forms, including an audio cue and/or a change in the graphical representation of either or both the cursor and object. The user may then activate, manipulate, or move the object that is under the cursor. The user is expected to indicate his intention to activate, manipulate, or move the object by performing a gesture.

[0428] The motion of the object of interest D105 may optionally be interpreted and classified by the gesture detection module D315 as described above with respect to FIG. 17. The gesture detection process D315 may utilize the data produced from any component of the system. The final coordinates D314, image coordinates D310 and D311, or a combination of D310, 311, and 314, may be sampled over time and provided as input to the gesture detection process D315. A variety of gestures (for example, "hovering" and "poking") have been successfully detected using this data as input to a gesture detection process D315.

[0429] In scenarios where the application's state (that is, whether of not the indicator D1101 is over a button D1109) is known and is conveyed to the gesture detection module D315. One gesture that the user performs to indicate the intention to activate the object (for example screen objects D1109, D1202) that is under the cursor D1101 is to cause the cursor to hover over the object (examples D1109, D1202) for longer than a predefined duration. This gesture performed by the user is detected by monitoring the application's state and triggering the gesture when the application state remains unchanged for the predetermined duration. The application need not be created specifically for the multicamera control system D100, as techniques exist that can unobtrusively monitor an application's state (in the Windows operating system by setting a "hook" using the Windows SDK function "SetWindowsHookEx") and emulating a mouse "click" (in the Windows operating system by using the Windows SDK function "SendInput").

[0430] In some scenarios, the application state may not be available and may not be monitored. In this case, some exemplary gestures that indicate the intention to active the object (for example screen objects D1109, D1202) under the cursor D1101 are holding the hand stationary ("hovering"), or poking the hand quickly forward and back.

[0431] A method by which "hovering" has been detected is by keeping a history of the position of the object of interest D105, where that history contains all records of the position and state for a predefined duration of time, ending with the most recent sample. That duration represents the minimum duration that the user must hold the hand stationary. The minimum and maximum position, separately in each of the three (x,y,z) dimensions, is found within the history. If the object of interest D105 was present within the region of interest D103 in all samples of the history, and the distance between the minimum and maximum is within a predefined threshold for each of the three dimensions, then the "hovering" gesture is reported. Those distance thresholds represent the maximum amount that the object of interest D105 is allowed to move, plus the maximum amount of variation (or "jitter") expected to be introduced into the hand position by the various components of the system. The typical method in which this gesture is reported, where the system is emulating a mouse as described above, is to emulate a mouse "click." Gestures representing additional operations of the mouse, "double clicks" and "dragging," have also been detected and those operations have been emulated.

[0432] In addition, gestures that are independent of the position of the indicator relative to an object may optionally be detected and given meaning by the application that may or may not be dependent on the application's state. An application that uses this style of interaction typically does not explicitly use or display the object of interest (such

Petitioner Exhibit 1002-2441

D317 or other positions. These applications can be wholly or primarily controlled with only the interpretations of the positions made by this system. These applications also need not be created specifically for this system because the interpretations made by this system can be used to simulate an action that would be performed on a traditional user input device, such as a keyboard or joystick.

[0433] Many useful interpretations depend directly on the absolute position of the object of interest D105 within the region of interest D103. (Alternately, the indicator position D1105 within the sub-region D1103 may be used in an equivalent manner). One method of making these interpretations is to define boxes, planes, or other shapes. A state is triggered on if the position (for example the position defined by block D314, or alternately by the remapped coordinates from remapping process D317) of the object of interest D105 is found to be within a first box (or beyond the border defined by the first plane), and had not been in the immediately preceding observation (either because it was elsewhere within the region of interest D103, or was not detected). This state is maintained until the hand position is not found to be within a second box (or beyond the border defined by the second plane), at which time the state is triggered off. The second box must contain the entire first box, and is typically larger. The use of a larger box reduces occurrences of the state unintentionally triggering on and off when the object of interest D105 is detected to be near the border of the boxes, where a very small motion or minor noise in the image signals would otherwise cause the position D317 to otherwise drift in and out of the box. Typically one of three methods of interpreting this state is used, depending on the intended use of the gesture. In one method, the gesture directly reflects the state with an on and off trigger. When emulating a keyboard key or joystick fire button, it is "pressed" when the state is triggered on, and "released" when the state is triggered off. In another method, the gesture is only triggered by the transition of the state from off to on. When emulating a keyboard key or joystick button, the key is "clicked." Although the duration and off state are not reported to the application, they are maintained so that the gesture will not be repeated until after the state is triggered off, so that each instance of the gesture requires a clearly defined intent by the user. A third method is to trigger the gesture when by the transition of the state from off to on, and to periodically re-trigger the gesture at predefined intervals so long as the state remains on. This emulates that way in which, holding a key down on a keyboard, causes the character to repeat in some applications.

[0434] One way in which boxes or planes, for the above techniques, may be defined within the region of interest D103 is as follows. By defining a first plane (D1501 in FIG. 27A) and second plane D1502 that divides the region of interest into "fire" D1503 and "neutral" D1504 regions (the gesture reported when the object of interest D105 is in the region D1505 between the planes depends on the previous positions of the object, as described above), the above technique can detect the object of interest D105 (typically a hand) "pushing" forward, which is one gesture for emulating a fire button on a joystick, or causing the application to respond in a way that is commonly associated with the pressing of a joystick button (for example, the firing of a weapon in a video game).

[0435] Another technique in which boxes or planes, for the above techniques, may be defined within the region of interest D103 is as follows. Planes of the first type D1506, D1507, D1508, D1509 are defined that separate each of the left, right, top and bottom portions of the region of interest D103, overlapping in the corner regions as illustrated in FIG. 27B. Planes of the second type are labeled as D1510, D1511, D1512, D1513. Each pair of first and second planes is processed independently. This combination of planes emulates the four directional cursor keys, where a hand in the corner triggers two

Petitioner Exhibit 1002-2442

keys, commonly interpreted by many applications as the four secondary 45 degree (diagonal) directions. Emulating the keyboard cursor in this method allows a variety of existing applications to be controlled by system D100, including, for example, Microsoft(R) PowerPoint(R) which responds to the emulated cursor keys (e.g. the up and down arrow keys) by advancing to the next or previous slide in a presentation sequence.

[0436] Another method of emulating control of discreet directions applies for applications that expect the four 45 degree direction states to be explicitly represented. Boxes D1514, D1515, D1516, D1517 are defined for each of the four primary (horizontal and vertical) directions, with additional boxes D1518, D1519, D1520, D1521 defined for each of the secondary 45 degree (diagonal) directions as illustrated FIG. 27C. For clarity, only boxes of the first type are illustrated. A gap is placed between these boxes. FIG. 27D illustrates how neighboring boxes are defined. The gap between boxes of the first type D1522, D1523 assures that the user intentionally causes the object of interest D105 to enter the box, while the gap D1524 is filled by overlapping boxes of the second type D1525, D1526, so that the system will report the previous gesture until the user was clearly intended to move the object of interest D105 into either a neighboring box or the central neutral region. This combination of buttons can be used to emulate an eight-directional joystick pad.

[0437] A wider class of gestures depend on motion instead of or in addition to position. An example is the gesture of "swiping the hand to the left." This is a one gesture to convey to an application that it is to return to a previous page or state. Through emulation of a keyboard and mouse, this gesture may be used to control information presentation software, in particular Microsoft(R) PowerPoint(R), to go to the previous slide of a presentation sequence. Through emulation of a keyboard and mouse, this gesture causes a web browser to perform the action associated with its "back" button. Similarly, the gesture of "swiping the hand to the right" is one gesture to convey to an application that the user desires to go to the next page or state. For example, this gesture causes presentation software to go to the next slide of a presentation sequence, and causes browser software to go to the next page.

[0438] One method for detecting "swiping the hand to the left" is as follows. A thin stripe along the leftmost part of the region of interest D103 is defined as the left-edge region. The position (for example the position defined by block D314, or alternately by the remapped coordinates from remapping process D317) of the object of interest D105 is represented as the following three states: 1. Object of interest is present and not inside the left-edge region 2. Object of interest is present and inside the left-edge region 3. Object of interest is not present within the hand detection region.

[0439] A transition from state 1 to state 2 above causes the gesture detection module D315 to enter a state whereby it starts a timer and waits for the next transition. If a transition to state 3 is observed within a predetermined duration of time, the "swiping the hand off to the left" gesture is reported to have occurred. This technique is typically duplicated for the right, upper, and lower edges, and, because the hand position is found in three dimensions, also duplicated to detect "pulling the hand back."

[0440] A variety of gesture detection techniques have been discussed. Still other gesture detection techniques (for example, Hidden Markov Layers) are described in research literature, and may be applied in the various implementations of the system D100 described herein.

[0441] Referring back to FIGS. 15 and 17, another implementation of the [illegible]

Petitioner Exhibit 1002-2443

control system D100 is described in further detail. While FIG. 15 shows a two camera system, it should be understood that the image processor D106 can be configured to receive input from more than two cameras, and may for particular applications include four (4) or more video cameras. In the four camera implementation, components D304-D311 of FIG. 17 are duplicated to support the two additional cameras. Additionally, the combination module D312 is configured to receive four sets of camera-relative presence and position data (similar to data D310 and D311) associated with the object of interest D105 being tracked. The techniques and equations (in particular, Eq. 5 and Eq. 6) previously described can be applied to the additional pair(s) of cameras, where the output of the combination module D312 is the average of all the position from each of the camera pairs. The gesture detection module D315 is similarly reconfigured to receive four sets of cameral-relative presence and position data D310, D311 from the two additional detection modules (similar to D308, D309) which are substantially similar to detection modules D310 and D311.

[0442] The output from the image processor 106, which now includes processed object position coordinates and gesture information associated with four cameras, can be used by another process or user application program 316. The formulas and geometry (described above) used to calculate coordinate information associated with the object of interest 105 from the two additional cameras are also used.

[0443] In one implementation using four cameras, the two additional cameras are positioned at the bottom two corners within the controlled background D104 and are oriented such that the region of interest D103 is within the field of view D205 of each camera. The advantage of a four camera system is that the position of the object of interest D105 can be tracked with greater accuracy. Thus, the application program may include more screen objects with increased density on the video display D107 because the increased tracking accuracy allows objects that are close in proximity to be correctly selected by small movements with the object of interest D105. Moreover, the two additional cameras reduce errors in tracking the object of interest D105 when a portion of the object of interest D105 is occluded within the field of view D205 associated with one or more of the other cameras.

Neutral Position of a Device

[0444] According to one general aspect, a method is disclosed. The method includes determining a neutral position of a device in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals, and measuring an angular displacement of the device about at least the first axis. The method also includes receiving a selection of the first control, and outputting one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0445] Implementations may include one or more of the following features. For example, the neutral position of the device may be determined in relation to at least a second axis, orthogonal to the first axis, where the angular displacement may include a first-axis component and a second-axis component. Furthermore, the neutral position of the device may be determined in relation to at least a third axis orthogonal to the first axis and the second axis, where the angular displacement may include a third-axis component. The first axis, the second axis, and/or the third axis may intersect within the device.

[0446] The first control may be associated with at least three output signals, or at least nine output signals, where each of the plurality of output signals may be [illegible]

Petitioner Exhibit 1002-2444

character, such as an alphanumeric character. The method may further include displaying the output signal, and/or displaying an indication of the angular displacement. The method may also further include defining a plurality of tilt regions about the first axis, wherein one of the first plurality of output signals is also output based upon the plurality of tilt regions. The angular displacement of the device about the first axis may be measured as 0.degree., where a first tilt region encompasses an angular displacement of 0.degree., or the first tilt region may be defined as a region encompassing approximately -30.degree. to 0.degree. about the first axis, where the second tilt region is defined as a region encompassing approximately 0.degree. to +30.degree. about the first axis. In a further aspect, a first output signal may be output if the angular displacement is within the first tilt region when the selection is received, where a second output signal may be output if the angular displacement is within the second tilt region when the selection is received. A third or fourth output signal may be output if the angular displacement is within the third or fourth tilt region, respectively, when the selection is received.

[0447] The method may also define a plurality of first-axis tilt regions about the first axis and a plurality of second-axis tilt regions about the second axis, where the one of the first plurality of output signals may also be output based upon the plurality of first-axis tilt regions and/or the plurality of second-axis tilt regions. When the selection is received, a first output signal may be output if the first-axis component is within a first first-axis tilt region and if the second-axis component is within a first second-axis tilt region, a second output signal may be output if the first-axis component is within a second first-axis tilt region and if the second-axis component is within the first second-axis tilt region, a third output signal may be output if the first-axis component is within the second first-axis tilt region and if the second-axis component is within a second second-axis tilt region, and/or a fourth output signal may be output if the first-axis component is within the second first-axis tilt region and if the second-axis component is within the second second-axis tilt region.

[0448] Alternatively, in another aspect, when the selection is received, a first output signal may be output if the first component is within a first first-axis tilt region and if the second-axis component is within a first second-axis tilt region, a second output signal may be output if the first component is within the first first-axis tilt region and if the second-axis component is within a second second-axis tilt region, a third output signal may be output if the first component is within the first first-axis tilt region and if the second-axis component is within a third second-axis tilt region, a fourth output signal may be output if the first component is within a second first-axis tilt region and if the second-axis component is within the first second-axis tilt region, a fifth output signal may be output if the first component is within the second first-axis tilt region and if the second-axis component is within the second second-axis tilt region, a sixth output signal may be output if the first component is within the second first-axis tilt region and if the second-axis component is within the third second-axis tilt region, a seventh output signal may be output if the first component is within a third first-axis tilt region and if the second-axis component is within the first second-axis tilt region, an eighth output signal may be output if the first component is within the third first-axis tilt region and if the second-axis component is within the second second-axis tilt region, and/or a ninth output signal may be output if the first component is within the third first-axis tilt region and if the second-axis component is within the third second-axis tilt region.

[0449] According to another general aspect, a device is disclosed. The device includes a tilt sensor configured to determine a neutral position of a device in relation to at least a first axis, and further configured to measure an angular displacement of the device about at least the first axis. The device also includes at least a first

Petitioner Exhibit 1002-2445

with a first plurality of output signals, and a processor configured to receive a selection of the first control and further configured to output one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0450] Implementations may include one or more of the following features. For example, the first axis and the second axis may intersect at a center of the device, or at a periphery portion of the device. The device may further include at least second through tenth controls each associated with second through tenth pluralities of output signals, respectively. The first control may be a button, and/or the device may be a telephone. The displacement signal may be measured using a tilt sensor, which may be a gyroscope. The device may further include a display configured to display the output signal, and/or configured to display an indication of the angular displacement, and the device may further include a keyboard configured to input the selection.

[0451] According to another general aspect, a computer program product, tangibly stored on a computer-readable medium, is disclosed. The computer program product is operable to cause a computer to perform operations including determining a neutral position of a device in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals, and measuring an angular displacement of the device about at least the first axis. The computer program product is also operable to cause a computer to perform operations including receiving a selection of the first control, and outputting one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0452] According to another general aspect, a telephone device is disclosed. The telephone device includes a tilt sensor configured to determine a neutral position of the telephone device in relation to at least a roll axis, and further configured to measure an angular displacement of the telephone device about the roll axis. The telephone device also includes at least first through eighth buttons each associated with at least four alphanumeric characters. Furthermore, the telephone device includes a processor configured to receive a selection of the first button and further configured to output one of the at least four alphanumeric characters based at least upon the selection and the angular displacement.

[0453] The details of one or more implementations are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

[0454] FIG. 28 depicts the exterior appearance of a device according to one exemplary implementation, in a state where the device is in the neutral position. The hardware environment of device E100 includes a keypad including at least a first control E102 for entering text data and user commands into the device E100, a display E105 for displaying text and images to a user, and an indicator, such as a tilt indicator E106, for displaying an indication of angular displacement or tilt orientation about at least one axis.

[0455] Display E105 displays the graphics, images, and text that comprise the user interface for the software applications used by this implementation, as well as the operating system programs necessary to operate the device E100. A user of device E100 uses first control E102 to enter commands and data to operate and control the operating system programs as well as the application programs.

[0456] Display E105 is configured to display the GUI to a user of device E100. A speaker may also be present also generate voice and sound data to a user of device E100.

Petitioner Exhibit 1002-2446

application programs operating on device E100, such as a voice from another user generated by a telephone application program, or a ring tone generated from a ring tone application program. A microphone may also be used to capture sound data generated by the user, for example, when the user is speaking to another user during a telephone call via device E100. Furthermore, tilt indicator E106 is configured to indicate the angular displacement or tilt orientation of device E100, to provide visual feedback to the user of device E100 and to make the user aware of the tilt orientation that will be used to interpret a control selection.

[0457] The operation of device E100 is based upon its orientation in two states: the "neutral" position, and a "selection" position corresponding to the position of the device prior to, at the time of, or after the selection of first control E102. More specifically, and as described fully below, the output of an output signal by device E100 is dependent upon the angular displacement between the neutral position and the selection position, in relation to at least one axis, where the angular displacement has an angular displacement component for each axis of interest.

[0458] FIG. 28, for example, depicts device E100 in one contemplated three-axis neutral position In particular, orthogonal X, Y and Z-axes intersect at the center of device E100, where the X-axis extends parallel to the longitudinal direction of device E100. According to this exemplary neutral position, a rotation around the X-axis would effectuate a rolling motion, a rotation around the Y-axis would effectuate a pitching motion, and a rotation around the Z-axis would effectuate a yawing motion. These roll, pitch, and yaw motions are generically referred to herein as "tilt" motions.

