips are supported and/or biased by a strip of flat spiral or leaf-type spring.

74 With springs below bridge:
This subclass is indented under subclass 72. Devices wherein pivoting nose grips are activated by springs mounted on the under side of the bridge.

75 With springs encased:
This subclass is indented under subclass 72. Devices wherein the nose grips are actuated by springs which are retained and covered by a hollow cup or barrel.

(1) Note. In the modification here the pivot and spring that actuate the guard lever may be mounted and contained within a recess cut away from a portion of the lens rim.

76 With adjustable or rockable nose grips or pads:
This subclass is indented under subclass 65. Subject matter wherein the nose grips or pads can be adjusted on their supports in one or more directions so as to fit any shape of nose.

(1) Note. The subclass provides for adjustable nose grips or pads intended for use with pince-nez eyeglasses as indicated for example by the general pince-nez background in the patent. The above nose grips or pads are usually adjustable laterlly and longitudinally and may be secured in the selected position. The modification here includes also nose grips or pads which are rockably connected to the support, or which are made from bendable or flexible material.

SEE OR SEARCH THIS CLASS, SUBCLASS:
71, for pince-nez eyeglasses with spring-biased nose guards, whose spring permits adjustment.
88, for adjustable nose guards incontinuous rim type lens mountings.
137, for adjustable or rockable nose pads or cushions generally.

77 With ball joints:
This subclass is indented under subclass 76. Subject matter wherein the nose grips or pads are connected with the pince-nez bridge or spring by ball-and-socket joints to cause the grips or pads to assume the proper and most suitable position relative to the nose.

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SEE OR SEARCH THIS CLASS, SUBCLASS:
140+, for spectacle and eyeglass connectors generally.

78 Nose pads or cushions:
This subclass is indented under subclass 65. Subject matter wherein resilient, soft or padded elements are attached to the metallic nose grips or guards which wear on the nose of a wearer to support pince-nez- type eyeglasses.

(1) Note. This subclass provides for nose pads or cushions intended for use with pince-nez eyeglasses as indicted for example by the general pince-nez background in the patent.

SEE OR SEARCH THIS CLASS, SUBCLASS:
132, for bridges combined with nose pads or cushions.
136, for nose pads or cushions generally.

79 Plural pad parts engage the nose:
This subclass is indented under subclass 78. Subject matter in which a supplemental pad or supplemental nose engaging portions are provided on the main bearing pad for increased gripping action.

80 Detachable:
This subclass is indented under subclass 78. Subject matter wherein the nose pads or the supporting guards are provided with means whereby the pads may be readily attached or detached for removal or replacement.

SEE OR SEARCH THIS CLASS, SUBCLASS:
138, for detachable nose pads or cushions generally.

81 Perforated or serrated:
This subclass is indented under subclass 78. Subject matter wherein the exposed faces of the nose pads have depressions or grooves, or the pad surfaces are provided with serrations or corrugations to firmly secure the eyeglasses to the nose.

82 Fluid-filled or suction type:
This subclass is indented under subclass 78. Subject matter wherein the nose contacting portion of the pad or bridge includes a tube or sac filled with a liquid or a filler of nonhardening material, or wherein nose pads or bridges have cups or shells to firmly grip the nose by suction.

83 Continuous rim mounting:
This subclass is indented under subclass 41. Subject matter wherein undivided continuous metal or plastic lens surrounding rims are connected by a bridge and are provided with end pieces and hinges to pivotally connect temples with the rims.

(1) Note. The above continuous lens rims are usually made from plastic base materials and are conventionally interconnected by an integral plastic bridge. Included here are nonmetallic lens rims interconnected by a metal bridge which may be detachably secured to the rims.

SEE OR SEARCH THIS CLASS, SUBCLASS:
154, for lens linings and rims.

SEE OR SEARCH CLASS:
2, Apparel, subclasses 426+, and particularly 439 holding rims in goggles.

84 With rotating means for multifocal lenses:
This subclass is indented under subclass 83. Subject matter wherein multifocal lenses can be rotated in the lens rims around an axis perpendicular to the surface of the lenses so as to bring any desired power sector into the field of vision.

(1) Note. Each lens may be revolved separately and independently of the other or the lenses may be simultaneously rotated.

SEE OR SEARCH THIS CLASS, SUBCLASS:
49, for rotatable mounts for polarized lens elements.

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85 Upper rim portion slotted:
This subclass is indented under subclass 83. Subject matter wherein grooved lens holder rims are formed with slots in their upper portion through which lenses may be inserted or removed.

(1) Note. The slots may be closed by pivoted arms after insertion of the lenses. The lenses may be supported in a separate mounting which is removably inserted through the rim-slots into the grooves of the lens holders.

SEE OR SEARCH THIS CLASS, SUBCLASS:
154, for lens linings and rims.
227, for trial frames.

86 With lens retaining or locking means:
This subclass is indented under subclass 83. Subject matter wherein the rims have lens receiving grooves provided with means to frictionally engage the peripheral edge of a lens, or wherein a member projecting from the groove engages a notch in the lens to prevent inadvertent rotation of the lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:
96, for lens-locking means in split rim mountings.
227, for trial frames.

87 Nose guards or pads integral with frame:
This subclass is indented under subclass 83. Subject matter wherein the lens rims are provided with integrally connected nose guards or pads.

(1) Note. The guards or pads may have a wire meshed fabric embedded therein or they may be slotted to receive the ends of bridge arms.

SEE OR SEARCH THIS CLASS, SUBCLASS:
76+, and 78+, for nose pads in pince-nez eyeglasses.
136+, for nose pads or cushions.

88 Nose guards or pads removable or adjustable:
This subclass is indented under subclass 83. Subject matter wherein the nose pads are removably secured as by clamping action on portions of the rims or where the pads can be adjusted into any desired horizontal or longitudinal position.

SEE OR SEARCH THIS CLASS, SUBCLASS:
76+, and 80, for adjustable or removable nose pads in pince-nez glasses.
137, and 138, for nose pads or cushions which are respectively adjustable and detachable.

89 With brace arm temple support:
This subclass is indented under subclass 83. Subject matter wherein symmetrically arranged brace bar temple supports follow substantially the upper contour shape of the lens rims.

(1) Note. The arms may extend upwardly from the rims or may be set into a groove provided in the upper edge of the rims. The brace arms however are distinct from the rims.

SEE OR SEARCH THIS CLASS, SUBCLASS:
93, for brace arms in split rim mountings.
103+, for brace arm or semirimless mountings.
125, for brow-bar-type bridges.

90 Split rim mounting:
This subclass is indented under subclass 41. Subject matter wherein lens holding rims connected by a bridge are divided or separated at one point on their periphery.

(1) Note. Usually the rims are split at their temporal sides and have endpieces or lugs which serve to lock the rim members around the lenses and also carry temple supporting hinges. The above rims may be formed from metal or plastic material. The rim-splits may be in line with, above or set at an angle to the center of the lenses.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

65+, for split lens holding rims in pince-nez eyeglasses.

154, for lens linings and rims.

91 **With brow pieces or top arms:**
This subclass is indented under subclass 90. Subject matter wherein divided lens holding rims are provided with metallic or plastic top arms or brow pieces which may be interchangeably or permanently connected to the rims.

(1) Note. The brow pieces or top arms are either single units fitted separately to the upper portion of each rim or may consist of a pair of top arms connected to each other at their inner portions by a bridge. Nose pads may be integrally connected with, or may be adhesively secured to the top arm.

SEE OR SEARCH THIS CLASS, SUBCLASS:

51+, for spectacles with ornamentation or decoration.

125, for brow-bar-type bridges.

131, for nose grips integral with the bridge.

92 **Screwless lens mounting:**
This subclass is indented under subclass 91. Subject matter wherein the lenses are retained within the mounting as by spring tension members, resilient clamping rims, hinged clasps or by hinged frame-portions acting as enclosures for the lens without the use of rivets, screws or other more conventional fastening devices, thereby making the lenses readily removable and interchangeable.

SEE OR SEARCH THIS CLASS, SUBCLASS:

79, for connectors with clamping arms.

106, for screwless lens mountings in brace arm or semirimless spectacles.

125, for bridges with brow bars.

133+, for bridges with connectors or straps.

229, for lens supports in trial frames.

93 **With brace arm supports for temple or lens:**
This subclass is indented under subclass 90. Subject matter wherein brace bars usually resilient are secured to and extend laterally along or above the top of divided rims.

(1) Note. The brace bars carry lens rim support and/or temple-hinge means, and provide a wide range of adjustment to different facial requirements. In this subclass the lens rims may have split ends at the nasal or at the temporal side thereof. The split ends may be at the horizontal center line, or may be above the center line and above the useful field of vision.

SEE OR SEARCH THIS CLASS, SUBCLASS:

89, for brace bars in continuous rim mountings.

103+, for brace bar mountings generally.

125, for brow-bar-type bridges.

94 **With auxiliary bridge:**
This subclass is indented under subclass 90. Subject matter wherein an auxiliary bridge member is detachably or rigidly attached to the primary bridge.

(1) Note. The auxiliary bridge member may include pivotable or fixedly secured nose pad members, and may be made of any suitable material such as plastic or metal.

SEE OR SEARCH THIS CLASS, SUBCLASS:

55, for auxiliary adjustable bridges.

67, for supplemental bridges in pince-nez eyeglasses.

132, for bridges with nose grips.

95 **Expansible and contractible lens rim:**
This subclass is indented under subclass 90. Subject matter wherein the size of the lens receiving opening of the rims can be expanded or contracted at the split-ends for properly securing different sizes of lenses in the rims.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

83+, for continuous rim mountings where the rim may be expandable and contractable.

154, for rims, per se.

96 Locking member secures lens against rotation:

This subclass is indented under subclass 90. Subject matter wherein a lens lock positioned between rim and lens or between the separable members of a split rim-joint projects into a notch or recess formed in the periphery of the lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:

86, for lens-locking means in continuous rim mountings.

149, for connectors with interengaging projections and recesses.

97 Split connected by U-clamps or pivot links:

This subclass is indented under subclass 90. Subject matter wherein the arms projecting from the divided protions of lens rims are drawn together by embracing U-type clamps or by pivoting toggle levers.

SEE OR SEARCH THIS CLASS, SUBCLASS:

152, for connectors with clamping arms.

98 Split on nasal side of rim (i.e., at bridge):

This subclass is indented under subclass 90. Subject matter wherein the lens rims are divided adjacent to the bridge at the nasal side of the rims, the temporal edges of the split rims being continuous and without the conventional rim connecting arms or studs.

(1) Note. Included here are frames made from plastic material wherein the bridge is divided lengthwise to provide split lens rim portions.

99 Clamp and temple pivot screw spaced along rim clamping arm:

This subclass is indented under subclass 95. Subject matter wherein the divided rims carry aligned end piece lugs provided with a lens rim clamping-screw and a temple retaining dowel remove from the clamping screw.

SEE OR SEARCH THIS CLASS, SUBCLASS:

121, for temples with connections.

140, for connectors.

100 Clamp and temple pivot screw coincident on rim clamping arm:

This subclass is indented under subclass 90. Subject matter wherein the opposite end of a divided rim terminate in aligned lugs which are drawn together by a single screw which tightens the rim around the lens and also affords a pivot for a temple.

SEE OR SEARCH THIS CLASS, SUBCLASS:

121, for temples with connections.

140, for connectors.

101 Metal clamps embrace the rims and connect to bridge and/or temples:

This subclass is indented under subclass 90. Subject matter wherein nonmetallic divided lens rims are connected with the bridge on the nasal side and with temple hinge parts on the temporal side by short sections of metallic tubing surrounding the rims.

SEE OR SEARCH THIS CLASS, SUBCLASS:

121, for temples with connections.

133, for bridges with connectors or straps.

154, for linings and rims.