[0459] The determination of the number of axes of interest, and the location and orientation of the axes with relation to device E100, is a device-specific and application-specific determination, and no limitation of any of these characteristics is inferred in the following description. For example, where it is undesirable or impossible to manipulate the device in a yawing motion, or where the number of output signals may be effectively controlled using motion about one or two axes, the neutral position of the device may be determined with regard to these one or two axes alone. Furthermore, the at least one axis may not intersect device E100, or the at least one axis may extend along a periphery or edge portion of device E100. Additionally, one of the axes may extend parallel along the longitudinal direction of device E100 or it may extend at an angle to the longitudinal direction of device E100. In any regard, the neutral position is aligned with an axis relative to the Earth, such as a magnetic or true North axis, or an axis pointing to the center of the Earth, or toward the horizon, with an axis relative to the user, the device, or other axis.

[0460] With regard to telephony, a one-axis neutral position is provided in the case where angular displacement is to be measured with regard to roll rotation around the X-axis, or a two-axis neutral position is provided in the case where angular displacement is to be measured with regard to roll and pitch rotation around the X-axis and Y-axis, respectively. In either case, the X-axis and Y-axis intersect at the center of the device, with the X-axis extending longitudinally parallel to the longitudinal direction of the device. Other neutral position orientations are contemplated as well.

[0461] When inputting characters into a device such as a telephone, the user typically holds the device at an positive (upwards) pitch angle while looking into the display. In that regard, the X-axis of the telephone in the neutral position may be defined at a similar upwards angle, such that flattening the angle of the telephone with regard to the ground would be registered as a pitched forward tilting motion. In other instances, of course, an X-axis which is parallel to the ground is the "neutral" position.

Petitioner Exhibit 1002-2447

[0462] Although device E100 is illustrated in FIG. 28 as a mobile telephone, in further aspects device E100 may include a desktop PC, a laptop, a workstation, a midrange computer, a mainframe, a handheld or tablet computer, a personal data assistant ("PDA") or another type of embedded system such as a computer keyboard or a remote control.

[0463] FIG. 29 depicts an example of an internal architecture of the implementation of FIG. 28. The computing environment includes processor E200 where the computer instructions that comprise an operating system or an application are processed; display interface E202 which provides a communication interface and processing functions for rendering graphics, images, and texts on display E105; keypad interface E204 which provides a communication interface to the keypad, including first control E102; tilt sensor E206 for measuring angular displacement of device E100 about at least a first axis; indicator interface E208 which provides a communication interface to the indicators, including tilt indicator E106, random access memory ("RAM") E210 where computer instructions and data are stored in a volatile memory device for processing by processor E200; read-only memory ("ROM") E211 where invariant low-level systems code or data for basic system functions such as basic input and output ("I/O"), startup, or reception of keystrokes from the keypad are stored in a non-volatile memory device; and optionally a storage E220 or other suitable type of memory (e.g. such as random-access memory ("RAM"), read-only memory ("ROM"), programmable read-only memory ("PROM"), erasable programmable read-only memory ("EPROM"), electrically erasable programmable read-only memory ("EEPROM"), magnetic disks, optical disks, floppy disks, hard disks, removable cartridges, flash drives), where the files that comprise operating system E230, application programs E240 and data files E246 are stored. The constituent devices and processor E200 communicate with each other over bus E250.

[0464] RAM E210 interfaces with bus E250 so as to provide quick RAM storage to processor 200 during the execution of software programs such as the operating system application programs, and device drivers. More specifically, processor E200 loads computer-executable processes from memory media into a field of RAM E210 in order to execute software programs. Data is stored in RAM E210, where the data is accessed by processor E200 during execution.

[0465] Also shown in FIG. 29, storage E220 stores computer-executable code for an operating system E230, application programs E240 such as word processing, spreadsheet, presentation, graphics, image interpretation training, gaming, or other applications, and data files E246. Although it is possible to use the above-described implementation, it is also possible to implement the functions according to the present disclosure as a dynamic link library ("DLL"), or as a plug-in to other application programs such as an Internet web-browser such as the MICROSOFT(R) Internet Explorer web browser.

[0466] Processor E200 is one of a number of high-performance computer processors, including an INTEL(R) or AMD(R) processor, a POWERPC(R) processor, a MIPS(R) reduced instruction set computer ("RISC") processor, a SPARC(R) processor, a HP ALPHASERVER(R) processor, an ACORN(R) RISC Machine ("ARM(R)") architecture processor, or a proprietary computer processor for a computer or embedded system, without departing from the scope of the present disclosure. In an additional arrangement, processor E200 in device E100 is more than one processing unit, including a multiple CPU configuration found in high-performance workstations and servers, or a multiple scalable processing unit found in mainframes.

Petitioner Exhibit 1002-2448

[0467] Operating system E230 may be MICROSOFT(R)WINDOWS NT(R)/WINDOWS(R) 2000/WINDOWS(R) XP Workstation; WINDOWS NT(R)/WINDOWS(R) 2000/WINDOWS(R) XP Server; a variety of UNIX(R)-flavored operating systems, including AIX(R) for IBM(R) workstations and servers, SUNOS(R) for SUN(R) workstations and servers, LINUX(R) for INTEL(R) CPU-based workstations and servers, HP UX WORKLOAD MANAGER(R) for HP(R) workstations and servers, IRIX(R) for SGI(R) workstations and servers, VAXNMS for Digital Equipment Corporation computers, OPENVMS(R) for HP ALPHASERVER(R)-based computers, MAC OS(R) X for POWERPC(R) based workstations and servers; SYMBIAN OS(R), WINDOWS MOBILE(R) or WINDOWS CE(R), PALM(R), NOKIA(R) OS ("NOS"), OSE(R), or EPOC(R) for mobile devices, or a proprietary operating system for computers or embedded systems. The application development platform or framework for operating system E230 may be: BINARY RUNTIME ENVIRONMENT FOR WIRELESS(R) ("BREW(R)"); Java Platform, Micro Edition ("Java ME") or Java 2 Platform, Micro Edition ("J2ME(R)"); PYTHON(TM), FLASH LITE(R), or MICROSOFT(R) .NET Compact.

[0468] Tilt sensor E206 detects the orientation of device E100, as described below, and is a gyroscope, an optical sensor, and/or other type of tilt sensor. An optical sensor, for example, may be used to detect the orientation of device E100 using an optical flow of a sequence of images from a camera embedded in device E100 to determine the motion and orientation of device E100. Optical flow describes the apparent relative velocity of features within a sequence of images. Since optical flow is relative to the camera, motion of the camera will result in apparent velocities of features in the camera view. The motion of the camera is calculated from the apparent velocities of features in the camera view. Position or orientation are also calculated relative to the neutral position, over an extended span of time. Although tilt sensor E206 has been described as an optical sensor using an optical flow approach for tracking the tilt or inclination of device E100 using camera, in other aspects the tilt or inclination of device E100 is tracked without using the optical flow approach, such as by using an accelerometer.

[0469] Computer readable memory media stores information within device E100, and is volatile or non-volatile. Memory may be capable of providing mass storage for device E100. In various different implementations, the memory may be a floppy disk device, a hard disk device, an optical disk device, or a tape device. While FIGS. 28 and 29 illustrate one possible implementation of a computing system that executes program code, or program or process steps, other types of computers or devices may also be used as well.

[0470] FIG. 30 is a flowchart illustrating a method in accordance with another exemplary implementation. Briefly, the method includes determining a neutral position of a device in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals, and measuring an angular displacement of the device about at least the first axis. The method also includes receiving a selection of the first control, and outputting one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0471] In more detail, method E300 begins (step ES301), and a plurality of tilt regions are defined about a first axis (step ES302). As is described in more detail below, the output of an output signal is based at least upon the angular displacement of a device upon the selection of a first control. In accordance with one aspect, tilt 'regions' are defined such that, upon the selection of the control, if the angular displacement falls within a particular tilt region or band of angles, an output associated with that tilt region

Petitioner Exhibit 1002-2449

is output.

[0472] FIGS. 31A to 31D illustrates several example tilt regions with regard to a hypothetical neutral axis, labeled the "N-axis," where the neutral represents the neutral X, Y and/or Z-axis. Each of the X, Y, or Z-axis can have individually-determined tilt regions, a common tilt region definition can be applied to multiple axes, or axes can have no defined tilt regions.

[0473] FIG. 31A illustrates an example of two tilt regions defined about the neutral axis. An angular displacement from approximately -90.degree. to 0.degree. about the neutral axis is within region E401, and an angular displacement from approximately 0.degree. to approximately 90.degree. about the neutral example is within region E402. An angular displacement from approximately 91.degree. to -91.degree., indicative of a device that is upside down, does not correspond to any region, and an angular displacement of exactly 0.degree. is in either region E401 or E402.

[0474] Where the neutral axis represents the X-axis, an angular displacement in region E401 would result from a negative roll of the device (to the left), and an angular displacement in region E402 would result from a positive roll of the device (to the right). Where the neutral axis represents the Y-axis, an angular displacement in region E401 would result from a negative pitch (forward) the device, and an angular displacement in region E402 would result from a positive pitch (rearward) of the device. Where the neutral axis represents the Z-axis, an angular displacement in region E401 would result from a negative yaw (counterclockwise), and an angular displacement in region E402 would result from a positive yaw (clockwise). Although two tilt regions are depicted, any number of tilt regions may be defined, depending largely upon the sensitivity of the tilt sensor, the number of output signals associated with each control and the ability of the user to discriminate between small angles when manipulating the device.

[0475] In any case, the signal output by the device is dependant upon the angular displacement and the tilt region. For example, the device outputs a first of a plurality of signals if the angular displacement of the device is within a first region, and a second of a plurality of signals if the angular displacement of the device is within a second region, even if the same control is selected in both circumstances. Although FIG. 28 illustrates regions E401 and E402 as encompassing .±.90.degree. bands, in a similar aspect tilt region E401 defines a region encompassing approximately -30.degree. to 0.degree. about the neutral axis, and the tilt region E402 defines a region encompassing approximately 0.degree. to +30.degree. about the neutral axis.

[0476] FIG. 31B illustrates an example of four tilt regions defined about the neutral axis, with a dead space between regions at 0.degree. about the neutral axis. Due to the insensitivity of a tilt sensor, the inability of a user to discriminate, or for other reasons, it is often desirable define a dead space between two otherwise-adjacent regions. Where the neutral axis represents the Y-axis, an angular displacement of between approximately 91.degree. to -91.degree., indicative of a device which is upside down, or an angular displacement of approximately 0.degree. does not correspond to any tilt region. If a control is selected when the device is not oriented in a tilt region, a default output is output, the last output is output, no output is output, an output associated with the closest tilt region or a complementary tilt region is output, or another type of output is output.

[0477] An angular displacement in region E404 would result from a hard negative pitch of the device, although an angular displacement in region E405 would also result from a negative pitch which is lesser in magnitude than a region E40[illegible]

Petitioner Exhibit 1002-2450

angular displacement in region E407 would result from a hard positive pitch of the device, although an angular displacement in region E406 would also result from a positive pitch which is lesser in magnitude than a region E407 negative pitch.

[0478] FIG. 31C illustrates an example of two tilt regions defined about the neutral axis, where the area around 0.degree. about the neutral axis is substantially within a first region. In particular, where the neutral axis represents the X-axis, the device would remain in region E409 if negatively rolled, if unmoved from the neutral position, or if modestly rolled in the positive direction. In order for the device to be oriented in region E410, a hard positive roll would have to occur. The tilt regions depicted in FIG. 31C would be desirable, for instance, where region E409 represents a default desired output, and where an affirmative, high magnitude manipulation of the device would be necessary to place the device in region E410, thus overriding the default desired output. In the FIG. 31C example, tilt region E409 encompasses an angular displacement of 0.degree., where the angular displacement of the device is in tilt region E409 if the angular displacement about the first axis is measured as 0.degree.

[0479] FIG. 31D illustrates an example of two tilt regions defined about the neutral axis, where a single region occupies angular displacement bands on both sides of the neutral axis. More particularly, region E412 is defined by the area surrounding 0.degree. about the neutral axis, and region E411 occupies symmetrical angular bands in the positive and negative angular directions. Where the neutral axis represents the Z-axis, an angular displacement in region E411 would result from a high-magnitude positive or negative yaw. An angular displacement in region E412 would result from a more modest positive or negative yaw, or from the orientation of the device remaining in the neutral position.

[0480] In any of the above described examples, the neutral axis may represent the X, Y, and/or Z-axis, thus effectively multiplying the total number of available tilt regions. For example, if the neutral axis in the FIG. 31A example represents the X-axis, and the neutral axis in the FIG. 31B example represents the Y-axis, a total of eight tilt regions would be available, since the four pitch tilt regions of FIG. 31B would each be divided into the two roll tilt regions of the FIG. 31A example. Assuming that each axis has an equal number n tilt regions, the total number of tilt regions for a two-axis arrangement is n.sup.2 and the total number of tilt regions for a three-axis arrangement is n.sup.3.

[0481] Finally, it is contemplated that in some instances the angular displacement itself, and not the tilt region, will be determinative of the output signal, and thus would be unnecessary to define tilt regions. Furthermore, tilt regions are also defined implicitly in the case where the range of motion about a desired axis is divided equally by the number of output signals, where each output signal corresponds to a mathematically-determined range of angles.

[0482] Returning to FIG. 30, the neutral position of a device is determined in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals (step ES304).

[0483] FIG. 32 illustrates a top exterior view of an example device according another exemplary implementation. Device E500, a mobile telephone, has a keypad including at least first control E502 associated with a first plurality of output signals. In the illustrated example, first control E502 is a key, or button, on the keypad or keyboard of device E500, where each individual control represents a multiple of alphanumeric characters or symbols. Specifically, first control E502 is labeled "9", and corresponds to four output signals indicative of the characters "W", "X", "Y", and "Z", or when [illegible]

Petitioner Exhibit 1002-2451

signals indicative of the case-sensitive characters "W", "X", "Y", "Z", "w", "x", "y", "z", and the symbols ",", ".", "/", and "". There is no limit for the number of output signals or characters that can correspond to a single control. In particular aspects, first control E502 is associated with a plurality of output signals, such as three output signals, or nine output signals. Each of the plurality of output signals may correspond to a character, such as an alphanumeric character or a symbol.

[0484] The neutral position of device E500 is determined, for example, when device E500 is powered on, prior to or after a selection of the first control, or at the site of manufacture. In one aspect, a memory buffer stores output data of the tilt sensor, and the neutral position of device E500 is reconstructed from the orientation of device E500 when a control is selected and the output data. In another aspect, the neutral position is a factory pre-set condition, such as the case where the neutral X-axis is defined as extending perpendicular to the center of the Earth, such that an angular displacement is measured if device E500 faces any direction other than up. In a further aspect, a processor, a tilt sensor, and the memory communicate to determine a common neutral position based upon the average position of device E500 whenever the control is ordinarily selected. Moreover, in an additional aspect, the neutral position is user-selectable. In any regard, the neutral position operates effectively to reset the tilt sensor to 0.degree. across each axis of interest, where any motion of device E500 away from the neutral position serves to register an angular displacement. In relation to the user of device E500 or the Earth, the neutral position is a flat position, a vertical upright position, or a canted or tilted position.

[0485] In an additional aspect, the neutral position of device E500 is determined in relation to at least a second axis, orthogonal to the first axis, where the angular displacement includes a first-axis component and a second-axis component. In a further aspect, the neutral position of device E500 is determined in relation to at least a third axis orthogonal to the first axis and the second axis, where the angular displacement includes a third-axis component. The first axis, the second axis, and/or the third axis intersect within the device E500, outside of device E500, or along a peripheral portion or edge of device E500.

[0486] Since device E500 includes a tilt sensor that detects the orientation of the device, entry of text into the device is facilitated. For example, the tilt sensor detects a degree to which the device has been rolled to the left, to the right, or pitched up or down, where the tilt orientation or angular displacement of the device about the axes of interest indicates how selection of control E502 is interpreted and output. For example, if control E502 corresponds to multiple characters, the orientation of device E502 identifies which of the multiple characters is output when control E502 is selected, or identify a case in which the appropriate character is output.

[0487] Using the orientation of the device to identify a character to be output enables a character to be output each time a single control is selected, increasing the speed of text entry by reducing the number of control selections required to enter text. Because a fixed number of controls selections represents entry of a character, a user may specify a subsequent character immediately after a current character has been specified, eliminating the need to wait for a predetermined amount of time before specifying the subsequent character, also increasing the speed of text entry.

[0488] As indicated above, the neutral position of the device is a reference orientation from which an angular displacement is measured about at least one axis, to the selection position, the selection position corresponding to the position of the device prior to, at the time of, or after the selection of a control such as [illegible]

Petitioner Exhibit 1002-2452

aspect, the neutral position of the device is determined in relation to one axis, and the neutral position is determined as a "flat" position, where the one axis is parallel to the ground. In another aspect, the neutral position of the device is determined in relation to two axis, and the neutral position is ergonomically determined as the orientation of a device as it would commonly be held by a user of the device. In a further aspect, the neutral position of the device is determined in relation to three axis, where one axis is determined as parallel to a magnetic North-South axis, one axis is determined as parallel to an East-West axis, and the third axis is determined as facing towards and away from the center of the Earth.

[0489] Returning to FIG. 30, an angular displacement of the device is measured about at least the first axis (step ES305). In particular, a tilt sensor, such as tilt sensor E206, measures the angular displacement between the current position of the device and the neutral position, where the angular displacement includes a component for each axis of interest. In one aspect, the tilt sensor E206 measures the angular displacement of the device at the moment the control is selected. Since the selection of the control itself may affect the orientation of the device, in another aspect the tilt sensor measures the angular displacement of the device a time before or after the control is selected.

[0490] The tilt sensor detects the orientation of the device. For example, the tilt sensor detects a degree to which the device has been rolled to the left or right, pitched up or down, or yawed clockwise or counterclockwise. In one aspect, the tilt sensor measures at least two discrete levels of roll tilt about the X-axis, in which case the device may be said to be rolled left, rolled right, or not rolled left or right. In addition, the tilt sensor measures at least two discrete levels of pitch tilt about the Y-axis in the forward or backward direction, in which case the device may be said to be pitched up, pitched down, or not pitched up or down. Further, the tilt sensor measures at least two discrete levels of yaw tilt about the Z-axis, in which case the device may be said to be yawed clockwise, yawed counterclockwise, or not yawed. In such an implementation, the tilt sensor indicates that the device has been rolled to the left when the device has been rolled between 15.degree. and 45.degree. to the left. As another example, the tilt sensor indicates that the device has not been pitched forward or backwards when the device has been pitched less than 15.degree. forward and less than 15.degree. backward. In another implementation, the tilt sensor may indicate more than three levels of tilt in each of the left-to-right and forward or backwards directions. In such an implementation, each of the levels of tilt in a particular direction corresponds to a range of degrees in which the device has been tilted.

[0491] An indication of the angular displacement is displayed (step ES306). As described above, it is possible that the orientation of the neutral position may not be instinctive to a user. Furthermore, each axis may have two or more tilt regions in each direction about each axis. For these and other reasons, an indicator is provided to display either an indication of the angular displacement, or an indication of the tilt region to which the angular displacement corresponds, in real-time or near real-time. If the angular displacement is measured at a time before or after the control is selected, the indicator estimates the appropriate angular displacement or indication of the tilt region at the time based upon all available information. If the neutral position is defined in relation to more than one axis, the user can determine which axis the indicator is indicating, the indicator can have a default or preset axis of interest, or the determination may be context sensitive.

[0492] FIGS. 33A to 33B illustrate example indicators according to one exemplary aspect. In FIG. 33A, indicator E600 indicates the orientation of the device on a display. The indicator provides visual feedback so that the user is aware of the orientation of the

Petitioner Exhibit 1002-2453

device that will be used to interpret a control selection.

[0493] Indicator E600 includes positive tilt indicator E601 and negative tilt indicator E604, that point in the negative (left) and positive (right) directions, respectively. In addition, indicator E600 includes center indicator E602 that is visually distinguished from positive tilt indicator E601 and negative tilt indicator E604 when the device is not tilted, such as when the device is in the neutral position or in a position that is unregistered by the tilt sensor, such as upside down. One of the tilt indicators is illuminated or otherwise visually distinguished from the other tilt indicator and center indicator E602 when the device is tilted in the indicated direction. Furthermore, center indicator E602 is illuminated or otherwise visually distinguished from positive tilt indicator E601 and negative tilt indicator E604 when the device is not rolled to the left of the right. The center indicator, for example would be illuminated when the device is oriented as illustrated in FIG. 28. Positive tilt indicator E601 would be illuminated when the device is oriented as illustrated in region E402 of FIG. 31A, and negative tilt indicator E604 would be illuminated when the device is oriented as illustrated in region E401 of FIG. 31A.

[0494] In another implementation illustrated in FIGS. 33B and 33C, indicator E605 also includes two partial tilt indicators E606 and E607 that also point in the negative and positive directions, respectively. Each of the partial tilt indicators is located between center indicator E604 and either negative tilt indicator E604 or positive tilt indicator E601. The partial tilt indicators are illuminated or otherwise visually distinguished from the other components of indicator E605 when the device is tilted partially in an indicated direction. In one implementation, both the partial tilt indicator and the center indicator are illuminated when the device is partially tilted partially in the corresponding direction. For example, negative tilt indicator E604 would be illuminated when the device is oriented in tilt region E404 of FIG. 31B, negative partial tilt indicator E606 and center indicator E602 would be illuminated when the device is oriented in tilt region E405 of FIG. 31B, center indicator 602 would be illuminated when the device is oriented in the neutral position, as illustrated in FIG. 28, positive partial tilt indicator E607 and center indicator 602 would be illuminated when the device is oriented in tilt region E406 of FIG. 31B, and positive tilt indicator E601 would be illuminated when the device is oriented in tilt region E407 of FIG. 31B. Any number of tilt indicators or partial tilt indicators are contemplated for each axis. For an axis having several dozen associated tilt regions, for example, the same number, more or fewer tilt indicators may be used to provide visual feedback.

[0495] FIG. 33D illustrates a two-axis tilt indicator which may be presented on the display. Although the axes discussed in conjunction with FIG. 33D are referred to as the pitch (forward and backward) and roll (left and right) axes, these designations are arbitrary, and one set of indicators could also be the yaw axis, or another axis. Indicator E609 operates similarly to indicator E605 with regard to one axis, however, indicator E609 also integrates a pitch tilt indicator comprising negative pitch indicator E610, partial negative pitch indicator E611, partial positive pitch indicator E612, and positive pitch indicator E614, to the previously described one-axis indicator E605, which was described as a roll indicator. In another aspect illustrated in FIG. 33E, the indicator includes a single feature E615 that indicates the significance of the orientation of the device. For example, the single feature indicator indicates whether or not numbers may be output because of the measurement of the angular displacement of the device.

[0496] Although the indicator is depicted in FIGS. 28 and 33 as a series of arrows or intuitive lights, in one aspect the indicator is incorporated into the display, such as display E105, or the indicator is a speaker which plays sounds to indicate [illegible]

Petitioner Exhibit 1002-2454

describe the tilt of the device to the user via audio. Furthermore, in another aspect, no indication of angular displacement or tilt region is displayed or otherwise generated.

[0497] Returning to FIG. 30, a selection of the first control is received (step ES307). In one aspect, the control is a keypad button, and selection occurs when the user depresses the button, thereby enabling a signal to be generated and transmitted to the processor indicating that a selection of the keypad button has occurred. In another aspect, the control is not a physical control, but rather an icon on a touch-sensitive screen. In this aspect, selection occurs when the user touches an area of the touch-sensitive screen associated with the icon, where a touch-sensitive screen application reads the coordinates of the touch, correlates the coordinates with the location of the icon, and transmits a signal indicating that the control has been selected. Other types of control selections are also contemplated.

[0498] According to the FIG. 32 implementation, device E500 includes a keypad, or grouping of controls, which enables the user to enter text in order to interact with the GUI presented on display E505. Each control corresponds to multiple output signals, each output signal associated with a characters. In one aspect, the keypad includes eight controls, labeled "2" to "9", that each correspond to multiple letters and a number. For example, the control labeled "2" corresponds to the letters "A," "B," and "C," and the number "2." In addition, other controls included in the keypad perform other text entry functions. For example, the control labeled "*" is used to change the case of a next character that is output. The control labeled "0" is used to advance to a subsequent character after a current character has been specified, and the control labeled "#" is used to insert a "space" character.

[0499] One of the first plurality of output signals is output based at least upon the selection and the angular displacement (step ES309), or at least upon the selection, the angular displacement, and the plurality of tilt regions. Since the first control is associated with a first plurality of output signals, the angular displacement, or the angular displacement and the plurality of tilt regions are used to determine which one of the first plurality of output signals are output. In one aspect, the neutral position of the device is determined in relation to one axis, where three tilt regions are defined around that one axis, and where the first control is associated with three tilt regions. In this case, if the angular displacement is in the first tilt region, the first output signal is output, if the angular displacement is in the second tilt region, the second output signal is output, and if the angular displacement is in the third tilt region, the third output signal is output. hi an alternative aspect, the output signal is output based upon the angular displacement and the number of output signals associated with the first control, based upon a formula or an algorithm.

[0500] Various figures depict front and side views of the FIG. 32 device in different states of manipulation. In particular, FIGS. 34A and 34B illustrate front and side views, respectively, of device E500 in the neutral position. FIG. 35A illustrates a front view of the device manipulated in a negative roll about the X-axis and FIG. 35B illustrates a front view of the device manipulated in a positive roll about the X-axis. Similarly, FIG. 36A illustrates a side view of the device manipulated in a positive pitch about the Y-axis and FIG. 36B illustrates a side view of the device manipulated in a negative pitch about the Y-axis. In FIGS. 35 and 36, the device has been tilted approximately .±.30.degree. about the respective axes from the neutral position, shown in FIG. 34.

[0501] The orientation of the device, as indicated by the angular displacement measured by the tilt sensor, when a control of the keypad is selected affects the output signal output by the device, affecting, for example, the character generated by the

Petitioner Exhibit 1002-2455

control selection. Each of the multiple characters or output signals represented by a single control of a keypad correspond to a different orientation of the device. When one of the controls of the keypad is selected, the device identifies the plurality of characters that correspond to the selected control and the orientation of the device indicated by the tilt sensor. One of the multiple characters and a case for the character are identified based on the identified orientation, and the identified character is output.

[0502] The degree to which the device has been rolled to the left or right when a control is selected affects which one of the multiple characters represented by the control is output. In one implementation, the controls that represent multiple characters represent three letters, and the letters represented by the control are listed from left to right on the control. The device is configured to indicate that the device is rolled left, rolled right, or not rolled left or right. In one such implementation, rolling the device to the left when the control is selected indicates that the leftmost listed character should be output. Similarly, rolling the device to the right when the control is selected indicates that the rightmost listed character should be output. Finally, keeping the device oriented in the neutral position when the control is selected indicates that the center character should be output.

[0503] In another implementation, rolling the device to the left when the control is selected indicates that the rightmost listed character should be output, rolling the device to the right when the control is selected indicates that the leftmost listed character should be output, and keeping the device oriented in the neutral position when the control is selected indicates that the center character should be output. Such an implementation may be used, for example, because rolling the device to the left causes the rightmost listed character to appear above and more prominently than the other listed characters, and rolling the device to the right causes the leftmost listed character to appear above and more prominently than the other listed characters.

[0504] In other implementations, the controls of the keypad represent more than three characters, such as three letters and a number, or four letters and a number. For example, the control on a conventional telephone labeled "7" corresponds to the letters "P,""Q,""R," and "S," and the number "7." In such a case, the tilt sensor is configured to identify more than three discrete left-to-right roll positions such that one of the more than three characters represented by a selected control may be identified based only on the roll orientation of the device. Each of the discrete roll positions correspond to one of the characters represented by the selected control . For example, if the selected control is the key labeled "7", the device being rolled as illustrated in region E404 of FIG. 31B would indicate that the letter "P" should be output, the device being rolled as illustrated in region E405 of FIG. 31B would indicate that the letter "Q" should be output, the device being rolled as illustrated in region E406 of FIG. 31B would indicate that the letter "R" should be output, the device being rolled as illustrated in region E407 of FIG. 31B would indicate that the letter "S" should be output, and the device being oriented in the neutral position, as illustrated in FIG. 28, would indicate that the number "7" should be output.

[0505] While the roll orientation of the device is used to identify a character to be output, the pitch orientation of the device is used to identify a case for the character. In one implementation, the device being pitched (or tilted) forward when a control is selected causes a character that is identified by the roll (left-to-right tilt) orientation of the device to be output in upper case. Similarly, the device not being pitched forward or backward (in a neutral pitch position) when a control is selected causes a character that is identified by the roll (left-to-right tilt) orientation of the device to be output in lower case.

Petitioner Exhibit 1002-2456

[0506] In some implementations, the device being pitched (or tilted) backward may cause a symbol to be output. The symbol may be a symbol corresponding to the number represented by the selected control on a conventional computer keyboard. For example, if the control that represents the number "1" is selected while the device is pitched backward, the symbol "!" may be output, because the symbol "!" corresponds to the number "1" on a conventional computer keyboard (e.g., pressing "Shift" and "1" on a computer keyboard outputs the character "!").

[0507] The tilt sensor is capable of detect more tilt positions in the pitch direction than is necessary to indicate the case of the character to be output. As such, the pitch positions that are not used to indicate the case of the character may be used to select the character. For example, a control may represent three letters and a number, and three roll positions may be used to select among the three letters. Two pitch positions may select the case for letters, and a third pitch tilt position may select the number represented by the key.

[0508] Furthermore, the tilt sensor independently indicates whether the device has been rolled left, neutral, or right or whether the device has pitched forward, neutral, or backwards, thereby allowing the tilt sensor to indicate whether the device is in one of nine orientations. Each of the nine orientations may correspond to a character and a case for the character.

[0509] FIG. 37 is a table showing one possible mapping of device orientations to output signals corresponding to characters and cases that may be output when the control labeled "2" on the keypad is selected. In the illustrated mapping, the device being rolled left and pitched forward causes the capital letter "A" to be output, the device not being rolled or pitched in either direction case the lower case letter "b" to be output, and the device being pitched backwards causes the number "2" to be output. In other implementations in which the tilt sensor may identify more than three roll positions or more than three pitch positions, more orientations that may be mapped to characters and cases are available.

[0510] Output signals corresponding to characters are described as being selected based on a first axis angular displacement or tilt position of the device, and output signals corresponding to upper or lower cases for the characters are described throughout as being selected based on a second axis angular displacement or position of the device. In other implementations, the angular displacement in different axes may effectuate the output of signals corresponding to characters or upper and lower cases of characters. In general, any orientation of the device may be mapped to any character and case for the character, regardless of which of the axes was used to select the character or the case.

[0511] In addition to outputting a signal corresponding to a character that is output in response to selection of a control, the orientation of the device may be used to indicate a menu option that is to be selected. For example, selection of a control that does not correspond to any characters, such as the "1" key on a telephone, causes a menu to be presented on the display of the telephone, where each option of the menu correspond to a different orientation of the telephone. The orientation of the device when a control indicating that a selection from the menu should be made (e.g., an "OK" key, an "Enter" key, or the "1" key) is selected may indicate which of the menu options is selected. In one aspect, a menu of symbols similar to what is illustrated in FIGS. 38A and 38B is displayed when the "1" key is selected. Tilting the device and selecting the "1" key again may cause a corresponding symbol to be output. Petitioner Exhibit 1002-2457

output, letters and numbers may be output, as described above, until the "1" key is selected again to display the symbol menu. Fully inverting the device, shaking the device, or otherwise moving the device in a manner that is not interpreted as a tilt of the device generates another menu.

[0512] A first output signal is output if the angular displacement is within the first tilt region when the selection is received, where a second output signal is output if the angular displacement is within the second tilt region when the selection is received. Furthermore, a third or fourth output signal is output if the angular displacement is within the third or fourth tilt region, respectively, when the selection is received.

[0513] If a plurality of first-axis tilt regions are defined about the first axis and a plurality of second-axis tilt regions are defined about the second axis, the one of the first plurality of output signals may be also output based upon the plurality of first-axis tilt regions and/or the plurality of second-axis tilt regions. When the selection is received, a first output signal may be output if the first-axis component is within a first first-axis tilt region and if the second-axis component is within a first second-axis tilt region, a second output signal may be output if the first-axis component is within a second first-axis tilt region and if the second-axis component is within the first second-axis tilt region, a third output signal may be output if the first-axis component is within the second first-axis tilt region and if the second-axis component is within a second second-axis tilt region, and/or a fourth output signal may be output if the first-axis component is within the second first-axis tilt region and if the second-axis component is within the second second-axis tilt region.

[0514] Alternatively, in another aspect, when the selection is received, a first output signal may be output if the first component is within a first first-axis tilt region and if the second-axis component is within a first second-axis tilt region, a second output signal may be output if the first component is within the first first-axis tilt region and if the second-axis component is within a second second-axis tilt region, a third output signal may be output if the first component is within the first first-axis tilt region and if the second-axis component is within a third second-axis tilt region, a fourth output signal may be output if the first component is within a second first-axis tilt region and if the second-axis component is within the first second-axis tilt region, a fifth output signal may be output if the first component is within the second first-axis tilt region and if the second-axis component is within the second second-axis tilt region, a sixth output signal may be output if the first component is within the second first-axis tilt region and if the second-axis component is within the third second-axis tilt region, a seventh output signal may be output if the first component is within a third first-axis tilt region and if the second-axis component is within the first second-axis tilt region, an eighth output signal may be output if the first component is within the third first-axis tilt region and if the second-axis component is within the second second-axis tilt region, and/or a ninth output signal may be output if the first component is within the third first-axis tilt region and if the second-axis component is within the third second-axis tilt region.

[0515] The output signal is displayed (step ES310), and method E300 ends (step ES311). The output signal is displayed on a display, such as display E105. In an alternate aspect, the output signal is not displayed.

[0516] In the FIG. 32 implementation, device E500 also includes display E505, which is used to present a graphical user interface ("GUI") to a user of device E500. The GUI enables a user of device E500 to perform functions that require the user to enter text into device E500. For example, the user may identify an entry for a person within a phonebook stored on device E500 by entering a name of the person as an input

Petitioner Exhibit 1002-2458

example, the user may add an entry for a person to the phonebook by entering information describing the person, such as the person's name and one or more phone numbers used by the person. Furthermore, the GUI enables the user to specify a text message that is to be sent from device E500 or to specify another textual note that is to be stored on device E500. Device E500 also displays a GUI that enables a user to specify a text message.