102 Combined metal and plastic rims:

This subclass is indented under subclass 90. Subject matter wherein each lens frame is formed by an inner metallic rim combined with and covered by an outer nonmetallic rim.

(1) Note. The combined rims are usually split at their temporal sides and the metallic rim carries rim locking and temple supporting means. However, each lens frame may comprise a split outside metallic rim combined with an inside continuous nonmetallic rim or vice versa, for resiliently and accurately mounting a lens in the frame.

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SEE OR SEARCH THIS CLASS, SUBCLASS:
154, for linings and rims.

103 Brace arm or semi-rimless mounting:
This subclass is indented under subclass 41. Subject matter wherein laterally extending and symmetrically arranged bars extend from the bridge to the temple connection or where such bars are disposed over the lenses to connect with the temples to leave a portion of each lens free or rimless.

(1) Note. The brace arms may extend rearwardly or upwardly from the lenses and may be associated into one single element which is connected with the bridge. For brace arms extending along the edge of the lens see subclass 109. For brace arms which support a lens at two spaced points see subclass 108. The brace arms are usually resilient.

SEE OR SEARCH THIS CLASS, SUBCLASS:
89, for brace arms in continuous rim mountings.
125, for brow-bar-type bridges.

104 Arm or rim of plastic or of different material (e.g., metal and plastic):
This subclass is indented under subclass 103. Subject matter where the brace arms or semirims are made from nonmetallic material or from plastic material reinforced by metal embracing the upper contour edges of the lenses, and secure both the lenses and the temples rigidly to the rim sections.

SEE OR SEARCH THIS CLASS, SUBCLASS:
102, for combined metal and plastic split rim mountings.
108, for brace arms supporting a lens at two spaced points.
117, and 129, for reinforced temples and bridges respectively.

105 Detachable brace arm:
This subclass is indented under subclass 103. Subject matter wherein the mounting is made up as a unit of detachably interconnected members such as the brace arms, bridge and/or nose pad supports.

(1) Note. The detachable mounting may comprise a central bridge member having brace arms and brackets attached thereto to detachably couple the bridge with its brace arms to conventional eyeglasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
140+, for connectors joining parts of spectacles.

106 Screwless lens mounting:
This subclass is indented under subclass 103. Subject matter wherein the lenses are attached to the mounting as by channel-like straps clamping the nasal edges of the lenses or by small arms which engage the upper surface of the peripery of the lenses, but without the use of screws, rivets, or other fasteners extending through the lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:
149, for connectors having a projection which engages a lens recess.
152, for connectors with clamping arms.

107 With adjustable lens or frame part:
This subclass is indented under subclass 103. Subject matter wherein the brace arms may be readily adjusted to various positions to conform to the shape of the lenses or wherein each lens is individually adjustable relative to the brace arm.

SEE OR SEARCH THIS CLASS, SUBCLASS:
55, for lenses vertically adjustable during use.
148, for strap-type connectors which permit adjustment of the lens.

108 Brace arm supports lens at two spaced points or constitutes a partial rim:
This subclass is indented under subclass 103. Subject matter wherein hinged or fixed lensstraps or brackets are mounted on the brace arms and secure the lenses at two spaced points, or where the brace arms have a longitu-

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dinally extending portion bearing against the upper contour of the lenses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
133, for bridges with connectors or straps.
142+, for strap-type lens connectors.

109 Brace arm extends along edge of lens:
This subclass is indented under subclass 103. Subject matter wherein relatively long and slender brace arms extend substantially along the upper contour edges of the lenses only and terminate in temple connections.

(1) Note. Where the brace arm actually engages or bears against the edge of the lens, classification is not here, but in such subclasses as 89, 93 and 108 above.

SEE OR SEARCH THIS CLASS, SUBCLASS:
125, for bridges with brow bars.

110 Rimless mounting:
This subclass is indented under subclass 41. Subject matter where the edges of the lens are free of any structure such as a rim around substantially all the perimeter.

(1) Note. In this subclass the sole edge structure is the connections to the other frame structure such as bridge and/or temple. The connections may be on opposite edges of the lens at the horizontal center line, or may be above the horizontal center line and above the useful field of vision. For classification here the complete spectacle combination must be claimed. That is the claims must include the bridge, lenses and temples. For the combination of the temple and the lens see subclasses 111+. For the combination of the bridge and one or both lenses see subclasses 124+.

SEE OR SEARCH THIS CLASS, SUBCLASS:
65+, for pince-nez-type spectacles.
103+, for brace arm or semirimless mountings.

111 Temples:
This subclass is indented under subclass 41. Subject matter including structure secured to the outer ends of the lenses or their frames and bearing upon the ears or sides of the user's head for maintaining the spectacle in desired position on the user.

(1) Note. The above noted temples are made from metal or from a plastic, and may be straight or provided with a hook and bend at their free ends.

(2) Note. This subclass provides for the combination of the temple and the rim or lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:
51+, for temples with ornamentation.
66, for pince-nez glasses with single temple.
89, and 93, for rim-type mountings with a brace arm temple support.

SEE OR SEARCH CLASS:
381, Electrical Audio Signal Processing Systems and Devices, subclass 327 for temple-pieces with concealed hearing-aids.

112 With pocket clip or clasp:
This subclass is indented under subclass 111. Subject matter wherein a resilient clip or clasp is integral with or otherwise attached to a temple piece for securing eyeglasses to an article of wearing apparel.

SEE OR SEARCH THIS CLASS, SUBCLASS:
155+, for spectacles with support or holders generally.

SEE OR SEARCH CLASS:
24, Buckles, Buttons, Clasps, etc., subclasses 455+ for clasps generally.

113 Spring biased:
This subclass is indented under subclass 111. Subject matter wherein the temples are biased by springs or by elastic metal members in addition to the usual temple structure either to yieldingly resist outward movement of the tem-

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ple, or to engage the head of the wearer with yieldable pressure.

SEE OR SEARCH THIS CLASS, SUBCLASS:
114, for resilient or flexible temples.
150+, for connectors with resilient parts.

SEE OR SEARCH CLASS:
267, Spring Devices, for spring structures generally.

114 Resilient or flexible:
This subclass is indented under subclass 111. Subject matter wherein the temples are flexible throughout or are provided with flexible portions to yieldingly engage the side of the head or the ear of the wearer.

SEE OR SEARCH THIS CLASS, SUBCLASS:
113, for spring biased temples.

115 Reversible or axially rotatable:
This subclass is indented under subclass 111. Subject matter wherein the temple can selectively be used as a right or left member in connection with the frame, or wherein the temple may be rotated about its straight portion as an axis, or wherein the temple may be swung to opposite sides of the frame.

(1) Note. Included here are temples with pivots permitting the temples to swivel on the front frame part so that when folded one of the temples lies in front and the other temple behind the lenses.

SEE OR SEARCH CLASS:
403, Joints and Connections, subclasses 52+ for articulated joints in general.

116 Detachable:
This subclass is indented under subclass 111. Subject matter wherein the temple is attached to the remaining spectacle structure for ready attachment or removal therefrom as by a hook or ring, or by a snapping or pressing action as distinct from the usual screw attachment; or wherein the greater part of the temple may be readily attached or removed from the remaining part which is more permanently attached to the other spectacle structure.

117 With covered core or rod (e.g., reinforced):
This subclass is indented under subclass 111. Subject matter wherein the temple is made from plastic or composition material and is reinforced by a metallic core extending throughout or through the major part of its length.

SEE OR SEARCH THIS CLASS, SUBCLASS:
117, for methods of making temples.
129, for reinforced bridges.

118 Extensible (e.g., with adjustable sleeve member:
This subclass is indented under subclass 111. Subject matter wherein two telescopically arranged temple sections are selectively adjustable together with means for holding the sections in relative longitudinally adjusted positions.

SEE OR SEARCH THIS CLASS, SUBCLASS:
113, for spring-biased extensible temples.
119, for two part temples generally.
227, for adjustable temples in trial frames.

SEE OR SEARCH CLASS:
403, Joints and Connections, subclasses 83+ for articulated connections lockable at a fixed position in general, particularly subclasses 109.1+ for such connections between telescoping members.

119 Two-part type (e.g., jointed):
This subclass is indented under subclass 111. Subject matter wherein the temple is composed of two end to end interengaging parts securely held against disconnection.

(1) Note. The above noted temples may comprise combine metallic and nonmetallic parts or may be formed of plastic material only. Often one part constitutes the ear piece, and the other the straight member.

SEE OR SEARCH THIS CLASS, SUBCLASS:
118, for extensible temples.

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SEE OR SEARCH CLASS:

381, Electrical Audio Signal Processing Systems and Devices, subclasses 312+ for hearing-aid temple members consisting of a rear portion, a forward portion and an extension member.

403, Joints and Connections, appropriate subclasses for joints and connections of general application.

120 Inclined to lens plane:

This subclass is indented under subclass 111. Subject matter wherein the temples are inclined with respect to the plane of the lenses, thereby positioning the lens frame or the lenses at an obtuse angle to the temples when rearwardly extended.

SEE OR SEARCH THIS CLASS, SUBCLASS:

115, for reversible or axially rotatable temples.

121 With connector:

This subclass is indented under subclass 111. Subject matter wherein the temple includes a connection such as a hinge which connects the temple to the lens or frame.

(1) Note. This connector may comprise spring loaded hinges or angularly and lengthwise adjustable hinges. Spectacle hinges are classifiable, per se, in Class 16, Miscellaneous Hardware (e.g., Bushing, Carpet Fastener, Caster, Door Closer, Panel Hanger, Attachable or Adjunct Handle, Hinge, Window Sash Balance, etc.), subclass 228, and Class 403, Joints and Connections, subclasses 52+, even when the claim indicates the hinge is to be used with or in spectacles. However, the recitation of specific temple features in combination with the hinge is sufficient for classification in this subclass 121.

SEE OR SEARCH THIS CLASS, SUBCLASS:

89, and 103+, for brace-arm-type temple connections.

99, and 100, for coincident and spaced rim clamp and pivot temple hinges respectively.

153, for connectors with hinges.

SEE OR SEARCH CLASS:

2, Apparel, subclasses 448+ for hinges in goggles.

16, Miscellaneous Hardware (e.g., Bushing, Carpet Fastener, Caster, Door Closer, Panel Hanger, Attachable or Adjunct Handle, Hinge, Window Sash Balance, etc.), subclass 228 for related hinge-structure, per se. See (1) Note above.

403, Joints and Connections, subclasses 52+ for related hinged rod joints. See also (1) Note above.

122 With skin protecting earpiece covering:

This subclass is indented under subclass 111. Subject matter wherein the earpiece of the temple is covered with nonmetallic material to prevent irritating the skin of a wearer.

(1) Note. The above noted covering may be produced by dipping the temple core in an appropriate solution or by providing a flexible nonmetallic cover around the earpiece.

123 With head or ear engaging attachments:

This subclass is indented under subclass 111. Subject matter wherein the temples are provided with slidable or fixed attachments which contact the wearer's head or ear to hold the spectacles firmly in place.

(1) Note. The above noted temple attachments may comprise cushions, pads, springs or suction cups.

SEE OR SEARCH THIS CLASS, SUBCLASS:

122, for temples with skin protecting covers.

124 Bridges:

This subclass is indented under subclass 41. Subject matter limited to structure which interconnects the rimmed or rimless lenses of spectacles and extends across the nose of a user.

(1) Note. The subject matter here does not include resilient bridges as used in pince-nez mountings. See subclasses 64 and 65+ above for such subject matter.

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This subclass provides for the combination of the bridge and the rim or lens, or the bridge with both rims or both lenses unless provided for above.

SEE OR SEARCH THIS CLASS, SUBCLASS:
65+, for bridges in pince-nez-type glasses, and especially subclasses 65 and 67.
227, for bridges in trial frames.