[0517] Interpreting control selections based on device orientations when the control selections are made increases the number of operations that may be performed with a single control selection. For example, each control selection may be interpreted in a number of manners that is equal to the number of distinct orientations of the device that may be detected. Furthermore, the orientation of the device may indicate how selection of control that do not correspond to any characters may be interpreted. Therefore, a user may be enabled to quickly perform relatively complex operations simply by tilting the device and selecting controls. For example, selecting the "*" key while the device is rolled to the left may cause a particular mode of text entry (e.g., numbers only, all capital letters) to be used for text entry until the next time the "*" key is selected when the device is rolled to the left. In another aspect, the tilt sensor effectuates tilt scrolling, such that, upon receipt of the selection of a control, a user interface is scrolled corresponding to the direction of the tilt. A forward pitch occurring at the time of control selection, for example, would result in the user interface, or a menu item on the user interface, scrolling upward.

[0518] According to another general aspect, a computer program product, tangibly stored on a computer-readable medium, is recited. The computer program product is operable to cause a computer to perform operations including determining a neutral position of a device in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals, and measuring an angular displacement of the device about at least the first axis. The computer program product is also operable to cause a computer to perform operations including receiving a selection of the first control, and outputting one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0519] Finally, although a number of implementations have been described or exemplified as a telephone device, it is contemplated that the concepts related herein are by no means limited to telephony, and are in fact applicable to a broad variety of devices, including any device in which the number of controls is minimized due to device design and layout restrictions. Sample devices include computer keyboards, remote controls, watches, joysticks or game controllers, or other computer input or consumer electronic devices.

[0520] Accordingly, a number of implementations have been described. Nevertheless, it will be understood that various modifications may be made. For example, elements of different implementations may be combined, supplemented, or removed to produce other implementations. Further, various technologies may be used, combined, and modified to produce an implemention, such technologies including, for example, a variety of digital electronic circuitry, hardware, software, firmware, integrated components, discrete components, processing devices, memory storage devices, communication devices, lenses, filters, display devices, and projection devices.

Game System

[0521] With reference to FIG. 39, a game system 39 according to some embodiments will be described. FIG. 39 is an external view illustrating the game system 39. In the

Petitioner Exhibit 1002-2459

following description, the game system 39 according to some embodiments includes a stationary game apparatus.

[0522] As shown in FIG. 39, the game system F1 includes a stationary game apparatus (hereinafter, referred to simply as a "game apparatus") F3, which is connected to a display (hereinafter, referred to as a "monitor") F2 of a home-use television receiver or the like having a speaker F2a via a connection cord, and a controller F7 for giving operation information to the game apparatus F3. The game apparatus F3 is connected to a receiving unit F6 via a connection terminal. The receiving unit F6 receives transmission data which is wirelessly transmitted from the controller F7. The controller F7 and the game apparatus F3 are connected to each other by wireless communication. On the game apparatus F3, an optical disc F4 as an example of an exchangeable information storage medium is detachably mounted. The game apparatus F3 includes a power ON/OFF switch, a game process reset switch, and an OPEN switch for opening a top lid of the game apparatus F3 on a top main surface of the game apparatus F3. When a player presses the OPEN switch, the lid is opened, so that the optical disc F4 can be mounted or dismounted.

[0523] Further, on the game apparatus F3, an external memory card F5 is detachably mounted when necessary. The external memory card F5 has a backup memory or the like mounted thereon for fixedly storing saved data or the like. The game apparatus F3 executes a game program or the like stored on the optical disc F4 and displays the result on the monitor F2 as a game image. The game apparatus F3 can also reproduce a state of a game played in the past using saved data stored in the external memory card F5 and display the game image on the monitor F2. A player playing with the game apparatus F3 can enjoy the game by operating the controller F7 while watching the game image displayed on the monitor F2.

[0524] The controller F7 wirelessly transmits the transmission data from a communication section F75 included therein (described later) to the game apparatus F3 connected to the receiving unit F6, using the technology of, for example, Bluetooth (registered trademark). The controller F7 has two control units, a core unit F70 and a subunit F76, connected to each other by a flexible connecting cable F79. The controller F7 is an operation means for mainly operating a player object appearing in a game space displayed on the monitor F2. The core unit F70 and the subunit F76 each includes an operation section such as a plurality of operation buttons, a key, a stick and the like. As described later in detail, the core unit F70 includes an imaging information calculation section F74 for taking an image viewed from the core unit F70. As an example of an imaging target of the imaging information calculation section F74, two LED modules F8L and F8R are provided in the vicinity of a display screen of the monitor F2. The LED modules F8L and F8R each outputs infrared light forward from the monitor F2. Although in the present embodiment the core unit F70 and the subunit F76 are connected to each other by the flexible cable, the subunit F76 may have a wireless unit, thereby eliminating the connecting cable F79. For example, the subunit F76 has a Bluetooth (registered trademark) unit as the wireless unit, whereby the subunit F76 can transmit operation data to the core unit F70.

[0525] Next, with reference to FIG. 40, a structure of the game apparatus F3 will be described. FIG. 40 is a functional block diagram of the game apparatus F3.

[0526] As shown in FIG. 40, the game apparatus F3 includes, for example, a RISC CPU (central processing unit) F30 for executing various types of programs. The CPU F30 executes a boot program stored in a boot ROM (not shown) to, for example, initialize memories including a main memory F33, and then executes a game program

Petitioner Exhibit 1002-2460

stored on the optical disc F4 to perform game process or the like in accordance with the game program. The CPU F30 is connected to a GPU (Graphics Processing Unit) F32, the main memory F33, a DSP (Digital Signal Processor) F34, and an ARAM (audio RAM) F35 via a memory controller F31. The memory controller F31 is connected to a controller I/F (interface) F36, a video I/F F37, an external memory I/F F38, an audio I/F F39, and a disc I/F F41 via a predetermined bus. The controller I/F F36, the video I/F F37, the external memory I/F F38, the audio I/F F39 and the disc I/F F41 are respectively connected to the receiving unit F6, the monitor F2, the external memory card F5, the speaker F2a, and a disc drive F40.

[0527] The GPU F32 performs image processing based on an instruction from the CPU F30. The GPU F32 includes, for example, a semiconductor chip for performing calculation process necessary for displaying 3D graphics. The GPU F32 performs the image process using a memory dedicated for image process (not shown) and a part of the storage area of the main memory F33. The GPU F32 generates game image data and a movie to be displayed on the monitor F2 using such memories, and outputs the generated data or movie to the monitor F2 via the memory controller F31 and the video I/F F37 as necessary.

[0528] The main memory F33 is a storage area used by the CPU F30, and stores a game program or the like necessary for processing performed by the CPU F30 as necessary. For example, the main memory F33 stores a game program read from the optical disc F4 by the CPU F30, various types of data or the like. The game program, the various types of data or the like stored in the main memory F33 are executed by the CPU F30.

[0529] The DSP F34 processes sound data or the like generated by the CPU F30 during the execution of the game program. The DSP F34 is connected to the ARAM F35 for storing the sound data or the like. The ARAM F35 is used when the DSP F34 performs a predetermined process (for example, storage of the game program or sound data already read). The DSP F34 reads the sound data stored in the ARAM F35, and outputs the sound data to the speaker F2a included in the monitor F2 via the memory controller F31 and the audio I/F F39.

[0530] The memory controller F31 comprehensively controls data transmission, and is connected to the various I/Fs described above. The controller I/F F36 includes, for example, four controller I/Fs F36a, F36b, F36c and F36d, and communicably connects the game apparatus F3 to an external device which is engageable via connectors of the controller I/Fs F36a, F36b, F36c and F36d. For example, the receiving unit F6 is engaged with such a connector and is connected to the game apparatus F3 via the controller I/F F36. As described above, the receiving unit F6 receives the transmission data from the controller F7 and outputs the transmission data to the CPU F30 via the controller I/F F36. The video I/F F37 is connected to the monitor F2. The external memory I/F F38 is connected to the external memory card F5 and is accessible to a backup memory or the like provided in the external memory card F5. The audio I/F F39 is connected to the speaker F2a built in the monitor F2 such that the sound data read by the DSP F34 from the ARAM F35 or sound data directly outputted from the disc drive F40 can be outputted from the speaker F2a. The disc I/F F41 is connected to the disc drive F40. The disc drive F40 reads data stored at a predetermined reading position of the optical disc F4 and outputs the data to a bus of the game apparatus F3 or the audio I/F F39.

[0531] Next, with reference to FIGS. 41 and 42, the controller F7 will be described. FIG. 41 is a perspective view illustrating an outer appearance of the controller F7. FIG. 42 is

Petitioner Exhibit 1002-2461

a perspective view illustrating a state of the connecting cable F79 of the controller F7 shown in FIG. 41 being connected to or disconnected from the core unit F70.

[0532] As shown in FIG. 41, the controller F7 includes the core unit F70 and the subunit F76 connected to each other by the connecting cable F79. The core unit F70 has a housing F71 including a plurality of operation sections F72. The subunit F76 has a housing F77 including a plurality of operation sections F78. The core unit F70 and the subunit F76 are connected to each other by the connecting cable F79.

[0533] As shown in FIG. 42, the connecting cable F79 has a connector F791 detachably connected to the connector F73 of the core unit F70 at one end thereof, and the connecting cable F79 is fixedly connected to the subunit F76 at the other end thereof. The connector F791 of the connecting cable F79 is engaged with the connector F73 provided at the rear surface of the core unit F70 so as to connect the core unit F70 and the subunit F76 to each other by the connecting cable F79.

[0534] With reference to FIGS. 43 and 44, the core unit F70 will be described. FIG. 43 is a perspective view of the core unit F70 as seen from the top rear side thereof. FIG. 44 is a perspective view of the core unit F70 as seen from the bottom front side thereof.

[0535] As shown in FIGS. 43 and 44, the core unit F70 includes the housing F71 formed by plastic molding or the like. The housing F71 has a generally parallelepiped shape extending in a longitudinal direction from front to rear. The overall size of the housing F71 is small enough to be held by one hand of an adult or even a child.

[0536] At the center of a front part of a top surface of the housing F71, a cross key F72a is provided. The cross key F72a is a cross-shaped four-direction push switch. The cross key F72a includes operation portions corresponding to the four directions (front, rear, right and left) represented by arrows, which are respectively located on cross-shaped projecting portions arranged at intervals of 90 degrees. The player selects one of the front, rear, right and left directions by pressing one of the operation portions of the cross key F72a. Through an operation on the cross key F72a, the player can, for example, instruct a direction in which a player character or the like appearing in a virtual game world is to move or a direction in which the cursor is to move.

[0537] Although the cross key F72a is an operation section for outputting an operation signal in accordance with the aforementioned direction input operation performed by the player, such an operation section may be provided in another form. For example, the cross key F72a may be replaced with a composite switch including a push switch including a ring-shaped four-direction operation section and a center switch provided at the center thereof. Alternatively, the cross key F72a may be replaced with an operation section which includes an inclinable stick projecting from the top surface of the housing F71 and outputs an operation signal in accordance with the inclining direction of the stick. Still alternatively, the cross key F72amay be replaced with an operation section which includes a disc-shaped member horizontally slidable and outputs an operation signal in accordance with the sliding direction of the disc-shaped member. Still alternatively, the cross key F72a may be replaced with a touch pad. Still alternatively, the cross key F72a may be replaced with an operation section which includes switches representing at least four directions (front, rear, right and left) and outputs an operation signal in accordance with the switch pressed by the player.

[0538] Behind the cross key F72a on the top surface of the housing F71, a plurality of operation buttons F72b, F72c, F72d, F72e, F72f and F72g are provided. The operation buttons F72b, F72c, F72d, F72e, F72f and F72g are each an operation section for

Petitioner Exhibit 1002-2462

outputting a respective operation signal assigned to the operation buttons F72b, F72c, F72d, F72e, F72f or F72g when the player presses a head thereof. For example, the operation buttons F72b, F72c, and F72d are assigned with functions of a first button, a second button, and an A button. Further, the operation buttons F72e, F72f and F72g are assigned with functions of a minus button, a home button and a plus button, for example. The operation buttons F72b, F72c, F72d, F72e, F72f and F72g are assigned with respective functions in accordance with the game program executed by the game apparatus F3. In an exemplary arrangement shown in FIG. 43, the operation buttons F72b, F72c and F72d are arranged in a line at the center in the front-rear direction on the top surface of the housing F71. The operation buttons F72e, F72f and F72g are arranged in a line in the left-right direction between the operation buttons F72b and F72d on the top surface of the housing F71. The operation button F72f has a top surface thereof buried in the top surface of the housing F71, so as not to be inadvertently pressed by the player.

[0539] In front of the cross key F72a on the top surface of the housing F71, an operation button F72h is provided. The operation button F72h is a power switch for remote-controlling the power of the game apparatus 3 to be on or off. The operation button F72h also has a top surface thereof buried in the top surface of the housing F71, so as not to be inadvertently pressed by the player.

[0540] Behind the operation button F72c on the top surface of the housing F71, a plurality of LEDs F702 are provided. The controller F7 is assigned a controller type (number) so as to be distinguishable from the other controllers F7. For example, the LEDs F702 are used for informing the player of the controller type which is currently set to controller F7 that he or she is using. Specifically, when the core unit F70 transmits the transmission data to the receiving unit F6, one of the plurality of LEDs F702 corresponding to the controller type is lit up.

[0541] On the top surface of the housing F71, a sound hole for externally outputting a sound from a speaker F706 shown in FIG. 45, which will be described below, is provided between the operation buttons F72e, F72f, and F72g and the operation button F72b.

[0542] On a bottom surface of the housing F71, a recessed portion is formed. As described later in detail, the recessed portion is formed at a position at which an index finger or middle finger of the player is located when the player holds the core unit F70. On a rear slope surface of the recessed portion, an operation button F72i is provided. The operation button F72i is an operation section acting as, for example, a B button. The operation button F72i is used, for example, as a trigger switch in a shooting game, or for attracting attention of a player object to a predetermined object.

[0543] On a front surface of the housing F71, an image pickup element F743 included in the imaging information calculation section F74 is provided. The imaging information calculation section F74 is a system for analyzing image data taken by the core unit F70 and detecting for the centroid, the size and the like of an area having a high brightness in the image data. The imaging information calculation section F74 has, for example, a maximum sampling period of about 200 frames/sec., and therefore can trace and analyze even a relatively fast motion of the core unit F70. The imaging information calculation section F74 will be described later in detail. On a rear surface of the housing F71, the connector F73 is provided. The connector F73 is, for example, a 32-pin edge connector, and is used for engaging and connecting the core unit F70 with the connector F791 of the connecting cable F79.

Petitioner Exhibit 1002-2463

[0544] With reference to FIGS. 45 and 46, an internal structure of the core unit F70 will be described. FIG. 45 is a perspective view illustrating, as seen from the rear side of the core unit F70, a state where an upper casing (a part of the housing F71) of the core unit F70 is removed. FIG. 46 is a perspective view illustrating, as seen from the front side of the core unit F70, a state where a lower casing (a part of the housing F71) of the core unit F70 is removed. FIG. 46 is a perspective view illustrating a reverse side of a substrate F700 shown in FIG. 45.

[0545] As shown in FIG. 45, the substrate F700 is fixed inside the housing F71. On a top main surface of the substrate F700, the operation buttons F72a, F72b, F72c, F72d, F72e, F72f, F72g and F72h, an acceleration sensor F701, the LEDs F702, an antenna F754 and the like are provided. These elements are connected to a micro computer F751 (see FIGS. 46 and 55) and the like via lines (not shown) formed on the substrate F700 and the like. The wireless module F753 not shown (see FIG. 55) and the antenna F754 allow the core unit F70 to act as a wireless controller. The quartz oscillator F703 not shown, which is provided in the housing F71, generates a reference clock of the micro computer F751 described later. On the top main surface of the substrate F700, the speaker F706 and an amplifier F708 are provided. The acceleration sensor F701 is provided near the edge of the substrate F700 offset from the center thereof. Therefore, a change of a direction of the gravitational acceleration and an acceleration containing a centrifugal force component can be detected based on a rotation of the core unit F70 about the longitudinal direction thereof, so that a predetermined calculation is used to determine the rotation of the core unit F70 with favorable accuracy based on the acceleration data having been detected.

[0546] As shown in FIG. 46, at a front edge of a bottom main surface of the substrate F700, the imaging information calculation section F74 is provided. The imaging information calculation section F74 includes an infrared filter F741, a lens F742, the image pickup element F743 and an image processing circuit F744 located in this order from the front surface of the core unit F70 on the bottom main surface of the substrate F700. At a rear edge of the bottom main surface of the substrate F700, the connector F73 is attached. Further, a sound IC F707 and the micro computer F751 are provided on the bottom main surface of the substrate F700. The sound IC F707, which is connected to the micro computer F751 and the amplifier F708 via lines formed on the substrate F700 and the like, outputs a sound signal to the speaker F706 via the amplifier F708 based on the sound data transmitted from the game apparatus F3. On the bottom main surface of the substrate F700, a vibrator F704 is provided. The vibrator F704 is, for example, a vibration motor or a solenoid. The core unit F70 is vibrated by an actuation of the vibrator F704, and the vibration is conveyed to the player's hand holding the core unit F70. Thus, a so-called vibration-feedback game is realized. The vibrator F704 is disposed slightly toward the front of the housing F71, thereby allowing the housing F71 held by the player to strongly vibrate, that is, allowing the player to easily feel the vibration.