125 Crossbar type:
This subclass is indented under subclass 124. Subject matter wherein the bridge is in the shape of a cross bar generally extending from the upper edge of one lens holding means to the upper edge of the other.

SEE OR SEARCH THIS CLASS, SUBCLASS:
60, for spectacles with lens suspension bars.
68, for pince-nez glasses with resilient brace-type bridge.
103+, for brace-arm type mountings.
227, for brow bar bridges in trial frames.

126 Flexible:
This subclass is indented under subclass 124. Subject matter wherein the bridge joining the lens holding members is made from resilient metal or includes flexible portions.

(1) Note. The above modification includes coil springs interposed between the lenses or lens mountings.

SEE OR SEARCH THIS CLASS, SUBCLASS:
65, for pince-nez glasses with flexible bridges.
156, for head-band type spectacles.

127 Ball or chain type:
This subclass is indented under subclass 126. Subject matter wherein the bridge connecting the lens holding rims is formed of a plurality of flexible hollow ball or link-chain members.

(1) Note. These bridges may be readily removable from the lens rims, and may be adjustable to produce the required distance between the lenses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
140+, for connectors.

SEE OR SEARCH CLASS:
2, Apparel, subclasses 445+ for ball or chain type bridges in goggles.

128 Adjustable:
This subclass is indented under subclass 124. Subject matter wherein the bridge is adjustable as to pupillary distance between the lenses, and/or to the facial characteristics of the wearer.

(1) Note. The bridges may comprise a tubular member and a second member selectively insertable therein, or the bridges may be deformable in order to position the lenses properly before the eyes.

SEE OR SEARCH THIS CLASS, SUBCLASS:
64, and 65+, for adjustable bridges in pince-nez glasses.
126+, for flexible bridges.
227, for bridges in trial frames.

129 Reinforced:
This subclass is indented under subclass 124. Subject matter wherein the bridge has a reinforcing metal core embedded inside, or disposed on the inner or outer face of the bridge.

(1) Note. The reinforcement may be in the form of a straight piece of wire or may be curved to conform to the curve of the bridge.

SEE OR SEARCH THIS CLASS, SUBCLASS:
117, for reinforced temples.

130 With auxiliary support:
This subclass is indented under subclass 124. Subject matter wherein the usual bridge is supplemented by an auxiliary universally adaptable nose engaging attachment.

(1) Note. The above attachment may be in the form of a brace, a clip or an auxiliary nosepiece.

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131 With nose grip or guard integral with bridge:

This subclass is indented under subclass 124. Subject matter wherein the bridge is integrally connected with a nose grip or guard.

SEE OR SEARCH THIS CLASS, SUBCLASS:

87, for continuous rim mountings with nose guards or pads integral with the frame.

132 With nose grip, nose guard, pad, or cushion:

This subclass is indented under subclass 124. Subject matter including significant nose grip, nose guard, pad or cushion structure with a bridge or wherein a significant relationship exists between this structure and the bridge.

SEE OR SEARCH THIS CLASS, SUBCLASS:

131, for nose grips or guards integral with the bridge.

136+, for nose pads or cushions.

133 With connectors or straps:

This subclass is indented under subclass 124. Subject matter wherein the bridge has lens or lens-rim supporting means laterally extending from the ends of the bridge.

(1) Note. In the embodiment here the bridge may be detachable from the lens supports, or may be interconnected with supports having ball-sockets, segmental attaching plates or spring arms.

SEE OR SEARCH THIS CLASS, SUBCLASS:

140+, for connectors joining a bridge to the lens or rim.

SEE OR SEARCH CLASS:

403, Joints and Connections, appropriate subclasses for joints and connections generally, especially subclasses 52+ for articulated connections.

134 Unitary bridge and straps:

This subclass is indented under subclass 133. Subject matter wherein the bridge and lens straps are made of an integral piece of metal, or wherein the ends of the bridge and the lens straps are soldered or welded together.

135 With lens clamping straps:

This subclass is indented under subclass 133. Subject matter wherein the bridge has lens clamping members which usually secure the lenses without screw fasteners and lens perforations.

(1) Note. The above bridge-clamps may use a cementitious medium to secure the lens in the clamping member.

SEE OR SEARCH THIS CLASS, SUBCLASS:

144, for lens straps with cementing or fusing.

149, for lens straps having projections to engage the lens.

152, for lens straps with clamping arms.

136 Nose pads or cushions:

This subclass is indented under subclass 41. Subject matter including pads or cushions which rest against the nose of the wearer and thereby prevent contact between the pad-supports and the nose.

(1) Note. The above noted pads or cushions may be integral with the bridge or lens rims or may be carried on the nose grip arms.

SEE OR SEARCH THIS CLASS, SUBCLASS:

78+, for nose pads in pince-nez-type glasses, or intended for use with pince-nez glasses.

132, for spectacle bridges including nose pads or cushions.

137 Adjustable, rockable, or pivotable:

This subclass is indented under subclass 136. Subject matter wherein the nose pads or cushions are movably mounted to have proper play or rocking movement.

SEE OR SEARCH THIS CLASS, SUBCLASS:

88, for continuous rim mountings with adjustable nose pads.

126+, and 128, for flexible and adjustable bridges respectively.

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148, for adjustable strap-type connectors.

138 Detachable:
This subclass is indented under subclass 136. Subject matter wherein the nose pad may be readily attached or detached from its support.

SEE OR SEARCH THIS CLASS, SUBCLASS:
80, for detachable nose pads in pince-nez glasses.
88, for continuous rim mountings with detachable nose pads.

139 With cover or coating:
This subclass is indented under subclass 136. Subject matter wherein the nose pads and/or its support has a covering tightly adherent thereto or a coating, which may be relatively noncorrosive.

SEE OR SEARCH THIS CLASS, SUBCLASS:
117, for temples with covered cores or rods.

140 Connectors:
This subclass is indented under subclass 41. Subject matter for joining parts of spectacles or eyeglasses together such as the bridge to the lens or rim, the nosepiece to the rim or lens, or the temple to the rim or lens.

(1) Note. This subject matter is restricted to the connector or the connector with conventional spectacle parts broadly claimed. Where details of other spectacle parts are recited classification is in the subclasses above; however, a lens claimed broadly or in detail together with connectors or mountings is classified here.

SEE OR SEARCH THIS CLASS, SUBCLASS:
133+, for bridges with connectors to the nose grips in pince-nez glasses.

SEE OR SEARCH CLASS:
285, Pipe Joints or Couplings, for pipe couplings generally.
403, Joints and Connections, appropriate subclasses for joints and connections in general.
411, Expanded, Threaded, Driven, Headed, Tool-Deformed, or Locked-Threaded Fastener, appropriate subclasses for various fasteners of general utility.

141 With screw locking means:
This subclass is indented under subclass 140. Subject matter wherein screw or bolt-locking means are provided to prevent loosening of the connecting screw or bolt.

(1) Note. The subject matter classified here may comprise conical nuts, springs, washers, and fusible or other locking means.

SEE OR SEARCH THIS CLASS, SUBCLASS:
121, for temple with connections or mountings.

SEE OR SEARCH CLASS:
70, Locks, subclasses 229+ for bolt, nut stud, stud-cap, and subclass 230 for such elements stationary locked.

142 Strap type:
This subclass is indented under subclass 140. Subject matter wherein the lens securing device comprised a strap with spaced ears or arms for engaging the lens therebetween.

(1) Note. The above noted lens-securing devices are usually provided in rimless-type spectacles and pince-nez glasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
64, and 65+, for pince-nez-type eyeglasses.
110, for rimless lens-type mountings.

143 With particular bracing bar or stud:
This subclass is indented under subclass 142. Subject matter in which the straps are equipped with reinforcing braces, supplemental lens gripping ears or rigid pins to securely embrace or clamp the lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:
70, for bridges with nose guards and connectors in pince-nez glasses.

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144 With cementing or fusing:
This subclass is indented under subclass 142. Subject matter wherein the strap and the lens are securely locked in assembled relation by the application of cement, solder or any other suitable bonding material between lens and strap-members.

(1) Note. The above noted strap and lens connecting means may be used to secure the bridge strap or the temple strap to the lenses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
65+, and 110, for pince-nez-type mountings and rimless-type spectacles respectively.

SEE OR SEARCH CLASS:
156, Adhesive Bonding and Miscellaneous Chemical Manufacture, especially subclasses 60 through 303 and 349 through 583.91 for surface bonding generally.

145 With cushion around lens screw or bolt:
This subclass is indented under subclass 142. Subject matter wherein resilient cushioning material is provided between the strap members and the lens and around the connecting screw or bolt.

(1) Note. The cushioning material here may be made of rubber, cardboard, fiber or plastic.

SEE OR SEARCH THIS CLASS, SUBCLASS:
151, for strap connectors with springs between the lens and the strap.

146 Sleeve or bushing:
This subclass is indented under subclass 145. Subject matter wherein the cushioning material constitutes a preformed bushing or sleeve which is pressed into the fastening hole of a lens or into the screw holes in the strap arms to prevent any play between the mounting and the lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:
110, for rimless lens-type mountings.

SEE OR SEARCH CLASS:
411, Expanded, Threaded, Driven, Headed, Tool-Deformed, or Locked-Threaded Fastener, subclasses 531+ for washers of general utility.

147 With serrated interengaging parts:
This subclass is indented under subclass 142. Subject matter wherein strap arms and screw heads are provided with serrations for interlocking engagement to prevent loosening of the interlocked members.

148 Adjusting:
This subclass is indented under subclass 142. Subject matter wherein the lens strap connectors are adjustable to permit changing the position of the lens vertically or horizontally with reference to the eye, or to permit insertion of lenses of different shape or dimensions.

SEE OR SEARCH THIS CLASS, SUBCLASS:
69, for pince-nez-type mountings in which the lens and nose guard pivot on the bridge.
128, for adjustable bridges.
153, for connectors with particular hinges.

SEE OR SEARCH CLASS:
24, Buckles, Buttons, Clasps, etc., subclass 265 for strap-end-attaching devices generally.

149 With interengaging projection and recess:
This subclass is indented under subclass 142. Subject matter including a stud or projection on the strap or lens engaging in a slot recess or indentation in the other.

(1) Note. Parts of the above noted mounting strap may engage with a plurality of slots arranged in the lens at angle to each other, or the strap may engage a lens-slot of varying width for securing the lens.

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150 With resilient parts (e.g., resilient strap arms):
This subclass is indented under subclass 142. Subject matter including clamps or brackets for yieldably attaching lenses to ophthalmic mountings.

SEE OR SEARCH THIS CLASS, SUBCLASS:
55, for bridges with clamping members.
106, for screwless-type lens connections in semirimless mountings.

151 Spring between lens and strap:
This subclass is indented under subclass 150. Subject matter wherein resilient metal elements, such as leaf springs, are interposed between the strap member and the adjacent edge of the lens to maintain the connection between the lens and the strap flexibly but firmly in proper relation.

(1) Note. These springs are usually provided in rimless-type spectacles.

SEE OR SEARCH THIS CLASS, SUBCLASS:
110, for rimless lens-type mountings.
145+, for strap connectors with a cushion around the lens screw or bolt.

SEE OR SEARCH CLASS:
267, Spring Devices, for spring structures generally.

152 With clamping arms:
This subclass is indented under subclass 142. Subject matter wherein strap-type lens connectors comprise metal clamps for gripping the surface of a rimless lens without employment of the usual fastening screw.

SEE OR SEARCH THIS CLASS, SUBCLASS:
103+, for semirim-type mountings.
110, for rimless lens-type mountings.
149, for strap-type connectors with interengaging projections and recesses.

SEE OR SEARCH CLASS:
24, Buckles, Buttons, Clasps, etc., subclass 265 for strap-end-attaching devices generally.

153 With particular hinge:
This subclass is indented under subclass 140. Subject matter wherein significant hinge details or relationships are claimed, such as the connector between a plastic temple and eyeglass rim comprising a metallic hinge member anchored in a slot or groove of the temple and/or the rim.

SEE OR SEARCH THIS CLASS, SUBCLASS:
121, for temples with connectors or straps.

SEE OR SEARCH CLASS:
16, Miscellaneous Hardware (e.g., Bushing, Carpet Fastener, Caster, Door Closer, Panel Hanger, Attachable or Adjunct Handle, Hinge, Window Sash Balance, etc.), subclass 228 for eyeglass hinge structure, per se.

154 Lens linings or rims:
This subclass is indented under subclass 41. Subject matter including linings for interposition between the edge of a lens and the rim of a frame or for application around lenses in rimless spectacles or eyeglasses; also included here are rims placed around the periphery of lenses to position the axes of cylindrical or prismatic lenses properly.

(1) Note. The above noted linings or rims may be made from rubber resilient metal or glass and may be transparent or colored.

SEE OR SEARCH THIS CLASS, SUBCLASS:
51+, for spectacles with ornamentation.
86, for spectacles with lens retaining or locking means.
102, for spectacles with combined metal and plastic rims.

155 With support or holder (e.g., on hat or cap):
This subclass is indented under subclass 41. Subject matter including structure in addition to the spectacle or eyeglass structure for sup-

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porting the spectacles or eyeglasses during use, or out of vision position.

(1) Note. For classification here the spectacles must be at least broadly included in the claim; or the support if claimed alone must be peculiarly adapted for holding spectacle or eyeglasses. Since a basic function of the spectacles is to support the lenses on the user, it is emphasized that the supports here classified are something in addition to the normal spectacle frames as classified above.

SEE OR SEARCH THIS CLASS, SUBCLASS:
43, for floating-type spectacles,
57, for spectacles with auxiliary lens attachment.
66, for pince-nez glasses with ear chains.
112, for temples with a pocket clip or clasp.
227, for trial frames.

SEE OR SEARCH CLASS:
206, Special Receptacle or Package, subclasses .5+ for spectacle cases.
248, Supports, subclasses 200+ for brackets generally.

156 With head embracing bow or chain:
This subclass is indented under subclass 155. Subject matter wherein spectacles are without the usual temples but comprise a strap or chain which embraces the head of a wearer to support and retain the glasses without irritating the nose or ears.

(1) Note. The above straps or chains carry usually means for adjusting the glasses manually, e.g., up., down, or farther apart for the correct pupillar distance.

SEE OR SEARCH THIS CLASS, SUBCLASS:
157, for neck retainers.
227, for trial frame structures.

SEE OR SEARCH CLASS:
2, Apparel, subclass 452 for goggles which often include similar supporting structure.

157 Neck retainers:
This subclass is indented under subclass 155. Subject matter wherein spectacles have a holder or band usually connected to the temples and encircling the head or neck of a wearer to retain and support the spectacles when removed from their operative position.

(1) Note. The above holders are usually adjustable longitudinally of the temples and are removably secured in a selected position.

SEE OR SEARCH CLASS:
381, Electrical Audio Signal Processing Systems and Devices, subclasses 330+ for supports for hearing aid devices.

158 Combined:
This subclass is indented under subclass 41. Subject matter wherein the spectacles or eyeglasses are combined with additional structure, which may or may not be optical, and not provided for elsewhere.

SEE OR SEARCH THIS CLASS, SUBCLASS:
44+, for spectacles with anti-glare or shading.
50, for spectacles with rear-view reflectors.
51+, for spectacles with decoration.
155, for spectacles with supports or holders.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 409+, 481, and 816 for telescopes and magnifiers with spectacle-type mounting.
362, Illumination, subclasses 103+ for combined light and spectacle structure, and for body attached light supports.
381, Electrical Audio Signal Processing Systems and Devices, subclass 327 for eyeglass hearing aid units.
607, Surgery: Light, Thermal, and Electrical Application, subclasses 139+ for spectacles with structure making electrical applications to the head.

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159.01 Ophthalmic lenses:
This subclass is indented under subclass 41. Subject matter wherein the lens has a surface so curved as to correct, modify or enhance the vision of an eye by placing the lens in front of or on the eye.

(1) Note: This subject matter is distinct from, and does not include, multiple component or compound lens systems designed for taking and exhibiting pictures or for use in binoculars, telescopes or microscopes. See appropriate subclasses of Class 359.

SEE OR SEARCH THIS CLASS, SUBCLASS:
41 through 158, for spectacles and eyeglasses, per se.
205 through 221, for subject matter which may include lenses for examining the eye of a patient.

SEE OR SEARCH CLASS:
2, Apparel, subclasses 426 through 454 for goggles, per se
359, Optical: Systems and Elements, appropriate subclasses or lenses and compound lens systems, per se.
623, Prosthesis (i.e., Artificial Body Members), Parts Thereof, or Aids and Accessories Therefor, subclasses 4.1 through 6.64 for surgically implanted lenses and corneal implants.

159.02 Eye contact:
This subclass is indented under 159.01. Subject matter wherein the lens is particularly adapted to be placed directly in contact with, usually on, the cornea of the eye.

SEE OR SEARCH CLASS:
623, Prosthesis (i.e., Artificial Body Members), Parts Thereof, or Aids and Accessories Therefor, subclasses 6.11 through 6.62 for intraocular lenses (IOLs), per se.

159.03 Electro-active:
This subclass is indented under subclass 159.02. Subject matter wherein the eye contact ophthalmic lens is composed of a material which, when activated by an applied electric potential, produces an index of refraction that is variable in response to the applied electrical potential.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.39, for electro-active non-eye contacting ophthalmic lenses.

159.04 With fluid exchange means:
This subclass is indented under subclass 159.02. Subject matter wherein the eye contacting lens provides for or facilitates the transfer of a gas or liquid between the lens surface and the eye.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 665 through 667 for a fluid lens, per se.

159.05 Multifocal:
This subclass is indented under subclass 159.02. Subject matter wherein the contact lens has two or more zones of different focal lengths for vision correction.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.41 through 159.49, for a non-eye contacting multifocal ophthalmic lens.
159.4, for an non eye-contacting electro-active multifocal ophthalmic lens.

159.06 Progressive:
This subclass is indented under subclass 159.05. Subject matter wherein the zones of the multifocal contact lens vary gradually in dioptic power.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.42, for a non-eye contacting multifocal progressive ophthalmic lens.

159.07 Astigmatic correction:
This subclass is indented under subclass 159.05. Subject matter wherein the multifocal eye contact lens compensates for astigmatism*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.46, for astigmatic-correcting, multifocal non-eye contacting ophthalmic lens.

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159.22, for an astigmatic correcting eye-contacting ophthalmic lens without multiple foci.

159.08 Lens pairs having differing profile:
This subclass is indented under subclass 159.05. Subject matter having a multifocal contact lens pair wherein each lens has a different zonal configuration.

159.09 Ghost image or blur reduction:
This subclass is indented under subclass 159.05. Subject matter wherein the eye contacting ophthalmic lens minimizes false images, faint secondary images or out of focus images.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.55, for a non-eye contacting ophthalmic lens for reducing ghosting.

159.1 Specific viewing zones:
This subclass is indented under subclass 159.05. Subject matter wherein the two or more zones are spatially distinct and defined.

159.11 Having diffractive portion:
This subclass is indented under subclass 159.1. Subject matter wherein a specific viewing area of the eye contacting multifocal lens causes a light beam to split and interfere with itself.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.35, for a monofocal eye-contacting ophthalmic lens having a diffractive portion.
159.15, for an eye-contacting multifocal ophthalmic lens having a diffractive portion without specific viewing zones.
159.26, for a colored eye contacting ophthalmic lens having a diffractive portion.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 358 through 567 for diffractive lenses, per se.

159.12 Annular zones:
This subclass is indented under subclass 159.1. Subject matter wherein specific viewing zones of the eye contacting multifocal ophthalmic lens are arranged in distinct circular areas positioned about an axis, i.e., in concentric rings.

159.13 Aspheric zone:
This subclass is indented under subclass 159.12. Subject matter wherein a specific viewing zone of the eye contacting multifocal lens has a slightly less than spheric shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.37, for an eye-contacting ophthalmic lens having an aspherical surface.
159.47, for a multifocal non eye-contacting ophthalmic lens having an aspherical surface.
159.53, for a non eye-contacting ophthalmic lens for focus or astigmatism correction having an asperhical surface.
159.71, for a non eye-contacting ophthalmic lens having an aspherical surface.
159.2, for an eye-contacting multifocal ophthalmic lens having an asperhical surface.

159.14 Segmented zones:
This subclass is indented under subclass 159.1. Subject matter wherein the specific viewing zones of the eye-contacting multifocal lens are arranged in distinct areas converging to an axis.

159.15 Having a diffractive portion:
This subclass is indented under subclass 159.05. Subject matter wherein the multifocal eye-contacting lens causes a light beam to split and interfere with itself.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.35, for a monofocal eye-contacting ophthalmic lens having a diffractive portion.
159.26, for a colored eye-contacting ophthalmic lens have a diffractive portion.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 358 through 567 for diffractive lenses, per se.

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159.16 With off-axis viewing zone:
This subclass is indented under subclass 159.05. Subject matter wherein the eye-contacting multifocal lens has a nonsymmetrical viewing area with respect to the optical axis of the lens.

159.17 Prismatic:
This subclass is indented under subclass 159.05. Subject matter wherein the multifocal eye-contacting ophthalmic lens is formed with a wedge or tapered cross-section to deflect incident light from the object to the eye.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.45, for a non eye-contacting prismatic multifocal ophthalmic lens.
159.58, for a non eye-contacting prismatic ophthalmic lens.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 831 through 837 for prisms, per se.

159.18 Having means to regulate pressure:
This subclass is indented under subclass 159.05. Subject matter wherein the multifocal eye-contacting ophthalmic lens includes means to apply or relieve force caused by eye fluid.

159.19 Having a means to limit or facilitate movement:
This subclass is indented under subclass 159.05. Subject matter wherein the multifocal eye-contacting ophthalmic lens includes means which aids or provides for the stabilization or movement of the lens with respect to the eye.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.36, for an eye-contacting ophthalmic lens having a means to limit or facilitate movement.

159.2 Aspherical:
This subclass is indented under subclass 159.05. Subject matter wherein the multifocal eye-contacting ophthalmic lens has a slightly less than spheric shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.37, for an eye-contacting ophthalmic lens having an aspherical surface.
159.47, for a multifocal non eye-contacting ophthalmic lens having an aspherical surface.
159.53, for a non eye-contacting ophthalmic lens for focus or astigmatism correction having an asperhical surface.
159.71, for a non eye-contacting ophthalmic lens having an aspherical surface.
159.13, for an eye-contacting, multifocal ophthalmic lens having an aspherical surface.

159.21 Toric:
This subclass is indented under subclass 159.2. Subject matter wherein the aspheric multifocal eye-contacting ophthalmic lens has a maximum optical power in one meridian and a minimum optical power in a perpendicular meridian.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.38, for an eye-contacting ophthalmic lens wherein the aspheric surface is toric.
159.54, for a non eye-contacting ophthalmic lens for focus or astigmatism correction where the aspheric surface is toric.
159.72, for a non eye-contacting ophthalmic lens wherein the aspheric surface is toric.

159.22 Astigmatic correction:
This subclass is indented under subclass 159.02. Subject matter wherein the eye-contacting ophthalmic lens compensates for astigmatism*.

159.23 Orthokeratology contact lens:
This subclass is indented under subclass 159.02. Subject matter wherein the eye-contacting ophthalmic lens is a rigid contact lens specifically designed to improve vision through the reshaping of the wearer’s cornea.

(1) Note: Othokeratology contact lenses are normally rigid gas-permeable contact lenses, worn during sleeping usually in an effort to correct myopia.