[0547] With reference to FIGS. 47 to 50, the subunit F76 will be described. FIG. 47 is a perspective view illustrating a first example of the subunit F76. FIG. 48 is a perspective view illustrating a state where an upper casing (a part of the housing F77) of the subunit F76 shown in FIG. 47 is removed. FIG. 49A is a top view illustrating a second example of the subunit F76. FIG. 49B is a bottom view illustrating the second example of the subunit F76. FIG. 49C is a left side view illustrating the second example of the subunit F76. FIG. 50 is a perspective view illustrating the second example of the subunit F76 as seen from the top front side thereof.

[0548] As shown in FIG. 47, the subunit F76 includes the housing F77 formed by, for

Petitioner Exhibit 1002-2464

example, plastic molding. The housing F77 extends in a longitudinal direction from front to rear, and has a streamline solid shape including a head which is a widest portion in the subunit F76. The overall size of the subunit F76 is small enough to be held by one hand of an adult or even a child.

[0549] In the vicinity of the widest portion on the top surface of the housing F77, a stick F78a is provided. The stick F78a is an operation section which includes an inclinable stick projecting from the top surface of the housing F77 and outputs an operation signal in accordance with the inclining direction of the stick. For example, a player can arbitrarily designate a direction and a position by inclining a tip of the stick in any direction of 360 degrees, whereby the player can instruct a direction in which a player character or the like appearing in a virtual game world is to move, or can instruct a direction in which a cursor is to move.

[0550] In front of the housing F77 of the subunit F76, a plurality of operation buttons F78d and F78e are provided. The operation buttons F78d and F78e are each an operation section for outputting a respective operation signal assigned to the operation buttons F78d and F78e when the player presses a head thereof. For example, the operation buttons F78d and F78e are assigned with functions of an X button and a Y button, for example. The operation buttons F78d and F78e are assigned with respective functions in accordance with the game program executed by the game apparatus F3. In an exemplary arrangement shown in FIG. 47, the operation buttons F78d and F78e are aligned from the top to bottom on the front surface of the housing F77.

[0551] In FIG. 48, a substrate is fixed in the housing F77. The stick F78a, an acceleration sensor F761 and the like are provided on the top main surface of the substrate. The stick F78a, the acceleration sensor F761 and the like are connected to the connecting cable F79 via lines (not shown) formed on the substrate and the like.

[0552] As shown in FIGS. 49A, 49B, 49C and 50, the subunit F76 of the second example includes the housing F77, the stick F78a, the operation buttons F78d and F78e as in the case of the subunit F76 of the first example, and the subunit F76 of the second example has the operation buttons F78b and F78c on the top surface of the housing F77.

[0553] Behind the stick F78a on the top surface of the housing F77, the subunit F76 of the second example has a plurality of operation buttons F78b and F78c. The operation buttons F78b and F78c are each an operation section for outputting a respective operation signal assigned to the operation buttons F78b and F78c when the player presses a head thereof. The operation buttons F78b and F78c are assigned with respective functions in accordance with the game program executed by the game apparatus F3. In an exemplary arrangement shown in FIGS. 49A, 49B, and 49C and 50, the operation buttons F78b and F78c are arranged in a line at the center of the top surface of the housing F77 in the left-right direction.

[0554] Although the stick F78a is an operation section for outputting an operation signal in accordance with a direction input operation performed by the player as described above, such an operation section may be provided in another form. Hereinafter, with reference to FIGS. 51 to 54, a first through a fifth exemplary modifications, each of which includes the subunit F76 of the second example having an operation section for outputting an operation signal in accordance with the direction input operation, will be described.

Petitioner Exhibit 1002-2465

[0555] As the first exemplary modification, as shown in FIG. 51, the subunit F76 may include a cross key F78f similar to the cross key F72a of the core unit F70 instead of the stick F78a. As the second exemplary modification, as shown in FIG. 52, the subunit F76 may include a slide pad F78g which includes a disc-shaped member horizontally slidable and outputs an operation signal in accordance with the sliding direction of the disc-shaped member, instead of the stick F78a. As the third exemplary modification, as shown in FIG. 53, the subunit F76 may include a touch pad F78h instead of the stick F78a. As the fourth exemplary modification, as shown in FIG. 54, the subunit F76 may include an operation section which has buttons F78i, F78j, F78k, and F78l representing at least four directions (front, rear, right and left), respectively, and outputs an operation signal in accordance with the button (F78i, F78j, F78k, or F78l) pressed by a player, instead of the stick F78a. As the fifth exemplary modification, the subunit F76 may include a composite switch including a push switch having a ring-shaped four-direction operation section and a center switch provided at the center thereof, instead of the stick F78a.

[0556] Next, with reference to FIG. 55, an internal structure of the controller F7 will be described. FIG. 55 is a block diagram illustrating the structure of the controller F7.

[0557] As shown in FIG. 55, the core unit F70 includes the communication section F75 in addition to the operation section F72, the imaging information calculation section F74, the acceleration sensor F701, the speaker F706, the sound IC F707, and the amplifier F708 as described above. Further, the subunit F76, which has the operation section F78 and the acceleration sensor F761 as described above, is connected to the micro computer F751 via the connecting cable F79 and the connectors F791 and F73.

[0558] The imaging information calculation section F74 includes the infrared filter F741, the lens F742, the image pickup element F743 and the image processing circuit F744. The infrared filter F741 allows only infrared light to pass therethrough, among light incident on the front surface of the core unit F70. The lens F742 collects the infrared light which has passed through the infrared filter F741 and outputs the infrared light to the image pickup element F743. The image pickup element F743 is a solid-state imaging device such as, for example, a CMOS sensor or a CCD. The image pickup element F743 takes an image of the infrared light collected by the lens F742. Accordingly, the image pickup element F743 takes an image of only the infrared light which has passed through the infrared filter F741 and generates image data. The image data generated by the image pickup element F743 is processed by the image processing circuit F744. Specifically, the image processing circuit F744 processes the image data obtained from the image pickup element F743, identifies a spot thereof having a high brightness, and outputs process result data representing the identified position coordinates and size of the area to the communication section F75. The imaging information calculation section F74 is fixed to the housing F71 of the core unit F70. The imaging direction of the imaging information calculation section F74 can be changed by changing the direction of the housing F71. The housing F71 is connected to the subunit F76 by the flexible connecting cable F79, and therefore the imaging direction of the imaging information calculation section F74 is not changed by changing the direction and position of the subunit F76. As described later in detail, a signal can be obtained in accordance with the position and the motion of the core unit F70 based on the process result data outputted by the imaging information calculation section F74.

[0559] The core unit F70 preferably includes a three-axis acceleration sensor F701. Further, the subunit F76 preferably includes a three-axis acceleration sensor F761. The three axis acceleration sensors F701 and F761 each detects for a linear acceleration in three directions, i.e., the up/down direction, the left/right direction, and the

Petitioner Exhibit 1002-2466

forward/backward direction. Alternatively, a two axis acceleration detection means which detects for only a linear acceleration along each of the up/down and left/right directions (or other pair of directions) may be used in another embodiment depending on the type of control signals used in the game process. For example, the three axis acceleration sensors F701 and F761 or the two axis acceleration sensors F701 and F761 may be of the type available from Analog Devices, Inc. or STMicroelectronics N.V. Preferably, each of the acceleration sensors F701 and F761 is of an electrostatic capacitance (capacitance-coupling) type that is based on silicon micro-machined MEMS (Micro Electro Mechanical Systems) technology. However, any other suitable acceleration detection technology (e.g., piezoelectric type or piezoresistance type) now existing or later developed may be used to provide the three axis acceleration sensors F701 and F761 or two axis acceleration sensors F701 and F761.

[0560] As one skilled in the art understands, the acceleration detection means, as used in the acceleration sensors F701 and F761, are capable of detecting for only acceleration (linear acceleration) along a straight line corresponding to each axis of the acceleration sensor. In other words, each of the direct outputs of the acceleration sensors F701 and F761 is limited to signals indicative of linear acceleration (static or dynamic) along each of the two or three axes thereof. As a result, the acceleration sensors F701 and F761 cannot directly detect movement along a non-linear (e.g. arcuate) path, rotation, rotational movement, angular displacement, tilt, position, attitude or any other physical characteristic.

[0561] However, through additional processing of the acceleration signals output from each of the acceleration sensors F701 and F761, additional information relating to the core unit F70 and the subunit F76 can be inferred or calculated, as one skilled in the art will readily understand from the description herein. For example, by detecting static acceleration (i.e., gravity), the outputs of the acceleration sensors F701 and F761 can be used to infer tilt of the object (core unit F70 or subunit F76) relative to the gravity vector by correlating tilt angles with detected acceleration. In this way, the acceleration sensors F701 and F761 can be used in combination with the micro computer F751 (or another processor) to determine tilts, attitudes or positions of the core unit F70 and the subunit F76. Similarly, various movements and/or positions of the core unit F70 and the subunit F76 can be calculated or inferred through processing of the acceleration signals generated by the acceleration sensors F701 and F761 when the core unit F70 containing the acceleration sensor F701 or the subunit F76 containing the acceleration sensor F761 is subjected to dynamic accelerations by, for example, the hand of a user, as described herein. In another embodiment, each of the acceleration sensors F701 and F761 may include an embedded signal processor or other type of dedicated processor for performing any desired processing of the acceleration signals outputted from the acceleration detection means prior to outputting signals to micro computer F751. For example, the embedded or dedicated processor could convert the detected acceleration signal to a corresponding tilt angle when the acceleration sensor is intended to detect static acceleration (i.e., gravity). Data representing the acceleration detected by each of the acceleration sensors F701 and F761 is outputted to the communication section F75.

[0562] In another exemplary embodiment, at least one of the acceleration sensors F701 and F761 may be replaced with a gyro-sensor of any suitable technology incorporating, for example, a rotating or vibrating element. Exemplary MEMS gyro-sensors that may be used in this embodiment are available from Analog Devices, Inc. Unlike the acceleration sensors F701 and F761, a gyro-sensor is capable of directly detecting rotation (or angular rate) around at least one axis defined by the gyroscopic element therein. Thus, due to the fundamental differences between a gyro-sensor and

Petitioner Exhibit 1002-2467

an acceleration sensor, corresponding changes need to be made to the processing operations that are performed on the output signals from these devices depending on which device is selected for a particular application.

[0563] More specifically, when the tilt or attitude is calculated using a gyro-sensor instead of the acceleration sensor, significant changes are necessary. Specifically, when using a gyro-sensor, the value of the tilt is initialized at the start of the detection. Then, data on the angular rate which is output from the gyro-sensor is integrated. Next, a change amount in tilt from the value of the tilt initialized is calculated. In this case, the calculated tilt corresponds to an angle. In contrast, when the acceleration sensor calculates the tilt, the tilt is calculated by comparing the value of the gravitational acceleration of each axial component with a predetermined reference. Therefore, the calculated tilt can be represented as a vector. Thus, without initialization, an absolute direction can be determined with an acceleration detection means. The type of the value calculated as the tilt is also very different between a gyro sensor and an acceleration sensor; i.e., the value is an angle when a gyro sensor is used and is a vector when an acceleration sensor is used. Therefore, when a gyro sensor is used instead of an acceleration sensor or vice versa, data on tilt also needs to be processed through a predetermined conversion taking into account the fundamental differences between these two devices. Due to the fact that the nature of gyroscopes is known to one skilled in the art, as well as the fundamental differences between the acceleration detection means and the gyroscope, further details are not provided herein. While a gyro-sensor is advantageous in that a rotation can be directly detected, an acceleration sensor is generally more cost effective when used in connection with the controller described herein.

[0564] The communication section F75 includes the micro computer F751, a memory F752, the wireless module F753 and the antenna F754. The micro computer F751 controls the wireless module F753 for wirelessly transmitting the transmission data while using the memory F752 as a storage area during the process. Further, the micro computer F751 controls the sound IC F707 and the vibrator F704 based on data from the game apparatus F3 having been received by the wireless module F753 via the antenna F754. The sound IC F707 processes sound data transmitted from the game apparatus F3 via the communication section F75, and the like.

[0565] Data from the core unit F70 including an operation signal (core key data) from the operation section F72, acceleration signals (core acceleration data) from the acceleration sensor F701, and the process result data from the imaging information calculation section F74 are outputted to the micro computer F751. An operation signal (sub key data) from the operation section F78 of the subunit F76 and acceleration signals (sub acceleration data) from the acceleration sensor F761 are outputted to the micro computer F751 via the connecting cable F79. The micro computer F751 temporarily stores the input data (core key data, sub key data, core acceleration data, sub acceleration data, and process result data) in the memory F752 as the transmission data which is to be transmitted to the receiving unit F6. The wireless transmission from the communication section F75 to the receiving unit F6 is performed periodically at a predetermined time interval. Since game process is generally performed at a cycle of 1/60 sec., data needs to be collected and transmitted at a cycle of a shorter time period. Specifically, the game process unit is 16.7 ms (1/60 sec.), and the transmission interval of the communication section F75 structured using the Bluetooth(R) technology is 5 ms. At the transmission timing to the receiving unit F6, the micro computer F751 outputs the transmission data stored in the memory F752 as a series of operation information to the wireless module F753. The wireless module F753 uses, for example, the Bluetooth(R) technology to modulate the operation information

Petitioner Exhibit 1002-2468

onto a carrier wave of a predetermined frequency, and radiates the low power radio wave signal from the antenna F754. Thus, the core key data from the operation section F72 included in the core unit F70, the sub key data from the operation section F78 included in the subunit F76, the core acceleration data from the acceleration sensor F701 included in the core unit F70, the subacceleration data from the acceleration sensor F761 included in the subunit F76, and the process result data from the imaging information calculation section F74 are modulated onto the low power radio wave signal by the wireless module F753 and radiated from the core unit F70. The receiving unit F6 of the game apparatus F3 receives the low power radio wave signal, and the game apparatus F3 demodulates or decodes the low power radio wave signal to obtain the series of operation information (the core key data, the sub key data, the core acceleration data, the sub acceleration data and the process result data). Based on the obtained operation information and the game program, the CPU F30 of the game apparatus F3 performs the game process. In the case where the communication section F75 is structured using the Bluetooth(R) technology, the communication section F75 can have a function of receiving transmission data which is wirelessly transmitted from other devices.

[0566] As shown in FIG. 56, in order to play a game using the controller F7 with the game system F1, a player holds the core unit F70 with one hand (for example, a right hand) (see FIGS. 57 and 58), and holds the subunit F76 with the other hand (for example, a left hand) (see FIG. 60). The player holds the core unit F70 so as to point the front surface of the core unit F70 (that is, a side having an entrance through which light is incident on the imaging information calculation section F74 taking an image of the light) to the monitor F2. On the other hand, two LED modules F8L and F8R are provided in the vicinity of the display screen of the monitor F2. The LED modules F8L and F8R each outputs infrared light forward from the monitor F2.

[0567] When a player holds the core unit F70 so as to point the front surface thereof to the monitor F2, infrared lights outputted by the two LED modules F8L and F8R are incident on the imaging information calculation section F74. The image pickup element F743 takes images of the infrared lights incident through the infrared filter F741 and the lens F742, and the image processing circuit F744 processes the taken images. The imaging information calculation section F74 detects infrared components outputted by the LED modules F8L and F8R so as to obtain positions and area information of the LED modules F8L and F8R. Specifically, the imaging information calculation section F74 analyzes image data taken by the image pickup element F743, eliminates images which do not represent the infrared lights outputted by the LED modules F8L and F8R from the area information, and identifies points each having a high brightness as positions of the LED modules F8L and F8R. The imaging information calculation section F74 obtains position coordinates, coordinates of the centroid, and the like of each of the identified points having the high brightness and outputs the same as the process result data. When such process result data is transmitted to the game apparatus F3, the game apparatus F3 can obtain, based on the position coordinates and the coordinates of the centroid, operation signals relating to the motion, attitude, position and the like of the imaging information calculation section F74, that is, the core unit F70, with respect to the LED modules F8L and F8R. Specifically, the position having a high brightness in the image obtained through the communication section F75 is changed in accordance with the motion of the core unit F70, and therefore a direction input or coordinate input is performed in accordance with the position having the high brightness being changed, thereby enabling a direction input or a coordinate input to be performed along the moving direction of the core unit F70.

[0568] Thus, the imaging information calculation section F74 of the core unit F70 takes

Petitioner Exhibit 1002-2469

images of stationary markers (infrared lights from the two LED modules F8L and F8R in the present embodiment), and therefore the game apparatus F3 can use the process result data relating to the motion, attitude, position and the like of the core unit F70 in the game process, whereby an operation input, which is different from an input made by pressing an operation button or using an operation key, is further intuitively performed. As described above, since the markers are provided in the vicinity of the display screen of the monitor F2, the motion, attitude, position and the like of the core unit F70 with respect to the display screen of the monitor F2can be easily calculated based on positions from the markers. That is, the process result data used for obtaining the motion, attitude, position and the like of the core unit F70 can be used as operation input immediately applied to the display screen of the monitor F2.

[0569] With reference to FIGS. 57 and 58, a state of a player holding the core unit F70 with one hand will be described. FIG. 57 shows an exemplary state of a player holding the core unit F70 with a right hand as seen from the front surface side of the core unit F70. FIG. 58 shows an exemplary state of a player holding the core unit F70 with a right hand as seen from the left side of the core unit F70.

[0570] As shown in FIGS. 57 and 58, the overall size of the core unit F70 is small enough to be held by one hand of an adult or even a child. When the player puts a thumb on the top surface of the core unit F70 (for example, near the cross key F72a), and puts an index finger in the recessed portion on the bottom surface of the core unit F70 (for example, near the operation button F72i), the light entrance of the imaging information calculation section F74 on the front surface of the core unit F70 is exposed forward to the player. It should be understood that also when the player holds the core unit F70 with a left hand, the holding state is the same as that described for the right hand.