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159.24 Colored:

This subclass is indented under subclass 159.02. Subject matter wherein the eye-contacting ophthalmic lens comprises, in whole or in part, a hue or tint.

SEE OR SEARCH THIS CLASS, SUBCLASS:

159.39, for a non eye-contacting electroactive ophthalmic lens having color.

159.66, for a non eye-contacting ophthalmic lens having color.

159.25 Digitally encoded:

This subclass is indented under subclass 159.24. Subject matter wherein the tint is applied to the eye-contacting ophthalmic lens via a pixel by pixel process.

159.26 Having a diffractive portion:

This subclass is indented under subclass 159.24. Subject matter wherein the colored eye-contacting ophthalmic lens includes an area that causes a light beam to split and interfere with itself.

SEE OR SEARCH THIS CLASS, SUBCLASS:

159.11, for an eye-contacting multifocal ophthalmic lens wherein the specific viewing area is diffractive.

159.15, for an eye-contacting multifocal ophthalmic lens having a diffractive portion without specific viewing zones.

159.35, for a monofocal eye-contacting ophthalmic lens having a diffractive portion.

SEE OR SEARCH CLASS:

359, Optical: Systems and Elements, subclasses 358 through 567 for diffractive lenses, per se.

159.27 With polarization:

This subclass is indented under subclass 159.24. Subject matter wherein the colored eye-contacting ophthalmic lens restricts vibrations of the magnetic or electric field vector to a single plane of the incident light.

SEE OR SEARCH THIS CLASS, SUBCLASS:

159.55, for a non eye-contacting ophthalmic lens having polarization.

159.56, for a non eye-contacting light filtering ophthalmic lens having polarization.

SEE OR SEARCH CLASS:

359, Optical: Systems and Elements, subclasses 483.01 through 494.01 for polarizing lenses, per se.

159.28 With indicia:

This subclass is indented under subclass 159.24. Subject matter wherein the colored eye-contacting ophthalmic lens further includes distinguishing markings (i.e., letters, numbers, symbols, etc.) on the lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:

159.69, for ophthalmic lenses with indicia not elsewhere provided for.

159.29 Protective color:

This subclass is indented under subclass 159.24. Subject matter wherein the color for a colored eye-contacting ophthalmic lens is provided to safeguard the eye of the user from harmful light energy.

159.3 Multiple colors:

This subclass is indented under subclass 159.24. Subject matter wherein the colored eye-contacting ophthalmic lens comprises two or more hues or tints.

159.31 Graded density distribution:

This subclass is indented under subclass 159.24. Subject matter wherein the color intensity of the colored eye-contacting ophthalmic lens is applied in a non-random manner.

159.32 Particular color:

This subclass is indented under subclass 159.24. Subject matter wherein the colored eye-contacting ophthalmic lens comprises a specific hue or tint.

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159.33 Hydrophilic:
This subclass is indented under subclass 159.02. Subject matter wherein the ophthalmic lens is made of a material that has an affinity for water.

159.34 Fluid lens:
This subclass is indented under subclass 159.02. Subject matter wherein the refractive material in an eye-contacting ophthalmic lens, is a transparent or translucent liquid or gas.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 665 through 667 for fluid lenses, per se.

159.35 Having a diffractive portion:
This subclass is indented under subclass 159.02. Subject matter wherein the eye-contacting ophthalmic lens causes a light beam to split and interfere with itself.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.11, for an eye-contacting multifocal ophthalmic lens having a diffractive portion.
159.26, for a colored eye-contacting ophthalmic lens having a diffractive portion.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 358 through 576 for diffractive lenses, per se.

159.36 Having a means to limit or facilitate movement:
This subclass is indented under subclass 159.02. Subject matter wherein the eye-contacting ophthalmic lens comprises a means which aids or provides for the stabilization of movement of the lens with respect to the eye.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.19, for eye-contacting lenses with means to limit or facilitate movement of the lens.

159.37 Aspherical:
This subclass is indented under subclass 159.02. Subject matter wherein the eye-contacting ophthalmic lens has a slightly less than spheric shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.47, for a multifocal non eye-contacting ophthalmic lens having an aspherical surface.
159.53, for a non eye-contacting ophthalmic lens for focus or astigmatism correction having an aspherical surface.
159.71, for a non eye-contacting ophthalmic lens having an aspherical surface.
159.13, for a multifocal eye-contacting ophthalmic lens having a specific viewing zone that is aspherical.
159.2, for an eye-contacting multifocal ophthalmic lens having an aspherical surface.

159.38 Toric:
This subclass is indented under subclass 159.37. Subject matter wherein the aspheric eye-contacting ophthalmic lens has a maximum optical power in one meridian and a minimum optical power in a perpendicular meridian.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.54, for a non eye-contacting ophthalmic lens for focus or astigmatism correction wherein the aspheric surface is toric.
159.72, for a non eye-contacting ophthalmic lens wherein the aspheric surface is toric.
159.21, for an eye-contacting multifocal ophthalmic lens wherein the aspheric surface is toric.

159.39 Electro-active:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens is composed of a material which, when activated by an applied electric potential, produces an index of refraction that is variable in response to the applied electrical potential.

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SEE OR SEARCH THIS CLASS, SUBCLASS:
159.03, for an electro-active eye-contacting ophthalmic lens.

159.4 Multifocal:
This subclass is indented under subclass 159.39. Subject matter wherein the electro-active ophthalmic lens has two or more zones of different focal lengths for vision correction.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.05 through 159.21, for an eye-contacting multifocal ophthalmic lens.
159.41 through 159.49, for a non eye-contacting multifocal ophthalmic lens.

159.41 Multifocal:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens has two or more zones of different focal lengths for vision correction.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.05 through 159.21, for an eye-contacting multifocal ophthalmic lens.
159.4, for an non eye-contacting electro-active multifocal ophthalmic lens.

159.42 Progressive:
This subclass is indented under subclass 159.41. Subject matter wherein the zones of differing focal lengths of the multifocal ophthalmic lens vary gradually in dioptic power.

159.43 Three or more foci:
This subclass is indented under subclass 159.41. Subject matter wherein the multifocal ophthalmic lens has at least three zones of different focal lengths for vision correction.

(1) Note. The lens may have countersinks and segments of different refractive powers fused therein, or the lens may be formed of one piece with the near vision and intermediate vision portions ground away. The countersinks and segments as well as the ground-away lens portions in the one-piece lens may be of different dimension and shapes.

159.44 Having a diffractive portion:
This subclass is indented under subclass 159.41. Subject matter wherein the multifocal ophthalmic lens causes a light beam to split and interfere with itself.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 358 through 576 for diffractive lenses, per se.

159.45 With prismatic segment:
This subclass is indented under subclass 159.41. Subject matter wherein the ophthalmic lens is formed with a wedge or tapered cross-section to deflect incident light.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.17, for an eye-contacting multifocal prismatic ophthalmic lens.
159.58, for prismatic ophthalmic lenses, per se.

159.46 Astigmatic correction:
This subclass is indented under subclass 159.41. Subject matter wherein the multifocal ophthalmic lens compensates for astigmatism*.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.22, for an astigmatic correcting eye-contacting ophthalmic lens without multiple foci.
159.07, for a multifocal eye-contacting ophthalmic lens with astigmatic correction.

159.47 Aspherical:
This subclass is indented under subclass 159.41. Subject matter wherein the multifocal ophthalmic lens has a slightly less than spheric shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.13, for an eye-contacting, multifocal lens with annular, aspheric zone.
159.37, for an eye-contacting, aspherical monofocal ophthalmic lens.
159.53, for a non eye-contacting ophthalmic lens for focus or astigmatism correction having an asperhical surface.

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159.71, for a non eye-contacting ophthalmic lens having an aspherical surface.

159.48 Multiple elements:
This subclass is indented under subclass 159.41. Subject matter wherein multiple lens elements of different refractive indices have their adjacent surfaces joined together to provide a unitary multifocal lens that has, for example, a long vision and a reading section.

(1) Note. The subject matter here comprises, for example, a major glass member having a shallow countersink and a relatively thin segment fused therein, a thin reading segment fused to a major glass surface, or the lens members may be held in place by using frame pieces.

159.49 With light filtering means:
This subclass is indented under subclass 159.41. Subject matter wherein the ophthalmic multifocal lens has the property of absorbing, blocking or reflecting selected electromagnetic radiation.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.6 through 159.65, for light filtering non-multifocal glasses or spectacles.
159.24, for a colored eye-contacting ophthalmic lenses having color.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 483.01 through 494.01 for polarization means in general, and subclasses 885-892 for light absorption means in general.

159.5 Image size (anisekonia) correction:
This subclass is indented under subclass 159.01. Subject matter wherein at least one surface of the ophthalmic lens is shaped to provide a prescribed magnification without refractive power.

(1) Note. The subject matter here may include the addition of refractive power by suitably grinding the second surface of the lens. This subclass also provides for two lenses (one for each eye), one or both of which may be within the scope of the above definition.

159.51 Lens for aphakic eye:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens is specially adapted for an eye lacking the crystalline lens due to surgical removal, perforating wound or ulcer, or congenital anomaly.

159.52 Focus or astigmatism correction:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens has at least one lens surface having a spherical curvature providing dioptics or lens powers for correction of focal errors of the eye or wherein one lens curvature may be in cylindrical or toric form to compensate for astigmatic errors of the eye.

159.53 Aspherical lens:
This subclass is indented under subclass 159.52. Subject matter wherein the ophthalmic lens for focal or astigmatism correction has a slightly less than spheric shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.13, for a multifocal, eye-contacting ophthalmic aspheric lens having annular zones.
159.02, for a multiocal, eye-contacting ophthalmic lens having an aspherical surface.
159.37, for an eye-contacting ophthalmic lens having an aspherical surface.
159.47, for a non eye-contacting multifocal ophthalmic lens having an aspherical surface.
159.71, for a non eye-contacting ophthalmic lens having an aspherical surface.

159.54 Toric:
This subclass is indented under subclass 159.53. Subject matter wherein the aspheric lens has a maximum optical power in one meridian and a minimum optical power in a perpendicular meridian.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.21, for an eye-contacting multifocal ophthalmic lens wherein the aspheric surface is toric.
159.38, for an eye-contacting ophthalmic lens wherein the aspheric surface is toric.

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159.72, for a non eye-contacting ophthalmic lens wherein the aspheric surface is toric.

159.55 Ghosting:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens minimizes false images, faint secondary images and out of focus images.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.09, for a multifocal eye-contacting ophthalmic lens for reducing blur or ghosting.

159.56 With polarization:
This subclass is indented under subclass 159.39. Subject matter wherein the light filtering ophthalmic lens, in whole or in part, restricts vibrations of the magnetic or electric field vector to a single plane of the incident light.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.27, for a colored, eye-contacting, polarizing ophthalmic lens.

159.57 With lens protective layer:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens comprises a covering for shielding the lens from physical damage (e.g., scratching, corrosion, breaking, etc.).

159.58 Prismatic:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens is formed with a wedge or tapered cross section to deflect incident light from the object to the eye.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.45, for a non eye-contacting multifocal prismatic ophthalmic lens.
159.17, for a prismatic multifocal eye-contacting ophthalmic lens.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 831 through 837 for prisms, per se.

159.59 With light filtering means:
This subclass is indented under subclass 159.58. Subject matter wherein the prismatic ophthalmic lens has the property of absorbing, blocking or reflecting selected electromagnetic radiation.

159.6 With light filtering means:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens has the property of absorbing, blocking or reflecting selected electromagnetic radiation.

SEE OR SEARCH THIS CLASS, SUBCLASS:
44, for antiglare or shading glasses or spectacles.
159.24, for eye-contacting ophthalmic lenses having color.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 483.01 through 494.01 for polarization means in general, and subclasses 885-892 for light absorption means in general.

159.61 Photochromatic:
This subclass is indented under subclass 159.6. Subject matter wherein the light filtering ophthalmic lens transmits light in reverse proportion to the intensity of the input light ray.

159.62 Laminated structure:
This subclass is indented under subclass 159.6. Subject matter wherein the light filtering ophthalmic lens is constructed in a layered configuration.

159.63 With different light absorption sections:
This subclass is indented under subclass 159.6. Subject matter wherein the ophthalmic lens has vision areas or zones that permit passage of light having a specified wavelength while blocking, without reflectance or transmittance, all other incident light.

159.64 Gradient sections:
This subclass is indented under subclass 159.63. Subject matter wherein the light absorbing sections of the ophthalmic lens have

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a transmittance intensity profile that is non-uniform and non-random.

159.65 Specific light filtering range:
This subclass is indented under subclass 159.6. Subject matter wherein the light filtering ophthalmic lens filters or blocks a specified wavelength range within the electromagnetic spectrum.

159.66 Having color:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens comprises, in whole or in part, a hue or tint.

159.67 With beveled, polished or reinforced edges:
This subclass is indented under subclass 159.01. Subject matter wherein the edge of the ophthalmic lens has been modified as a result of a cutting or grinding process or an addition made to render the periphery smooth or stronger.

159.68 Fluid lens:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens has at least one component or one element which uses a transparent liquid or gas as a refractive material.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.34, for an eye-contacting ophthalmic fluid lens.
159.04, for an eye-contacting ophthalmic lens having a fluid exchanging means.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 665 through 667 for a fluid lens, per se.

159.69 With indicia or marking:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens further comprises distinguishing markings (i.e., letters, symbols, etc.) on the lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.28, for an eye-contacting colored lens with indicia.

159.7 Multiple elements:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens is composed of two or more optical elements.

159.71 Aspherical:
This subclass is indented under subclass 159.01. Subject matter wherein the ophthalmic lens has at least one surface or region that is slightly less than spheric in shape.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.37, for an eye-contacting ophthalmic lens having an aspherical surface.
159.47, for a non eye-contacting multifocal ophthalmic lens having an aspherical surface.
159.53, for a non eye-contacting ophthalmic lens for focus or astigmatism correction having an asperhical lens.
159.13, for an eye-contacting multifocal ophthalmic lens having an aspherical surface.
159.2, for an eye-contacting multifocal ophthalmic lens having an asperhical surface.

159.72 Toric:
This subclass is indented under subclass 159.71. Subject matter wherein the aspheric ophthalmic lens has a maximum optical power in one meridian and a minimum optical power in a perpendicular meridian.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.54, for a non eye-contacting ophthalmic lens for focus or astigmatism correction wherein the aspheric surface is toric.
159.21, for an eye-contacting ophthalmic lens wherein the aspheric surface is toric.
159.38, for an eye-contacting ophthalmic lens wherein the aspheric surface is toric.

159.73 Methods:
This subclass is indented under subclass 159.01. Subject matter including a process of making ophthalmic lenses not elsewhere classifiable.

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(1) Note. This subclass includes process for making contact lenses in general.

SEE OR SEARCH THIS CLASS, SUBCLASS:
247, for a method of fitting a contact lens to the patient's eyeball.

SEE OR SEARCH CLASS:
65, Glass Manufacturing, appropriate subclasses for glass manufacturing, per se.
156, Adhesive Bonding and Miscellaneous Chemical Manufacture, for adhesive bonding of such lenses.
264, Plastic and Nonmetallic Article Shaping or Treating: Processes, subclasses 1.1 through 2.7 for optical article shaping or treating.
451, Abrading, provides for grinding or polishing a lens.

159.74 Lens design:
This subclass is indented under subclass 159.73. Subject matter comprising a method for the development of a plan providing physical parameters for producing an ophthalmic lens.

SEE OR SEARCH CLASS:
703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, for the computer design of physical objects, per se.

159.75 Eyeglasses or spectacles:
This subclass is indented under subclass 159.74. Subject matter wherein the method for designing a lens is for a lens having structure for positioning or supporting the lens from or on the head of the wearer in a correct operative position.

SEE OR SEARCH THIS CLASS, SUBCLASS:
41, for eyeglasses or spectacles, per se.

159.76 Optimization:
This subclass is indented under subclass 159.75. Subject matter wherein the method functions to maximize the efficiency of an eyeglass or spectacle lens's physical parameter.

159.77 Optimization:
This subclass is indented under subclass 159.74. Subject matter wherein the method functions to maximize the efficiency of an ophthalmic lens's physical parameter.

159.78 Eye treatment correcting or relieving (without medication):
This subclass is indented under subclass 159.73. Subject matter wherein the method provides a physical application to the eye to correct an ailment or to offer comfort.

SEE OR SEARCH CLASS:
606, Surgery, subclasses 4 through 6 for ophthalmic light applying instruments, and subclass 204.25, for applying pressure on the eye.

159.79 Myopia:
This subclass is indented under subclass 159.78. Subject matter wherein the eye treatment method provides for treatment of a visual defect wherein images are focused in front of the eye's retina.

159.8 Lens marking:
This subclass is indented under subclass 159.73. Subject matter wherein the method is for providing indicia on the ophthalmic lens.

(1) Note. This subclass provides for the nominal recitation of the printing process. Claims drawn to details of the printing process per se are classified in Class 101, Printing.

SEE OR SEARCH THIS CLASS, SUBCLASS:
159.28, for a colored eye-contacting ophthalmic lens having indicia.
159.69, for ophthalmic lens having indicia.

SEE OR SEARCH CLASS:
101, Printing, for the printing process, per se.

159.81 Creating visual effects:
This subclass is indented under subclass 159.73. Subject matter wherein the method provides the ophthalmic lens wearer with an artificially ophthalmological anomaly.

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178 Methods (e.g., securing lenses in mountings):

This subclass is indented under subclass 41. Subject matter including processes of making spectacles and eyeglasses, securing an eyeglass lens to its support, or of assembling lenses in spectacle frames.

SEE OR SEARCH THIS CLASS, SUBCLASS:

42, for lens-repair devices.
177, for methods of making ophthalmic lenses.
246, for methods of operating or using eye testing instruments.

SEE OR SEARCH CLASS:

29, Metal Working, subclass 20 for machines and processes for making spectacle frames, temples and bridges.

200 EYE EXAMINING OR TESTING INSTRUMENT:

This subclass is indented under the class definition. Subject matter including ophthalmic instruments, optical systems and methods for testing vision, for optical examination and diagnosis (and treatment) with respect to disease and irregularities of the eye, and for ascertaining lenses for correcting errors of refraction or other defects of the eye.

(1) Note. The instruments may comprise supporting bases corneal microscopes, slit lamps and other eye illuminating means, adjustable head or chin resting devices, and illuminable targets. The instruments here are concerned with for example the measuring and testing of the vision characteristics of the eye for the purpose of correcting any determined visual defects. These instruments are associated with the visual path of the eye either for viewing the interior of the eye through the visual path or by utilizing the visual path during the measurement or test. Instruments especially for examining or diagnosing the eye which do not involve its visual path are classified here, if they are essentially optical. However, instruments for treating the eye, or for examining the eye when not optical and not associated with the visual path are classifiable elsewhere. For example, Class 600, Surgery, subclasses 398+ for Tonometry, Class 351, subclasses 41+ for spectacles and eyeglasses and Class 601, Surgery: Kinesitherapy subclass 37 for eye exercising devices. Multipurpose instruments which measure or test within the scope of this subclass, but also perform some nonoptical eye test not associated with the visual path or perform some treatment of the eye are classifiable here, especially in the indented subclass 203.

SEE OR SEARCH THIS CLASS, SUBCLASS:

41+, for spectacles and eyeglasses.
205+, for objective eye testing (e.g., ophthalmoscope and retinoscopes).
211+, for projected target image.
222+, for subjective eye testing.

SEE OR SEARCH CLASS:

359, Optical: Systems and Elements, subclasses 368+ for microscopes, generally.
600, Surgery, subclasses 300+ for diagnostic instruments generally.
606, Surgery, subclass 204.25 for eye exercising devices which make physical contact with the eye. See also (1) Note above.

201 For fusion and space perception testing (e.g., stereoscopic vision):

This subclass is indented under subclass 200. Subject matter including instruments used for testing simultaneous binocular vision for determining space perception and determining the condition of prismatic imbalance, both vertically and laterally, of a pair of eyes.

(1) Note. The above instruments may polarize the light in crossed planes coming from the different portions of a target, or may present pairs of half stereograms to the respective eyes, or may present a plurality of independently movable targets so that the correct optical positions for true image convergence or true stereopsis are obtained.

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SEE OR SEARCH CLASS:
600, Surgery, subclasses 300+ for diagnostic apparatus.

202 Of abnormal muscular functioning:
This subclass is indented under subclass 201. Subject matter relates to apparatus for detecting the state of extrinsic ocular muscles and for determining the amount of imbalance or insufficiency thereof.

(1) Note. Spaced apart target means in conjunction with binocular polarizing viewers may be utilized in the above apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:
232, for subjective eye testing with light polarizing lens.

203 Eye exercising or training type:
This subclass is indented under subclass 200. Subject matter including multipurpose instruments, which serve to examine and test the eye to rectify defective vision, and which may be used to subject the eyes to a controlled muscle strain period or flashed illumination for training and exercising purposes.

(1) Note. The above instruments may comprise prismatic lenses of adjustable power, stereoscopic devices, or movable test objects for exercising ocular muscles.

204 For interpupillary distance measuring or lens positioning:
This subclass is indented under subclass 200. Subject matter including instruments for ascertaining the accurate distance between the pupils of a patient's eyes so that spectacle frames and/or eyeglass lenses will be properly related to the pupils.

(1) Note. Included here are instruments to accurately determine the best size and vision field placement of multifocal segments.

SEE OR SEARCH CLASS:
33, Geometrical Instruments, subclass 200 for spectacle gauges.

205 Objective type:
This subclass is indented under subclass 200. Subject matter including instruments for examining the eye of a patient independently of the patient's perceptions of responses, for example, by observing a light or image directed onto or into the eye to diagnose the eye or to ascertain the power of refraction.

SEE OR SEARCH THIS CLASS, SUBCLASS:
245, for instrument support.

SEE OR SEARCH CLASS:
600, Surgery, subclasses 300+ for diagnostic instruments generally.

206 Including eye photography:
This subclass is indented under subclass 205. Subject matter includes still or motion-picture apparatus for photographing the interior of the eye.

(1) Note. The above apparatus may comprise luminous eye fixation objects and/or interconnected illumination and shutter-actuating means.

SEE OR SEARCH CLASS:
352, Optics: Motion Pictures, for motion-picture apparatus.
396, Photography, subclass 18 for an ocular camera.

207 Having spurious reflection blocking:
This subclass is indented under subclass 206. Subject matter including means for blocking undesirable reflections from the eye, or from elements in the optical path.

208 Having means to detect proper distance or alignment (i.e., eye to instrument):
This subclass is indented under subclass 206. Subject matter including means for indicating when the photographing instrument and the eye are at the proper alignment or distance with respect to each other.

209 Including eye movement detection:
This subclass is indented under subclass 205. Subject matter including means for indicating or recording eye movement.

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210 Using photodetector:
This subclass is indented under subclass 209. Subject matter where the indicating or recording means is a photosensitive device.

211 Including projected target image:
This subclass is indented under subclass 205. Subject matter wherein light rays or images of illuminated targets or reticules are projected onto a selected plane in the eye or a patient during examination.

(1) Note. The above noted targets may be used with monocular or binocular testing instruments and the images may be directed into the eye by mirrors or prisms which intersect the line of vision.

SEE OR SEARCH THIS CLASS, SUBCLASS:
237, for projected target in subjective testing.