[0571] Thus, the core unit F70 allows a player to easily operate the operation section F72 such as the cross key F72a or the operation button F72i while holding the core unit F70 with one hand. Further, when the player holds the core unit F70 with one hand, the light entrance of the imaging information calculation section F74 on the front surface of the core unit F70 is exposed, whereby the light entrance can easily receive infrared lights from the aforementioned two LED modules F8L and F8R. That is, the player can hold the core unit F70 with one hand without preventing the imaging information calculation section F74 from functioning. That is, when the player moves his or her hand holding the core unit F70 with respect to the display screen, the core unit F7o can further perform an operation input enabling a motion of the player's hand to directly act on the display screen.

[0572] As shown in FIG. 59, the LED modules F8L and F8R each has a viewing angle .theta.1. The image pickup element F743 has a viewing angle .theta.2. For example, the viewing angle .theta.1 of the LED modules F8L and F8R is 34 degrees (half-value angle), and the viewing angle .theta.2 of the image pickup element F743 is 41 degrees. When both the LED modules F8L and F8R are in the viewing angle .theta.2 of the image pickup element F743, and the image pickup element F743 is in the viewing angle .theta.1 of the LED module F8L and the viewing angle .theta.1 of the LED module F8R, the game apparatus F3 determines a position of the core unit F70 using positional information relating to the point having high brightness of the two LED modules F8L and F8R.

[0573] When either the LED module F8L or LED module F8R is in the viewing angle .theta.2 of the image pickup element F743, or when the image pickup element F743 is in either the viewing angle .theta.1 of the LED module F8L or the viewing angle .theta.1

Petitioner Exhibit 1002-2470

of the LED module F8R, the game apparatus F3 determines a position of the core unit F70 using the positional information relating to the point having high brightness of the LED module F8L or the LED module F8R.

[0574] As described above, the tilt, attitude or position of the core unit F70 can be determined based on the output (core acceleration data) from the acceleration sensor F701 of the core unit F70. That is, the core unit F70 functions as an operation input means for performing an operation in accordance with a player moving a hand holding the core unit F70, for example, upward, downward, leftward, or rightward.

[0575] Next, with reference to FIG. 60, a state of a player holding the subunit F76 with one hand will be described. FIG. 60 shows an exemplary state of a player holding the subunit F76 with a left hand as seen from the right side of the subunit F76.

[0576] As shown in FIG. 60, the overall size of the subunit F76 is small enough to be held by one hand of an adult or even a child. For example, a player can put a thumb on the top surface of the subunit F76 (for example, near the stick F78a), put an index finger on the front surface of the subunit F76 (for example, near the operation buttons F78d and F78e), and put a middle finger, a ring finger and a little finger on the bottom surface of the subunit F76 so as to hold the subunit F76. It should be understood that also when the player holds the subunit F76 with a right hand, the holding state is similar to that described for the left hand. Thus, the subunit F76 allows the player to easily operate the operation section F78 such as the stick F78a and the operation buttons F78d and F78e while holding the subunit F76 with one hand.

[0577] As described above, the tilt, attitude or position of the subunit F76 can be determined based on the output (sub acceleration data) from the acceleration sensor F761 of the subunit F76. That is, the subunit F76 functions as an operation input means for performing an operation in accordance with the player moving a hand holding the subunit F76, for example, upward, downward, leftward, and rightward.

[0578] Here, an exemplary game played using the aforementioned controller F7 will be described. As a first example, a shooting game played using the controller F7 will be described. FIG. 61 is a diagram illustrating an exemplary game image displayed on the monitor F2 when the game apparatus F3 executes the shooting game.

[0579] As shown in FIG. 61, a portion of a three-dimensional virtual game space S is displayed on the display screen of the monitor F2. As a game object acting in accordance with an operation of the controller F7, a portion of the player character P and a portion of a gun G held by the player character P are displayed on the display screen. Moreover, the virtual game space S displayed on the display screen represents a field of front vision of the player character P, and for example an opponent character E is displayed as a shooting target in FIG. 61. A target indicating a position at which the player character P shoots the gun G is displayed on the display screen as the target cursor T.

[0580] In the shooting game having such a game image displayed on the monitor F2, a player operates the core unit F70 with one hand and operates the subunit F76 with the other hand as shown in FIG. 18 so as to play the game. For example, when the player inclines the stick F78a (see FIGS. 49A, 49B, 49C and 50) on the subunit F76, the player character P is moved in the virtual game space S in accordance with the inclining direction. Further, when the player moves his or her hand holding the core unit F70 with respect to the display screen, the target cursor T is moved in accordance with the motion, attitude, position and the like of the core unit F70 with respect to the display screen

Petitioner Exhibit 1002-2471

monitor F2 (LED modules F8L and F8R). When the player presses the operation button F72i (shown in FIG. 44) on the core unit F70, the player character P shoots the gun G at the target cursor T.

[0581] That is, while the player uses the stick F78a on the subunit F76 so as to instruct the player character P to move, the player can operate the core unit F70 as if the core unit F70 is a gun for the shooting game, thereby enhancing enjoyment in playing a shooting game. The player can perform an operation of moving the player character P and an operation of moving the target cursor T by using respective units held by different hands, whereby the player can perform the respective operations as independent ones. For example, since the virtual game space S displayed on the display screen is changed in accordance with the movement of the player character P, it is sometimes difficult to keep the target positioned near a position observed by the player in the virtual game space S because, for example, the player may be paying attention to the opponent character E suddenly jumping into the virtual game space S. However, while the player is moving the player character P with one hand (for example, a thumb of a left hand), the player can control a motion of the arm (for example, a right arm) which is not used for moving the player character P such that the core unit F70 has its front surface pointed to the observed position, thereby substantially enhancing flexibility for operating the controller F7 and increasing the reality of the shooting game. Further, in order to move the target cursor T, the player moves the controller. However, the operation of moving the controller does not hinder the player from performing a direction instruction operation for moving the player character P, thereby enabling the player to stably perform the two direction instruction operations. That is, by using the controller F7, the player can freely use his or her left and right hands and can perform a new operation having increased flexibility, which cannot be achieved using a physically single controller.

[0582] In a second example, a player inclines the stick F78a on the subunit F76 so as to move the player character Pin the virtual game space S in accordance with the inclining direction as in the first example. The player moves a hand holding the core unit F70 with respect to the display screen so as to move a sight point of a virtual camera in accordance with a position of the core unit F70 with respect to the monitor F2 (LED modules F8L and F8R). These operations allow the player to observe a position to which the core unit F70 is pointed in the virtual game space S while operating the stick F78a on the subunit F76 so as to instruct the player character P to move.

[0583] In the above description, the controller F7 and the game apparatus F3 are connected to each other by wireless communication. However, the controller F7 and the game apparatus F3 may be electrically connected to each other by a cable. In this case, the cable connected to the core unit F70 is connected to a connection terminal of the game apparatus F3.

[0584] Moreover, in the present embodiment, only the core unit F70 among the core unit F70 and the subunit F76 of the controller F7 has the communication section F75. However, the subunit F76 may have the communication section for wirelessly transmitting the transmission data to the receiving unit F6. Further, both the core unit F70 and the subunit F76 may have the respective communication sections. For example, the respective communication sections included in the core unit F70 and the subunit F76 may wirelessly transmit the transmission data to the receiving unit F6, or the communication section of the subunit F76 may wirelessly transmit the transmission data to the communication section F75 of the core unit F70, and the communication section F75 of the core unit F70 may wirelessly transmit, to the receiving unit F6, the

Petitioner Exhibit 1002-2472

received transmission data from the subunit F76 and the transmission data of the core unit F70. In these cases, the connecting cable F79 for electrically connecting between the core unit F70 and the subunit F76 can be eliminated.

[0585] In the above description, the receiving unit F6 connected to the connection terminal of the game apparatus F3 is used as a receiving means for receiving transmission data which is wirelessly transmitted from the controller F7. Alternatively, the receiving means may be a receiving module built in the game apparatus F3. In this case, the transmission data received by the receiving module is outputted to the CPU F30 via a predetermined bus.

[0586] Although in the present embodiment the imaging information calculation section F74 included in the core unit F70 is described as an example of a determining section for outputting a signal (process result data) in accordance with a motion of the core unit F70 body, the imaging information calculation section F74 may be provided in another form. For example, the core unit F70 may include the acceleration sensor F701 as described above, or may include a gyro sensor. The acceleration sensor or the gyro sensor can be used to determine a motion or attitude of the core unit F70, and, therefore, can be used as a determining section for outputting a signal in accordance with the motion of the core unit F70 body using the detection signal for the motion or attitude. In this case, the imaging information calculation section F74 may be eliminated from the core unit F70, or sensor and the imaging information calculation section can be used in combination.

[0587] Further, although in the present embodiment only the core unit F70 includes the imaging information calculation section F74, the subunit F76 may also include a similar imaging information calculation section.

[0588] Further, when the controller F7 includes a plurality of units, each of which may have a plurality of operation means such as the imaging information calculation section, the acceleration sensor, the gyro sensor, the stick, the cross key, and the operation button, various combination of the operation means can realize various controllers. Here, the operation means included in the core unit F70 and the subunit F76 are classified into an operation means A and an operation means B. The operation means A, such as the imaging information calculation section F74, the acceleration sensors F701 and F761, and the gyro sensor, outputs a signal in accordance with the movement of the unit body. The operation means B, such as the stick, the cross key, the operation button, the touch pad, outputs a signal in accordance with the player pressing a button, tilting a component or touching the same.

[0589] When the core unit F70 includes the operation means A and the subunit F76 includes the operation means B, the player can move one hand holding the core unit F70 while the player makes an input with a finger of the other hand holding the subunit F76 as in the case of a conventional controller. That is, the player can perform different operations with a right and a left hands, respectively, thereby realizing a new operation which cannot be performed by a conventional controller. In this case, according to various embodiments, operation data outputted by the operation means A corresponds to first operation data, and operation data outputted by the operation means B corresponds to second operation data. Further, the controller may be constructed such that the subunit F76 may include the operation means A, the core unit F70 may include the operation means A, and the subunit F76 may include the operation means A and the operation means B. In this manner, the player can move both hands individually, thereby realizing an increasingly improved operation. In this case, according to various embodiments, operation data outputted by the operation means A of the subunit F76

Petitioner Exhibit 1002-2473

corresponds to third operation data.

[0590] Further, when the core unit F70 and the subunit F76 each includes the operation means A, the player can move one handholding the core unit F70 while the player can move the other hand holding the subunit F76 so as to make an input. That is, the player can move a right and a left hands individually, thereby realizing a new operation which cannot be performed by a conventional controller. In this case, according to various embodiments, operation data outputted by the respective operation means A of the core unit F70 and the subunit F76 correspond to first operation data and second operation data. Further, each of the core unit F70 and the subunit F76 may include both the operation means A and the operation means B. In this manner, the player can perform operations by moving both hands and using fingers of both hands, thereby realizing a new operation. In this case, according to various embodiments, operation data outputted by the operation means B of the core unit F70 corresponds to first key operation data, and operation data outputted by the operation means B of the subunit F76 corresponds to second key operation data.

[0591] Furthermore, when each of the core unit F70 and the subunit F76 includes the operation means A, one of the core unit F70 or the subunit F76 may include various types of operation means A. As described above, when the operation means A includes the imaging information calculation section, a direction, a position and the like of the unit with respect to the imaging target (marker) can be calculated, thereby enabling an operation based on the direction and the position of the unit with respect to the monitor F2. On the other hand, when the operation means A includes the acceleration sensor or the gyro sensor, a tilt, an attitude, a position and the like of the unit itself can be calculated, thereby enabling an operation based on the attitude and the position of the unit. Accordingly, when the core unit F70 includes the imaging information calculation section and one of the acceleration sensor or the gyro sensor, and the subunit F76 includes the acceleration sensor or the gyro sensor, the core unit F70 can perform the aforementioned two operations. In this case, according to various embodiments, operation data outputted by the imaging information calculation section of the core unit F70 corresponds to first operation data, operation data outputted by the acceleration sensor or the gyro sensor of the subunit F76 corresponds to second operation data, and operation data outputted by the acceleration sensor or the gyro sensor of the core unit F70 corresponds to third operation data.

[0592] In the present embodiment, image data taken by the image pickup element F743 is analyzed so as to obtain position coordinates and the like of an image of infrared lights from the LED modules F8L and F8R, and the core unit F70 generates process result data from the obtained coordinates and the like and transmits the process result data to the game apparatus 3. However, the core unit F70 may transmit data obtained in another process step to the game apparatus F3. For example, the core unit F70 transmits to the game apparatus F3 image data taken by the image pickup element F743, and the CPU F30 may perform the aforementioned analysis so as to obtain process result data. In this case, the image processing circuit F744 can be eliminated from the core unit F70. Alternatively, the core unit F70 may transmit, to the game apparatus F3, the image data having been analyzed halfway. For example, the core unit F70 transmits to the game apparatus F3 data indicating a brightness, a position, an area size and the like obtained from the image data, and the CPU F30 may perform the remaining analysis so as to obtain process result data.

[0593] Although in the present embodiment infrared lights from the two LED modules F8L and F8R are used as imaging targets of the imaging information calculation section F74 in the core unit F70, the imaging target is not restricted thereto. For example,

Petitioner Exhibit 1002-2474

infrared light from one LED module or infrared lights from at least three LED modules provided in the vicinity of the monitor F2 may be used as the imaging target of the imaging information calculation section F74. Alternatively, the display screen of the monitor F2 or another emitter (room light or the like) can be used as the imaging target of the imaging information calculation section F74. When the position of the core unit F70 with respect to the display screen is calculated based on the positional relationship between the imaging target and the display screen of the monitor F2, various emitters can be used as the imaging target of the imaging information calculation section F74.

[0594] The aforementioned shapes of the core unit F70 and the subunit F76 are merely examples. Further, the shape, the number, setting position and the like of each of the operation section F72 of the core unit F70 and the operation section F78 of the subunit F76 are merely examples. In various embodiments, the shape, the number, the setting position and the like of each of the core unit F70, the subunit F76, the operation section F72, and the operation section F78 may vary and still fall within the scope of various embodiments. Further, the imaging information calculation section F74 (light entrance of the imaging information calculation section F74) of the core unit F70 may not be positioned on the front surface of the housing F71. The imaging information calculation section F74 may be provided on another surface at which light can be received from the exterior of the housing F71.

[0595] Further, although the speaker F706, the sound IC F707, and the amplifier F708 as described above are included in the core unit F70, any devices at hand capable of outputting a sound may be included in either the subunit F76 or the core unit F70.

[0596] Thus, the controller according to various embodiments allows a player to operate both the core unit F70 and the subunit F76 included therein so as to enjoy a game. For example, the core unit F70 has a function of outputting a signal in accordance with a motion of the unit body including the imaging information calculation section F74 and the accelerator sensor F701, and the subunit F76 has a function of outputting a signal in accordance with a direction input operation performed by the player. For example, when used is a controller into which the core unit F70 and the subunit F76 are integrated, the whole controller has to be moved so as to output a signal in accordance with the motion of the unit body, thereby exerting some influence on the direction input operation. Further, the integration of the core unit F70 and the subunit F76 causes the opposite influence, that is, flexibility, which is realized by separation between the core unit F70 and the subunit F76, is substantially reduced. As another example, the core unit F70 may have a function of outputting a signal in accordance with a motion of the unit body including the imaging information calculation section F74 and the acceleration sensor F701, and the subunit F76 may have a function of outputting a signal in accordance with the motion of the unit body including the acceleration sensor F761. Therefore, the player can move both hands holding the different units individually so as to make an input. Accordingly, the core unit F70 and the subunit F76 can be separated into a right unit and a left unit as in the case of a conventional controller for the game apparatus, and simultaneously the core unit F70 and the subunit F76 allow the player to freely use his or her right and left hands, thereby providing the player with a new operation, which cannot be performed by the integrated controller. Further, the controller can be operated with substantially enhanced flexibility, thereby providing a player with a game operation having increased reality.

[0597] The game controller and the game system according to various embodiments can realize an operation having increased flexibility, and are useful as a game controller which includes two independent units and is operated by a player holding the

Petitioner Exhibit 1002-2475

two independent units, a game system including the game controller, and the like.