212 For cornea curvature measurement:
This subclass is indented under subclass 211. Subject matter wherein the projected target image is used for measuring the curvature of the cornea.

SEE OR SEARCH THIS CLASS, SUBCLASS:
247, for methods of contact lens fitting.

213 Including light filter or absorber:
This subclass is indented under subclass 205. Subject matter including a filter or absorber wherein a light beam directed into a patient's eye is of a specific color or wave length, or wherein the luminous intensity of the light is weakened to a desired magnitude by appropriate absorbers.

SEE OR SEARCH THIS CLASS, SUBCLASS:
233, for movable lens or filter selectively insertable in optical path.

214 Including diaphragm of slit:
This subclass is indented under subclass 205. Subject matter in which a movable diaphragm or narrow slit is provided through which a strong light is passes into the eye being tested.

(1) Note. The above instruments employ usually artificial light, e.g., Neon light, and the diaphragm or slit is adjustable to determine refraction deficiencies of the eye.

215 Including light polarizing means:
This subclass is indented under subclass 205. Subject matter including a light polarizer wherein the light which is directed into or emerges from the eye of a patient is polarized to avoid reflexes and to obtain the greatest possible intensity of illumination and image-clarity.

(1) Note. The above light polarizers may comprise two adjustable light polarizing foils, or the foils may polarize the light linearly so that their planes of oscillation are at right angles to each other.

SEE OR SEARCH THIS CLASS, SUBCLASS:
203, for eye-exercising devices with light polarizers.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 483.01 through 494.01 for polarizing devices generally.

216 Including lens selectively insertable in optical path:
This subclass is indented under subclass 205. Subject matter wherein adjustably mounted test lens(es) are selectively placed in front of the observed eye for measuring the refraction of the eye so as to provide correcting lenses therefor.

(1) Note. The lenses may be spherical, cylindrical or prismatic, and may be insertable in monocular or binocular test instruments, which may be portable or fixedly mounted in a physicians's office.

SEE OR SEARCH THIS CLASS, SUBCLASS:
234, for subjective testing instruments wherein lenses or filters are mounted on a rotatable disc.

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217 On rotary disc:
This subclass is indented under subclass 216. Subject matter wherein multiple test lenses are eccentrically mounted on either a single rotary disc or a pair of rotary discs.

(1) Note. The lens discs in this generic subclass are used in monocular or binocular test instruments which are usually permanently mounted in the office of the oculist. Plural superimposed discs used in the instrument are mounted for rotation about a common axis so as to successively align the test lenses with coaxial sight openings in the discs.

SEE OR SEARCH THIS CLASS, SUBCLASS:
234, for subjective testing instruments with the lenses mounted on rotatable disc.

218 Hand held type:
This subclass is indented under subclass 217. Subject matter includes test instruments with rotatable multiple lens discs which are portable and held in hand during examination.

(1) Note. The above instruments may comprise an electrical light source adjustable mounted inside the handle or battery casing.

SEE OR SEARCH THIS CLASS, SUBCLASS:
221, for illuminators in objective testing.

SEE OR SEARCH CLASS:
362, Illumination, appropriate subclasses.

219 With contact lens:
This subclass is indented under subclass 205. Subject matter which includes a lens which makes contact with the eye.

(1) Note. The contact lens may include fluid which contacts the eye.

220 Including reflectors with off-set surfaces:
This subclass is indented under subclass 205. Subject matter wherein a light deflecting device, such as a mirror or reflector has two reflecting surfaces, offset with respect to each other, in order to provide a sight opening for the oculist to view the eye.

(1) Note. The surfaces of the above deflecting device may be angled relative to each other so that the reflected beams cross or overlap each other as they enter the eye.

221 Including illuminator:
This subclass is indented under subclass 205. Subject matter relating to devices including a light source for internal or external illumination of the eye during examination and/or photographing thereof.

(1) Note. Included here are light source devices for controlled illumination of vision test charts used in the practice of optometry, slit lamps with or without fibre-optical image-transfer devices, and illuminators in the form of a contact lens fitting over the scieral area of the eye.

SEE OR SEARCH THIS CLASS, SUBCLASS:
237, for subjective testing with target projection.
243, for illuminated charts and targets.

SEE OR SEARCH CLASS:
362, Illumination, appropriate subclasses for portable and self-contained illuminators combined with other instruments in general, for battery powered lamps; and for illumination projectors.

222 Subjective type:
This subclass is indented under subclass 200. Subject matter including instruments through which the patient views a test object (target) or the test object so viewed, for detecting various ocular characteristics or deficiencies of the patient or for prescribing necessary corrections for the patient's vision based on the patient's perceptions or responses.

(1) Note. The above instruments may be permanent or nonportable installations in the office of an examining physician, or may be portable and conveniently carried units.

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SEE OR SEARCH THIS CLASS, SUBCLASS:
239, including test chart or target.
244, for test instrument supports.

SEE OR SEARCH CLASS:
600, Surgery, subclasses 300+ for diagnostic instruments generally.

223 Self examining type:
This subclass is indented under subclass 222. Subject matter includes eye testing devices which may be operated by a person testing his own eyes.

(1) Note. The device is usually inside a cabinet holding a plurality of pairs of eyeglasses for displaying, selecting and/or vending such glasses. Eyeglasses of varying strength are brought successively into the line of vision of the person desiring glasses until the spectacles best fitting the person's eyes are determined.

224 Perimeter type:
This subclass is indented under subclass 222. Subject matter including a surface usually illuminated from a light source together with test targets movable along the inside face of the surface, which targets are viewed by the patient undergoing eye examination for determining fiel of vision.

(1) Note. The above instruments may comprise electromagnetical recording devices which receive impulses from a photoelectric cell.

225 With rotatable arm:
This subclass is indented under subclass 224. Subject matter where the means for producing the test targets on the surface is a rotatable arm.

226 With bowl type screen:
This subclass is indented under subclass 224. Subject matter wherein the surface is shaped as a hollow hemispherical bowl or cup carrying inside suitable test patterns or targets which are viewed by the patient.

227 Including trial frames:
This subclass is indented under subclass 222. Subject matter including frame structure for removably, adjustably and selectively supporting test lenses before the patient's eyes during examination, the structure being adjustable to the features of the patient's head.

(1) Note. The adjustment to the patient's features may include lateral and vertical adjustment, angular adjustment between the temples and the center part of the frame, and interpupilar distance. The test-lens support may include a ring type holder which may be rotated and may be provided with a graduated scale to ascertain the axial line and position of a cylindrical or prismatic lens.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216, including movable lens.

228 With multifocal lens:
This subclass is indented under subclass 227. Subject matter including structure for selecting near and far vision portions of multifocal lenses, demonstrating optical characteristics of multifocal lens segments, and for properly locating the segments relative to the basic lens and the eyes of the patient.

229 With plural lens carrier:
This subclass is indented under subclass 227. Subject matter including frame structure for selectively supporting a plurality of different test lenses in series in separate spaced apart relation, and usually having open-topped ring-type holders.

(1) Note. The above test lens holders may comprise graduated axis scales, and may be adjusted for pupiliary distance and other facial requirements of different individuals.

230 With individual lens holder:
This subclass is indented under subclass 227. Subject matter including individual lens holders for single test lenses which may be temporarily and interchangeably inserted into trial or conventional eyeglass frames.

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(1) Note. The above lens holders carry usually projecting handles or calibrated dials which bear date indentifying each lens as by sphere, diopter and axis.

SEE OR SEARCH THIS CLASS, SUBCLASS:
154, for lens rims generally.

231 Removably attachable to eyeglass frame:
This subclass is indented under subclass 227. Subject matter where the frame structure is removably attachable to an eyeglass frame.

232 With light polarizing lens:
This subclass is indented under subclass 222. Subject matter wherein adjustable light polarizing means are positioned in the light beam of a projected test-image and/or before each eye of a patient viewing a test target.

SEE OR SEARCH THIS CLASS, SUBCLASS:
49, for antiglare spectacles with polarizing lenses.
203, for eye exercising devices with light polarizers.

SEE OR SEARCH CLASS:
359, Optical: Systems and Elements, subclasses 483.01 through 494.01 for polarizing devices generally.

233 Lens or filter selectively insertable in optical path:
This subclass is indented under subclass 222. Subject matter wherein the instrument includes selective lenses or spectacle frames carrying lenses of different power movable into and out of eye testing position until errors of refraction are determined, proper lenses have been found and/or corrected vision is obtained.

SEE OR SEARCH THIS CLASS, SUBCLASS:
216+, for movable lens selectively insertable in optical path.
227+, for trial frames.

234 Mounted on rotatable disc:
This subclass is indented under subclass 233. Subject matter wherein the person undergoing eye examination views a test object through test lenses mounted in a circle on one or several rotatable discs, each lens having a different spherical, cylindrical or light absorbing power.

(1) Note. The above eye testing instruments may comprise illumination means functioning electrically in conjunction with a timing and time indicating apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:
205, for objective testing instruments having lenses mounted on rotatable discs.

SEE OR SEARCH CLASS:
353, Optics: Image Projectors, for image projectors of general utility.

235 Having plural disc carrier:
This subclass is indented under subclass 234. Subject matter wherein two eye testing units, one for each eye, are supported on a standard, each of the units comprising a plurality of rotatable test lens discs, which are superposed and mounted on or in the same housing or baseplate on a common central axis.

236 Movable along optical axis:
This subclass is indented under subclass 233. Subject matter wherein individual trial lenses or optical systems comprising plural superimposed adjustable lenses are movable along the optical axis before the eyes of a patient in a plane vertical to the direction of sight.

(1) Note. The above lenses or optical systems may be in monocular or binocular test instruments, and may comprise sets of reflecting prisms intersecting the line of sight.

237 Including target image projection:
This subclass is indented under subclass 222. Subject matter wherein a still projector casts one or more illuminated chart or target images on a screen for use in vision testing.

(1) Note. Included here are two-dimensional and/or stereoscopic reading-training projectors which are successively fed sequential frames of intelligence on strips or circular discs.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

211, for projected targets involved in objective eye testing.

243, for illuminated test charts or targets generally.

238 Tachistoscope type:

This subclass is indented under subclass 237. Subject matter wherein written material or other target-subject matter us projected onto a screen or shown on a panel for controlled short periods of time to test the reading ability or visual acuity of an individual's eyes.

(1) Note. Class 434, particularly subclasses 159+, 167+, 185 and 327+ in some respects are similar to this subclass, these subclasses containing targets or reading charts and viewing devices. In this Class 351 the devices are directed as their primary purpose to testing the acuity of vision of an individual with short, accurate and selective timing, while in Class 434 the devices are directed to the general purpose of testing knowledge or instructing in characteristics of article.

239 Including test chart or target:

This subclass is indented under subclass 222. Subject matter including charts with movable or stationary patterns or targets for either direct reading, or in relation with an optical instrument for testing or otherwise determining visual acuity or errors of refraction of the eye.

SEE OR SEARCH THIS CLASS, SUBCLASS:

211, for objective eye testing which involves projecting a chart or target into the eye.

237, for target projection.

SEE OR SEARCH CLASS:

600, Surgery, subclasses 300+ for diagnostic instruments.

606, Surgery, subclass 204.25 for eye orthopedics.

240 Stereoscopic type:

This subclass is indented under subclass 239. Subject matter comprising stereoscopic or depth perception target-charts, such as used for testing muscle-imbalance and or depth perception of the eye.

241 Astigmatism type:

This subclass is indented under subclass 239. Subject matter comprising eye test charts having for example changeable color lines or colored contour bands, to determine the axis and amount of astigmatism and the required cylindrical lens axis.

SEE OR SEARCH CLASS:

40, Card, Picture, or Sign Exhibiting, subclasses 446+ for changeable exhibitors, and subclasses 541+ for illuminated signs.

242 Chromaticity type:

This subclass is indented under subclass 239. Subject matter relating to polychromatic charts or plates used in color deficiency or color sensitivity test, the plates or charts exposing to the viewer graphic representations of different particular colors and/or varying intensity.

SEE OR SEARCH THIS CLASS, SUBCLASS:

237, for chart and/or target projection.

243 Illuminated:

This subclass is indented under subclass 239. Subject matter including structure for illuminating the chart or target, or for backlighting perforated or translucent symbols.

SEE OR SEARCH THIS CLASS, SUBCLASS:

237, for target image projection.

SEE OR SEARCH CLASS:

40, Card, Picture, or Sign Exhibiting, subclass 541 for illuminated signs.

362, Illumination, appropriate subclasses for light combined with structure generally and for projectors.

244 Having support or cabinet:

This subclass is indented under subclass 239. Subject matter wherein reading charts or test targets are supported by and individually exhibited at a display window of a cabinet or removably secured to a base board or handle.

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(1) Note. The above noted chart supporting cabinets may be foldable and portable and may comprise reflecting mirrors or electrical illuminators.

SEE OR SEARCH THIS CLASS, SUBCLASS:
203, for eye exercising and training devices.
245, for eye-testing instrument supports generally.

SEE OR SEARCH CLASS:
248, Supports, subclasses 127+, for stands generally.
312, Supports: Cabinet Structure, for cabinet supports.

245 Support:
This subclass is indented under subclass 200. Subject matter relates to adjustable stands or bases which support ophthalmic diagnostic test instruments for test charts.

(1) Note. Included here are instrument supports with or without test chart holders comprising adjustable head and chin rests for the patient while under eye inspection or treatment.

SEE OR SEARCH THIS CLASS, SUBCLASS:
239+, for test charts or targets with supports.

SEE OR SEARCH CLASS:
248, Supports, subclasses 121, 127 and 176.1+ for article supporting stands and brackets.
254, Implements or Apparatus for Applying Pushing or Pulling Force, subclass 93 for instrument supports with hydraulic or fluid pressure means.

246 Methods of use:
This subclass is indented under subclass 200. Subject matter including the methods of operating or utilizing the instruments as defined in this subclass for the purpose of examining or testing the eyes.

(1) Note. The subclass does not provide for methods of making lenses except where fitting is involved as indicated in the indented subclass. Methods of making spectacles or lenses therefor are classified in subclasses 159.73 through 159.81 unless provided for elsewhere as indicated in the search notes appended thereto. In general the original patents classified here have only method claims. If claims are included to both the testing instrument structure and the method of operating the instrument, the classification is with the instrument in the subclasses above, with a cross reference to these method subclasses.

SEE OR SEARCH THIS CLASS, SUBCLASS:
203, for combined eye testing and exercising instruments.
223, for eye testing devices operated by the person himself while selecting eyeglasses.

247 For contact lens fitting:
This subclass is indented under subclass 246. Subject matter limited to process for measuring and determining the curvature of a patient's eyeball so that the bearing surfaces of a contact lens may be made to fit the eyeball accurately.

(1) Note. The above fitting processes may include photographing the eye, projecting a silhouette of the contour of a mold or cast, or otherwise making accurate eye measurements to fit contact lenses of suitable shape and characteristics to the eye. Included also here are methods for fitting contact lenses by taking molds of the eye and forming an eye fitting cast of the mold.

(2) Note. When modification of the contact lens such as grinding, polishing or otherwise altering the shape of the lens is done concurrently with and necessary to the fitting, as opposed to the making of the preliminary blank, classification is in this subclass. However, subclass 159.73 below provides for methods of making contact lenses with the scope of its subclass definition where no fitting of the lens is involved.

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SEE OR SEARCH THIS CLASS, SUBCLASS:

159.02 through 159.38 for eye contact lenses, per se.

159.73, through 159.81 for methods making contact lenses generally. (See (2) Note above.).

178, for methods of making spectacles and eyeglasses generally.

SEE OR SEARCH CLASS:

451, Abrading, subclass 42 for grinding or polishing lenses.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

FOR 100 Ophthalmic lenses or blanks (351/159):
This foreign art collection is indented under the class definition. Foreign art collection wherein subject matter is limited to lenses with specific optical characteristics for use in spectacles or eyeglasses, said lenses having surfaces of spherical, cylindrical or toric curvatures for aiding vision or for correcting focal errors of the eye.

(1) Note. The subject matter here is distinct from and does not include multiple component or compound lens systems designed for example for taking and exhibiting pictures or for use in binoculars, telescopes, and microscopes. See Class 359, Optical: Systems and Elements, subclasses 362+ and 642+ for this subject matter generally.

(2) Note. The indented subclass 177 includes processes of making ophthalmic lenses as defined above and methods of uniting optical elements to form multifocal lenses wherein steps of grinding or finishing subsequent to uniting are included.

FOR 101 Eye contact type (351/160 R):
This foreign art collection is indented under FOR 100. Foreign art collection wherein the lenses are peculiarly adapted to be placed directly in contact with the eyeball and to move with the eyeball.

(1) Note. The contact lens may comprise ventilating or lubricating channels or ducts to obtain free circulation of lacrimal fluid. The subject matter here may be a compound lens system in which one element is a contact lens worn on the eye and the other element is mounted in front of the eye in the manner of the conventional spectacle lens. The contact lens may comprise a skirt conforming to the conjunctival sac of the eye, said skirt carrying a lens disposed in front of but in spaced relation to the cornea.

FOR 102 Multifocal (351/161):
This foreign art collection is indented under FOR 101. Foreign art collection wherein the contact lens comprises two zones of different focal length, one zone to correct the distance vision and another zone to correct the reading vision.

FOR 103 Colored (351/162):
This foreign art collection is indented under FOR 101. Foreign art collection wherein the contact lens, or a portion thereof is colored to absorb part of the visible spectrum or to change the color of the iris in the eye.

FOR 104 Hydrophilic (351/160 H):
This foreign art collection is indented under FOR 101. This foreign art collection was derived from an undefined alpha subclass. Consult the documents contained herein to clarify or interpret the title and scope of this foreign art collection.

FOR 105 With light filtering means (351/163):
This foreign art collection is indented under FOR 101. Foreign art collection wherein the lenses have the property of absorption of rays in portions of the visible or invisible spectrum, or are combined with additional structure having this property.

(1) Note. For classification here an ophthalmic lens must be included in the claims specifically or broadly if the dis-

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closure relates to such a lens. Light filters, per se, which may be used with spectacle lenses are classified in Class 359, Optical: Systems and Elements, subclasses 885+. These lenses may be polarizing.

FOR 106 Multifocal (351/164):
This foreign art collection is indented under FOR 105. Foreign art collection wherein multifocal lenses absorb certain portions of rays in the visible or invisible spectrum, or are combined with additional structure having such an absorption property.

FOR 107 With sections of different light absorption (351/165):
This foreign art collection is indented under FOR 105. Foreign art collection wherein the lenses have vision areas of different light abosorptive qualities which may differ in density and/or in frequency (e.g., clear or slightly tinted central glass portions and deeply colored surrounding areas).

FOR 108 With lens protective layers (351/166):
This foreign art collection is indented under FOR 100. Foreign art collection wherein one or both surfaces of a lens are covered with a layer or layers and impact resisting, transparent and hardened material; or wherein the lens comprises a pair of glass elements and an intermediate resilient reinforcing adhesive securing these elements together.

FOR 109 Cataract correction type (351/167):
This foreign art collection is indented under FOR 100. Foreign art collection wherein the lens is specially adapted to use after the operation for cataract and corrects by being very powerful.

(1) Note. The lens is usually composite comprising a double convex and a concavo-convex lens secured together, or the lens may comprise a lenticular support or border portion in which a strong vision lens is mounted. The above lens may be unifocal or may comprise lens elements of different refractive indices as to provide a long vision and a reading section, the diopter range usually being between 10 and 18.

FOR 110 Multifocal (351/168):
This foreign art collection is indented under FOR 100. Foreign art collection wherein the ophthalmic lens has at least two vision fields of different focal strength.

(1) Note. The different focal strength may be produced by using material of different refractive indices or different curvatures.

FOR 111 Gradually varying focal power (351/169):
This foreign art collection is indented under FOR 110. Foreign art collection wherein the multifocal lens has areas gradually changing in dioptric power.

(1) Note. The lens may have countersink and a segment with different indices of refraction fused therein, or may be formed from one piece or material by providing a continuously varying radius of curvature.

FOR 112 With prismatic segment (351/170):
This foreign art collection is indented under FOR 110. Foreign art collection wherein one of the multifocal lens elements has a specific prismatic correction whose prism base is located relative to the optical center of the distance and/or intermediate vision lens sections to give the desired correction.

(1) Note. The lens section with prismatic correction may be in the form of a segment fused into a lens countersink or the prismatic correction may be formed by grinding a desired area of a multifocal lens made of one piece of material.

FOR 113 Three or more foci (351/171):
This foreign art collection is indented under FOR 110. Foreign art collection wherein multifocal lenses have portions of three or more focal powers respectively, for example, for near, intermediate and far vision.

(1) Note. The above noted lenses may have countersinks and segments of different refractive powers fused therein, or the lenses may be formed of one piece of glass and by grinding away the near vision and intermediate vision portions.

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The countersinks and segments as well as the ground-away lens portions in the one piece lenses may be of different dimensions and shapes.

FOR 114 Multiple elements (351/172):
This foreign art collection is indented under FOR 110. Foreign art collection wherein multiple lens elements of different refractive indices have their adjacent surfaces joined together to provide a unitary multifocal lens that has, for example, a long vision and a reading section.

(1) Note. The modification here comprises for example a major glass member having a shallow countersink and a relatively thin segment fused therein, a thin reading segment fused to a major glass surface, or the lens members may be held in place by usual frame pieces. The countersinks and segments may be of different dimensions and shapes.

FOR 115 Image size (aniseikonia) correction (351/173):
This foreign art collection is indented under FOR 100. Foreign art collection wherein one surface of a lens is shaped so as to give a prescribed image-size correction (magnification) without refractive power.

(1) Note. The modification here may comprise the addition of refractive power by suitably grinding the second surface of the lens. This subclass also provides for two lenses (one for each eye), one or both or which may be within the scope of the above definition.

FOR 116 With beveled, polished or reinforced edges (351/174):
This foreign art collection is indented under FOR 100. Foreign art collection wherein the edge of the lens is polished, beveled or otherwise modified for protecting or reinforcing the lens for example.

(1) Note. The modification here is integral with the lens. Subclass 154 above provides for linings and rims separate from the lens.

FOR 117 Prismatic type (351/175):
This foreign art collection is indented under FOR 100. Foreign art collection wherein the lens is formed with a wedge or tapered cross section to deflect, for example, the light path from the object to the eye, or to correct strabismus or eye deviation.

FOR 118 Focus and/or astigmatism correction (351/176):
This foreign art collection is indented under FOR 100. Foreign art collection wherein one of the lens surfaces has a spherical curvature providing dioptrics or lens powers for correction of focal errors of the eye and/or wherein one lens curvature may be in cylindrical or toric form to compensate for astigmatic errors of the eye.

FOR 119 Methods (351/177):
This foreign art collection is indented under FOR 100. Foreign art collection including processes of making ophthalmic lenses as there defined and not otherwise classifiable.

(1) Note. Class 451 provides for grinding or polishing a lens; Class 65 provides for fusion bonding of glass lenses; while Class 156 provides for adhesive bonding of such lenses. The patents classified in this subclass 177 usually claim combinations of these methods, which are beyond the scope of any one of the above classes. See also the reference to these classes below.

(2) Note. This subclass includes processes for forming contact lenses adapted to be in contact with the eyeball, as opposed to the fitting of contact lenses to the eye which are classified in subclass 40 above.

END

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