Motion Control for Gaming Devices

[0598] In some embodiments, a gaming device, such as a mobile gaming device, receives inputs in the form of motion. For example, a human holding a mobile gaming device may make commands or provide instructions by tilting the device, moving the device in some direction, rotating the device, shaking the device, hitting the device against something, tossing the device, or providing any other motion-based inputs to the device. The motions may translate to one or more commands or instructions used in a game. The motions may also translate to commands or instructions or requests used for other purposes, e.g., beyond the play of a game. Commands, instructions, requests, and specifications may include: (a) an instruction to place a bet; (b) a specification of the size of a bet; (c) an instruction to begin a game; (d) an instruction to pursue a particular strategy in a game; (e) an instruction to hold a particular card in a game of video poker; (f) an instruction to hit in a game of blackjack; (g) an instruction to cash out; (h) an instruction to switch games; (i) a specification of a particular type of game to play; (j) an instruction to make a particular selection in a bonus round; (k) a request to order a drink; (l) a request to order food; (m) an instruction to summon a casino representative; (n) a request to redeem comp points; (o) a request to receive a comp benefit; (p) an instruction to open up a line of communication with another person (e.g., with a friend who is also in a casino); (q) an instruction to make a withdrawal from an account (e.g., from a bank account); (r) an instruction to fund an account (e.g., to fund an account a player has with a casino with gaming credits); (s) a request to make a purchase; (t) a request to purchase show tickets; (u) an instruction to make a reservation at a restaurant; (v) a request for information; (w) a request for information about a pay table (e.g., about the payouts on a pay table); (x) a request for a location of a particular room; (y) a request to check into a hotel room; (z) a request to reserve a hotel room; (aa) a request to check on show times; (ab) a request to claim a jackpot; (ac) a request to make a phone call; (ad) a specification of a phone number; (ad) a request to access a network; (ae) a request to access the Internet; (af) a specification of a Web or URL address; (ag) a request to receive information about another player; (ah) a request to see information about a game outcome of another player; (ai) a request to see information about the gaming history of another player; (aj) a request to receive information about one or more players, dealers, gaming devices, or game tables (e.g., a request to see the most recent outcomes for any of the aforementioned); and any other request, instruction, command, or specification. The mobile gaming device may include hardware and/or software for detecting motions. The mobile gaming device may work in conjunction with external hardware or software for detection motions. The mobile gaming device or another device may include software for translating motions detected into instructions that can be used in conducting a game or in any other fashion.

[0599] Herein, "motion control" may include using motion as an input to a game, using motion as a command, and/or using motion as instructions. Motion control may include using the motion of a mobile gaming device to provide inputs to the games played on the mobile gaming device, to select games to play, to indicate a player's desire to cash out, or to provide various other instructions or indications.
1. TECHNOLOGIES. Various technologies may be used to enable motion control. Such technologies may include technologies for sensing motion, including such information as acceleration, velocity, angular motion, displacement, position, angular displacement, angular velocity, angular acceleration, impact shocks, and any other information that may be associated with motion. Technologies may include sensors, including hardware sensors. Technologies may also include software for translating motions detected into

Petitioner Exhibit 1002-2476

from sensors into information about the position, trajectory, or other spatial information about a mobile gaming device. For example, software may be used to translate acceleration information into position information, e.g., through double integration. Various technologies may or may not be described in the following references, each of which is hereby incorporated by reference herein: (1) U.S. Patent Application 20040046736 "Novel man machine interfaces and applications"; (2) U.S. Patent Application 20030100372 "Modular entertainment and gaming systems"; (3) U.S. Pat. No. 7,058,204 "Multiple camera control system"; (4) U.S. Pat. No. 5,534,917 "Video image based control system"; (5) U.S. Patent Application 20060281453 "ORIENTATION-SENSITIVE SIGNAL OUTPUT"; (6) U.S. Patent Application 20060098873 "Multiple camera control system"; (7) U.S. Pat. No. 6,850,221 "Trigger operated electronic device"; (8) U.S. Patent Application 20070072680 "Game controller and game system"; (9) U.S. Patent Application 20070066394 "VIDEO GAME SYSTEM WITH WIRELESS MODULAR HANDHELD CONTROLLER"; (10) U.S. Patent Application 20070050597 "Game controller and game system"; (11) U.S. Patent Application 20070049374 "Game system and storage medium having game program stored thereon"; (12) U.S. Patent Application 20060139322 "Man-machine interface using a deformable device"; (13) U.S. Pat. No. 6,676,522 United States Patent "Gaming system including portable game devices"; (14) U.S. Pat. No. 6,846,238 "Wireless game player"; (15) U.S. Pat. No. 6,702,672 "Wireless interactive gaming system"; (16) U.S. Pat. No. 7,148,789 "Handheld device having multiple localized force feedback"; (17) U.S. Pat. No. 7,209,118 "Increasing force transmissibility for tactile feedback interface devices"; (18) U.S. Pat. No. 6,965,868, "System and method for promoting commerce, including sales agent assisted commerce, in a networked economy"; and (19) U.S. Pat. No. 7,058,204, "Multiple camera control system".

1.1. CAMERA IN THE DEVICE. A camera on the mobile gaming device may capture images. As the mobile gaming device moves, different images will likely be captured by the camera. Stationary objects may appear to move between the images captured in successive frames. From the apparent motion of the stationary objects, the motion of the mobile gaming device may be inferred.

1.2. EXTERNAL CAMERAS. External cameras, such as stationary wall-mounted cameras, may film the mobile gaming device and/or the player holding the mobile gaming device. From footage of the mobile gaming device, algorithms may infer the motion of the mobile gaming device.

1.3. EXTERNAL READERS (E.G., RANGE FINDERS). External sensors or readers may detect the motion of the mobile gaming device. For example, ultrasound waves or lasers may be bounced off the mobile gaming device. From changes in the reflected sound or light, the motion of the mobile gaming device may be inferred.

1.4. ACCELEROMETERS. A mobile gaming device may include built-in accelerometers. These may detect changes in velocity, which may be used to infer other aspects of motion, such as change in position or velocity.

1.5. GYROSCOPE SENSORS. A mobile gaming device may contain internal gyroscopes. These may detect an orientation of the mobile gaming device. Information from a gyroscope may be used to infer other information, such as angular displacement.

1.6. POSITION DETECTORS INTERNAL (GPS). A mobile gaming device may include position detectors, such as sensors for a global positioning system or for a local positioning system. Position, when measured over time, may be used to infer other aspects of motion, such as velocity or acceleration.

1.7. POSITION DETECTORS EXTERNAL. External detectors may measure the position of a mobile gaming device. For example, the mobile gaming device may emit a signal in all directions. Based on the time it takes the signal to reach various fixed detectors, the position of the mobile gaming device may be inferred.

1.8. RFID. DETECT AS THE SIGNAL STRENGTH OF AN RFID ACTIONS ARE EXCITED

Petitioner Exhibit 1002-2477

OR WEAKER. A mobile gaming device may contain a radio frequency identification (RFID) tag or other radio frequency emitting device. Based on the reception of the signal from the RFID tag, information about the position of the mobile gaming device may be inferred. For example, if the signal received is weak, it may be inferred that the mobile gaming device is far from a fixed receiver. If the received signal is strong, it may be inferred that the mobile gaming device is near to the fixed receiver.
2. SWITCH FOR MOTION COMMANDS. ENABLE SWITCH FOR THE MOTION COMMAND. PRESS MOTION BUTTON, AND WHILE PRESSED, MOTION WORKS. COULD BE A CONSTANT COMMAND OR TOGGLE ON OR OFF TO MAKE THE COMMAND BE IN FORCE. TO ENABLE THAT YOU'RE IN MOTION CONTROL MODE, YOU COULD GO THROUGH ALL THESE MOTIONS. In various embodiments, motion control may alternately enabled or disabled. At some times motion control may be in use, while at other times motion control may not be in use. For example, at a first time a the motion of a mobile gaming device may cause decisions to be made in a game, while at a second time the motion of a mobile gaming device may not have any effect on a game. When motion control is enabled, a player may be able to conveniently engage in game play. When motion control is off, a player may move a mobile gaming device inadvertently without worry that such movement will affect a game. Thus, there may be reasons at various times to have motion control enabled, and reasons at various times to have motion control disabled.
2.1. TOGGLE ON AND OFF. In various embodiments, a player must provide continuous, substantially continuous, or persistent input in order to maintain the enablement of motion control. Continuous input may include continuous pressure, such as the continuous pressing and holding of a button. Continuous input may include continuous squeezing of buttons or of the device (e.g., the mobile gaming device) itself. In some embodiments, continuous input may include repeated pressing of a button such that, for example, each button press occurs within a predetermined time interval of the previous button press. In various embodiments, continuous input may include continuous contact. For example, to maintain the enablement of motion control a player must maintain a finger or other appendage in constant contact with a touch sensitive device (e.g., on the mobile gaming device).

[0611] In various embodiments, a continuous input may require the player to continuously supply heat, such as body heat through contact. In various embodiments, continuous input may require the player to continuously supply a finger print, e.g., through keeping a finger in continuous contact with fingerprint reader. In various embodiments, continuous input may include continuous noise or sound generation, e.g., continuous humming by the player.

[0612] So long as a player provides a continuous input, the player may be able to move the mobile gaming device or some other device in order to control action in a game or to otherwise provide commands, instructions or other inputs. For example, to provide an input using motion, a player may press a button on a mobile gaming device and, while the button is pressed, move the mobile gaming device around. Should the player let go of the button, the motion of the mobile gaming device would cease to be used as an input. Should the player then resume pressing the button, the player may once again use the motion of the mobile gaming device as an input.

[0613] In various embodiments, a continuous input may be provided to the mobile gaming device, e.g., when the player holds a button on the mobile gaming device. In various embodiments, a player may provide continuous input to another device. For example, the player may hold down a foot pedal. The foot pedal may be in communication with the mobile gaming device, either directly or indirectly, or the foot pedal may be in communication with another device which would then communicate

Petitioner Exhibit 1002-2478

motion of the mobile gaming device. Thus, based on whether the foot pedal is pressed, a determination may be made as to whether the motion of the mobile gaming device will be used to control a game or to provide other input.

[0614] In some embodiments, a continuous input from the player is necessary to disable motion control. In the absence of the continuous input (e.g., if a button is not pressed), the motion of the mobile gaming device will be used to control a game or to provide other direction.

2.2. CONSTANT COMMAND. In various embodiments, a single input, set or inputs, or an otherwise limited set of inputs may switch motion control on or off. For example, a player may press a button to switch motion control on. The player may press the same button again to switch motion control off. As another example, a player may flip a switch one way to switch motion control on, and may flip the switch the other way to switch motion control off. As another example, a player may select from a menu an option to enable motion control. The player may later select another option from the menu to disable motion control.

[0616] Once motion control has been enabled (e.g., with a single press of a button), the motion of the mobile gaming device may be used to control a game or to provide other directions. No further input to enable motion control may be required beyond the initial flipping of a switch or pressing of a button, for example.

2.2.1. MOTION CONTROL GOES OFF WHEN: In some embodiments, motion control may be automatically disabled under certain circumstances. For example, when the player has selected from a menu an option to enable motion control, motion control may remain enabled until some triggering condition occurs which will cause motion control to be automatically disabled.
2.2.1.1. NO MOTION FOR A WHILE. If, for some period of time, there has been no motion, no significant motion, no detectable motion, and/or no motion that is translatable into a coherent instruction, then motion control may be automatically switched off. Motion control may be automatically switched off after 30 seconds, for example.
2.2.1.2. DEVICE LOWERED OR PUT IN POCKET. If a mobile gaming device has been lowered then motion control may be disabled. For example, it may be presumed that a player has put down a mobile gaming device and is no longer playing the mobile gaming device, therefore motion control may be disabled automatically. If a mobile gaming device has been placed in a player's pocket, motion control may be disabled automatically. If, for example, the sensors in the mobile gaming device no longer detect light, and/or detect proximate body heat, motion control may be disabled.
2.2.2. KEYBOARD LOCKING TO AVOID SWITCHING ON MOTION CONTROL ACCIDENTALLY. In various embodiments, a key, switch, or other input device may be manipulated (e.g., pressed) in order to enable motion control. It is possible, in some embodiments, that a player would inadvertently press a button or otherwise manipulate an input device so as to enable motion control. In various embodiments, a key pad of a mobile gaming device may be locked. For example, the player may press a key or sequence of keys that lock the keypad so that that the same input devices which would enable motion control are temporarily non-functional. In various embodiments, only the input devices that could be used to enable motion control are disabled.
2.3. In various embodiments, an alert is provided when motion control is enabled. For example, a mobile gaming device may beep, buzz, or emit a tone when motion control is enabled. A text message may be displayed, lights may flash, or other visual alerts may be output when motion control is enabled. In various embodiments, a voice output may be used to alert a player that motion control is enabled.

Petitioner Exhibit 1002-2479

[0622] In various embodiments, an alert may indicate that motion control has been disabled. The alert may take the form of text, flashing lights, audio, voice, buzzing, vibrating, or any other form.

3. USE OF VERY PRECISE OR DEFINITIVE MOTION FOR IMPORTANT THINGS (WHERE MONEY IS ON THE LINE), AND LESS PRECISE MOTION FOR LESS IMPORTANT THINGS. THIS WAY, ACCIDENTS LIKE "BET MAX" ARE AVOIDED. ALSO, CERTAIN BETS, LIKE "BET MAX" ARE NOT ALLOWED WHEN MOTION IS ON. In various embodiments, the nature or degree of motion required to provide an instruction may depend on the nature of the instruction itself. Some instructions may require a motion encompassing relatively small displacements, small accelerations, small changes in angle, and/or other small changes. Other instructions may require a motion encompassing relatively large displacements, relatively large accelerations, relatively large changes in angle, or relatively large amounts of other changes. What constitutes a large displacement, acceleration, change in angle, or other change may be defined in various ways, e.g., by some threshold. Thus, for example, a displacement of more than six inches may be considered large or at least may be considered sufficient for one type of instruction. Some instructions may require motions with a large number of repetition or a long sequence of motion (e.g., the device is moved up then down, then side to side, then up again). Some instructions may require motions with little repetition or with a small sequence of motion (e.g., up then down).

3.1. SIZE OF BET. The nature of motion required may depend on the size of a bet placed. For a player to place a large bet (e.g., a bet greater than a certain threshold amount), the player may be required to use motions encompassing large displacements, accelerations, changes in angle, and or other large changes. For a smaller bet, the player may use motions encompassing smaller changes. In various embodiments, the degree of motion may not itself specify the size of a bet. For example, making a motion encompassing a large displacement may not in and of itself specify that a bet should be $25. The specification of a bet may still require a precise sequence of motions, such as one motion for each digit describing the bet, or such as one motion for each credit bet. However, a large bet may require that each of the motions used be more expansive or more emphasized than what would be required with a smaller bet. What constitutes a large bet may vary, and may include any bet that is greater than some threshold, such as $10. Further, there may be multiple thresholds of bets, with each threshold requiring a more emphatic or expansive set of motions.

3.2. SIZE OF POTENTIAL PAYOUT. The nature of motion required may depend on the size of a potential payout. For example, a player may be engaged in a game of video poker and may receive an intermediate outcome comprising five cards. If the intermediate outcome includes four cards to a royal flush, the player may have a large potential payout should he complete the royal flush. Accordingly, when the player selects cards to keep and/or cards to discard, expansive or emphatic motion may be required. If the intermediate outcome does not make a large payout likely, then less expansive or emphatic motions may be required for the player to choose discards. In various embodiments, a mobile gaming device, casino server, or other device may determine whether or not a large payout is possible and/or the probability of a large payout. Based on the size of the payout, the probability of the payout, and/or the possibility of the payout, the nature of the motion required to make a decision in a game may be varied.

3.3. MAKING A SUBOPTIMAL DECISION. In various embodiments, the motion required to make an optimal decision may be less than that required to make a suboptimal decision. For example, to make a blackjack decision that maximizes a player's expected winnings may require a relatively small displacement, while to make another decision may require a large displacement. In various embodiments, a mobile gaming device, casino server, or other device may determine a strategy that maximizes

Petitioner Exhibit 1002-2480

a player's expected winnings, that maximizes a potential payout for the player, or that maximizes some other criteria for the player. The mobile gaming device may accept relatively less expansive motions which provide instruction to follow the best strategy, while the mobile gaming device may require relatively more expansive motions if such motions correspond to an instruction to follow a strategy other than the best strategy.

4. CALIBRATION SEQUENCE, TUTORIAL. MAY BE REQUIRED SO YOU CAN'T LATER CLAIM THAT YOU DIDN'T MEAN TO MAKE A BET. In various embodiments, a player may go through an exercise to calibrate a mobile gaming device to his way of providing motion. Each player may be unique. For example, each player may have arms of a different length, hands of a different size, different body mechanics, different muscle strengths, and other differences which may effect the way a player moves a mobile gaming device. Thus, a player may go through a process of training the mobile gaming device to recognize the individual player's motions. In various embodiments, the mobile gaming device may guide the player through a sequence of steps in order to calibrate the mobile gaming device. The mobile gaming device may provide the player with instructions, e.g., using the screen display of the mobile gaming device or using voice prompts.

4.1. MAKE A MOTION X TIMES. OK, THIS WILL BE HOW YOU BET. In various embodiments, the mobile gaming device may instruct the player to make a particular motion. Exemplary instructions may include: "move the mobile gaming device up"; "move the mobile gaming device up 6 inches"; "move the mobile gaming device down"; "move the mobile gaming device left"; "move the mobile gaming device right"; "tilt the mobile gaming device left"; "tilt the mobile gaming device right"; "rotate the screen of the mobile gaming device towards you"; "shake the mobile gaming device"; "tap the mobile gaming device against something". The mobile gaming device may instruct the player to make a sequence of motions. Exemplary instructions may include: "move the mobile gaming device up and then to the right"; "move the mobile gaming device up, then down, then up again"; "tilt the mobile gaming device left and move it left". The mobile gaming device may instruct the player to perform a given motion one or more times. For example, the mobile gaming device may instruct the player to perform a given motion five times. When the player performs a motion multiple times, the mobile gaming device may have more data with which to establish an "average" motion or an expected range of motion which will be used to correspond to a given instruction. In various embodiments, a player may be asked to repeat the same motion several times in succession. In various embodiments, a player may be asked to perform a number of different motions such that certain motions are repeated, but not necessarily right after one another. Throughout the process of a player making motions (e.g., while holding the mobile gaming device), the mobile gaming device or another device may record data about the motions. For example, the mobile gaming device may record the amount of displacement, the amount of acceleration, the speed, the time taken to complete a motion, the amount of angular rotation, and/or any other aspects of the motion. In the future, the mobile gaming device or other device may associate similar data with the same motion. For example, if a player was asked to move a mobile gaming device in a particular way and if data was recorded about the way in which the player actually did move the mobile gaming device, then it may be assumed that if similar data is received in the future then the player has again tried to move the mobile gaming device in the same particular way. In various embodiments, certain motions from the player may not be accepted. For example, the mobile gaming device may have software with inbuilt expectations about what an "up" motion should be. If the mobile gaming device has asked the player to move the mobile gaming device "up" and the mobile gaming device detects what it interprets as a downward motion, then the mobile gaming device may take various actions. The mobile gaming device may ask the player to please try again. The mobile gaming device may tell the player that he has not followed instructions and that he should have moved the mobile gaming device up.

Petitioner Exhibit 1002-2481

4.2. TEST In various embodiments, a player may be asked to perform a motion of his choice. The mobile gaming device may then try to identify the motion. The mobile gaming device may indicate, for example, whether the motion was up, down, to the left, etc. The mobile gaming device may indicate the instruction that the motion was interpreted as. For example, the mobile gaming device may indicate that the motion was a "discard first card" instruction or that the motion was a "spin reels" motion. After a mobile gaming device indicates its interpretation of a motion, the player may confirm whether or not the mobile gaming device was correct. For example, the player may press a "correct" or "incorrect" button on the mobile gaming device. If the mobile gaming device has incorrectly identified one or more player motions, then the player may be asked to go through a process of training, e.g., an additional process of training. In various embodiments, training may continue until the mobile gaming device can successfully identify all player motions and/or all player instructions (e.g., until the mobile gaming device is correct on 50 straight trials).
4.3. TUTORIAL.

In various embodiments, a training session or tutorial may be geared towards a player. The mobile gaming device, another device, or a human (e.g., a casino representative) may show the player which motions to use for various instructions. For example, the mobile gaming device may tell the player to tilt the mobile gaming device twice to the left to discard the first card in a game of video poker. The player may then be asked to try the motion one or more times. At some point, a player may be tested as to his understanding of which motions perform which commands. The player may be asked to do various things, such as to initiate a game, such as to make a "double down" decision in blackjack, such as to cash out, or such as any other thing. In various embodiments, the player may be required to repeat the tutorial and/or may be prevented from gaming using motion control until he passes a test of his knowledge of which motions perform which instructions. Passing may include, for example, providing accurate motions for all 10 things one is asked to do. In some embodiments, a player may be required to take a game-specific tutorial and/or to pass a game-specific test prior to playing a particular game. The game may require specialized motions and it may therefore be prudent for the player to take a tutorial on such motions. Absent taking a game-specific test or tutorial, a player may still be allowed to play other games.
4.4. SIGN OR OTHERWISE VERIFY YOU WENT THROUGH THE TUTORIAL. In various embodiments, a player may be asked to confirm or verify that he completed a tutorial, such as a tutorial which instructs the player on what motions to use for particular instructions. The player may confirm by providing a biometric reading (e.g., by touching his thumb to a touchpad), by signing something (e.g., by signing the screen of his mobile gaming device with a stylus), by recording a voiced statement to the effect that he has completed the tutorial, or by providing any other confirmation.
4.5. MOTION AIDS, CAN BE TURNED ON OR OFF. FOR EXAMPLE, LITTLE ARROWS ON THE SCREEN EXPLAIN HOW TO MOVE THE DEVICE TO MAKE VARIOUS BETS. BUT AS YOU GET USED TO THESE, YOU CAN TURN THE ARROWS OFF. In various embodiments, a player may be provided with various aids or hints during a game, the aids telling the player how to provide certain instructions. For example, text displayed on the screen of a mobile gaming device may tell the player what motion to make to "hit", what motion to make to "stand", and so on. In a game of video poker, a voice may be emitted from the mobile gaming device telling the player how to discard the first card, how to discard the second card, and so on. For example, the voice may say, "tilt the device forward to discard the third card". In another example, arrows may appear showing the player how to move the device to provide a particular instruction. For example, an arrow pointing left that is superimposed on a card may tell the player to tilt the device left in order to discard the card. In various embodiments, the aids or hints may be turned on or off by the player in the player preferences.

Petitioner Exhibit 1002-2482

player may wish to have the aids on. However, eventually the player may become so familiar with the motion control that the player may wish to turn off the aids. The mobile gaming device may then no longer provide hints or aids as to what motions to make in order to provide a particular instruction. In some embodiments, hints or aids may appear automatically or by default, such as when a player first begins playing a new type of game (e.g., such as when the player first starts playing video poker). In some embodiments, the default setting is not to have aids.

4.6. CUSTOMIZE MOTIONS. I WANT X TO MEAN Y. THESE CAN BE COMPLICATED SETS OF INSTRUCTIONS. In various embodiments, a player may customize the motions that will correspond to various instructions. The mobile gaming device may take the player through a calibration sequence where the mobile gaming device asks the player what motion he would like to make to correspond to a given instruction. The player may be asked to make the motion some number of times, such as a fixed number of times or such as a number of times needed in order for the player to establish a consistency of motion or for the mobile gaming device to extract the essential parameters of the motion. The calibration sequence may proceed through one or more instructions until the player has created a motion corresponding to each. In various embodiments, each instruction may correspond to a default motion. The player may have the opportunity to change the default motion to another motion that better suits his preferences. In various embodiments, a player may wish for a motion to correspond to a sequence of instructions, e.g., a long or complicated sequence of instructions. For example, the player may wish for a single motion to correspond to the following sequence: (1) bet $5; (2) initiate a game of video poker; and (3) automatically choose discards in accordance with optimal strategy. The motion may be a motion where the player shakes the mobile gaming device twice, for example. Thus, in various embodiments, a simple motion may be used to execute a lengthy or complicated set of instructions. This may allow a player to conveniently perform desired sequences of actions.

5. THERE MAY BE CONFIRMATION. A DISPLAY MAY SAY, "YOU HAVE MOTIONED TO BET 10." In various embodiments, following a motion made by a player (e.g., following the player moving the mobile gaming device), a confirmation or an interpretation of the player's motion may be output. The mobile gaming device or another device may make such a confirmation. The mobile gaming device may display a message on its display screen indicating how the player's motion has been interpreted. For example, the mobile gaming device may display a message indicating that the player has instructed that a bet of 10 be placed on a game. The mobile gaming device may also output a message in the form of audio (e.g., using synthetic voice) or in any other format. The player may have the opportunity to view the message and to take action if he believes his motions have been misinterpreted as the wrong instructions. For example, the mobile gaming device may output an audio message using synthetic voice. The audio message may say, "You have chosen to stand. Shake the mobile gaming device if this is not your intention." The player may have some limited period of time in which to take an action to prevent the mobile gaming device from carrying out the misconstrued instruction. If the player takes no action, the instruction that has been construed by the mobile gaming device may be carried out. The player may also have the opportunity to confirm an interpretation of his motion and, for example, to thereby cause his instructions to be executed more quickly. For example, the player may shake a mobile gaming device once to confirm an interpretation of the player's prior motion by the mobile gaming device, and to thereby allow the mobile gaming device to execute the player's instruction.

5.1. THERE MAYBE VERIFICATION. A PERSON MUST MOTION AGAIN TO COMPLETE A BET. In some embodiments, a player must confirm an interpretation of a motion before his instruction will be executed. In some embodiments, a person must repeat a motion one or more times (e.g., the player must provide the same motion two

Petitioner Exhibit 1002-2483

two or more times) before the instruction will be carried out. In some embodiments, higher levels of verification may be required for instructions with greater consequence, such as instructions to bet large amounts or such as instructions provided when a player has the potential to win a large payout. For example, a player may have 3 seconds to stop a mobile gaming device from executing its interpretation of an instruction to bet $50, but only 1 second to stop a mobile gaming device from executing its interpretation of an instruction to bet $5.

6. MOTION TO VERIFY PLAYER IDENTITY. FOR EXAMPLE, EACH PLAYER MAY MOVE A DEVICE IN A UNIQUE WAY. In various embodiments, the motion of a mobile gaming device or other device may be used as a biometric or as a way to presumably uniquely identify a person. It may be presumed, for example, that each person has a different way in which they would move a mobile gaming device. Software within a mobile gaming device or within another device may capture motion data (e.g., using accelerometers, gyroscopes, cameras, etc.). The software may then determine salient features or statistics about the motion. For example, the software may determine a degree of curvature or loopiness to the motion, a maximum acceleration, a maximum speed, a total displacement, a presence of vibrations, and/or any other characteristics of the motion. When a player attempts to verify his identity by supplying a motion sample (e.g., by moving a mobile gaming device), software may compare his newly supplied motion to a motion previously supplied by the purported player. If the motions match (e.g., if the values of salient features of the motion are the same within some confidence interval), then the player may be presumed to be who he says he is. Having confirmed his identity, a player may be granted certain privileges, such as the right to engage in gaming activities using the mobile gaming device.

6.1. ENTER A PASSWORD WITH MOTION. A PASS-SEQUENCE OF MOTIONS. In various embodiments, a player may enter a password using a set of motions. A password may comprise, for example, a sequence of directional motions, such as "up", "down", "left", and "right". A password may consist of 7 such motions, for example. A player may use such a password to verify his identity, for example. Having provided a correct password, a player may be granted certain privileges, such as the right to engage in gaming activities using the mobile gaming device.

7. STANDARD MOTION USED ACROSS MULTIPLE GAMES. In various embodiments, two or more games may receive similar instructions. For example, two or more games may each receive similar instructions as to how much a player wishes to bet. In various embodiments, a given motion may have the same interpretation (e.g., may convey the same instruction or set of instructions) across multiple games. A player may thereby need to learn to use certain motions only once, yet be able to play many games using those motions.

7.1. In various embodiments, a set of standards may be developed, where such standards indicate what motions are to correspond to what instructions. Games that conform to such standards may be labeled as such. For example, a game that accepts a certain set of motions for standard instructions in the game may be associated with a claim that says, "Conforms to Motion 5.0 Standards" or some similar claim. In various embodiments, there may be multiple different standards. A given game may be capable of accepting motions according to multiple different standards. In various embodiments, a player may choose which standard he wishes for a game to employ. For example, a player may have learned to use motions based on a first standard and so may indicate that a game should use the first standard in interpreting his motions as opposed to using a second standard.

7.2. CASHOUT. An instruction which may be common to two or more games is an instruction to cash out. Such an instruction may correspond to a standard motion, such as shaking the mobile gaming device up and down twice.

7.3. QUIT A GAME. An instruction which may be common to two or more games is an instruction to quit the game. Such an instruction may correspond to a standard motion,

Petitioner Exhibit 1002-2484

7.4. INITIATE A GAME. An instruction which may be common to two or more games is an instruction to initiate or start play of the game. Following such an instruction in a slot machine game, for example, the reels (or simulated reels) may begin to spin. Following such an instruction in a game of video poker, for example, an initial set of five cards may be dealt. Such an instruction may correspond to a standard motion, such as tapping the mobile gaming device against something.

7.5. MAKING A BET. Instructions which may be common to two or more games may include instructions to specify a bet size. One common instruction may be an instruction to increment a bet by one unit or one credit. Such an instruction would, for example, increase a bet from $3 to $4, or a bet from $0.75 to $1.00. One common instruction may be an instruction to increment a bet by a fixed monetary value, such as by 1 quarter or by one dollar. With instructions available to increment bets, a player may specify a bet size by repeatedly incrementing a bet until it reaches the desired size. In various embodiments, instructions to decrement a bet may also be available and may also be standardized. An exemplary such instruction may include an instruction to reduce a bet size by one credit.

7.5.1. NUMERALS. In various embodiments, a bet size may be specified with numerals. Standard instructions based on motions may be available for specifying numerals. For example, a first motion may correspond to the number "1", a second motion may correspond to the number "2", and so on.

7.6. REPEAT LAST ACTION. An instruction may include an instruction to repeat a prior action, such as the last action performed. For example, if the player has just used a first motion to instruct a mobile gaming device to discard the first card in a hand of video poker, the player may use a second motion to instruct the mobile gaming device to repeat the last instruction (i.e., the instruction indicated by the first motion), and to apply the last instruction to the second card in the hand of video poker. In various embodiments, an instruction may include an instruction to repeat a prior game. The instruction may indicate that the amount bet and the number of pay lines played from the prior game should be repeated with the current game. Instructions to repeat a prior action, to repeat a most recent action, or to repeat a game may be common to one or more games, and thus may have standard motion associated with them.

7.7. REPEAT LAST ACTION FROM THIS SITUATION. An instruction may include an instruction to repeat an action from a similar situation in the past. For example, if a player is playing a game of blackjack, the player may provide an instruction to make the same decision that he had made in a previous game in which he had the same point total and in which the dealer had the same card showing. Such an instruction may be associated with a motion. Such a motion may be standardized across two or more games.

7.8. MOTION GENERATES RANDOM NUMBERS. In some embodiments, motion is used to generate one or more random numbers used in a game. For example, readings from various sensors on the mobile gaming device may be captured when the mobile gaming device is moving. Such readings may be converted into numbers (e.g., using some algorithm). The numbers may, in turn, be used in an algorithm for generating a game outcome. In some embodiments, numbers generated by motion are used as the only input to an algorithm for generating an outcome. In some embodiments, numbers generated from the motion of a mobile gaming device may be paired with other numbers (e.g., with random numbers generated by a separate internal algorithm of the mobile gaming device; e.g., with a number representing a time) in order to generate the outcome of a game.

7.8.1. THE IMAGE CAPTURED IS CONVERTED INTO A RANDOM NUMBER. In some embodiments, an image captured from a camera of a mobile gaming device may be converted into a number. In some embodiments, a sequence of images captured during the motion of a mobile gaming device may be used in combination to generate a random number. For example, numbers representing pixel values may be combined to

Petitioner Exhibit 1002-2485

using some function to arrive at a number, e.g., a random number.

7.8.2. THE POSITIONS ARE USED AS A RANDOM NUMBER. In some embodiments, the various positions (e.g., coordinates in two-dimensional or three-dimensional space) to which a mobile gaming device is moved are used to generate numbers, such as random numbers. In some embodiments, accelerations, velocities, durations of motions, paths taken, angular changes, angular accelerations, and any other aspect of motion may be used to generate numbers.

7.9. MOVE THE MOBILE GAMING DEVICE TO KEEP REELS SPINNING. WHEN YOU STOP MOVING, THE REELS STOP. In some embodiments, a player may move a mobile gaming device to draw out the duration of a game. For example, the reels in slot machine game may continue to spin as the player continues to move the mobile gaming device. The reels may stop spinning once the player has stopped moving the mobile gaming device.

8. NEW ARRANGEMENT OF GAME SYMBOLS TO MAKE MOTION CONTROL EASIER. In various embodiments, game indicia, game controls, or other visuals used in a game may be arranged on a display screen of a mobile gaming device in a way that makes it intuitive for a player to interact with such visuals. For example, a player may have available to him four possible motions: (1) tilt the mobile gaming device forward, or away from himself; (2) tilt the device left; (3) tilt the device right; and (4) tilt the device backwards, or towards himself. To make such motions intuitive to use, visuals in a game may be clearly situated in one of four areas of a display screen, namely the top, bottom, left side, and right side. A player may thus readily interact with a visual on top of the screen using a forward tilting motion, with a visual on the left side of the screen using a left tilting motion, with a visual on the right side of the screen using a right tilting motion, and with a visual at the bottom of the screen using a backwards tilting motion. In various embodiments, indicia or other visuals are displayed in an area of a display screen such that the direction of such area from the center of the display screen corresponds to a direction of motion that a player must use in order to interact with such indicia.

8.1. IN VIDEO POKER, CARDS ARE ARRANGED AROUND THE PERIPHERY OF THE SCREEN. THIS WAY, YOU CAN TILT FORWARD, RIGHT, BACK, LEFT, AND MORE CLEARLY INDICATE WHICH CARD TO HOLD. In some embodiments, the cards dealt in a game of video poker may be displayed respectively at the four corners of a display screen on the mobile gaming device, with a fifth card displayed perhaps in the center of the screen. A player may indicate that he wishes to discard a particular card by tilting the mobile gaming device towards the corner of the display screen in which the particular card is displayed. To discard the card in the center, for example, the player may move the mobile gaming device up and down. Thus, by displaying cards in an arrangement other than a linear arrangement, intuitive motion control is facilitated.

8.1.1. PENTAGONAL DISPLAY. In various embodiments, a display may have the shape of a pentagon. A pentagonal display may allow for each corner of the display to be occupied by a different card in a game of video poker, for example. A player may then be able to tilt or otherwise move the mobile gaming device in the direction of one of the corners in order to hold or discard the card which is shown in that corner. In various embodiments, displays of other shapes may be used. The shape of a display may be chosen which most conveniently or intuitively corresponds to a game. In some embodiments, the hardware used for a display may itself maintain a standard form, such as a rectangular form. However, the display may simulate another display which is of a different shape. For example, a rectangular display may simulate a pentagonal display by only illuminating a pentagonal portion of the display screen.

8.2. BETTING BUTTONS MAY ALSO BE ALLOCATED AROUND THE PERIPHERY OF THE SCREEN. In various embodiments, control buttons or control-related visuals may be situated in areas of a display screen that make interaction with such buttons

Petitioner Exhibit 1002-2486

using motion intuitive. Control visuals may correspond to instructions that may be used in a game. Control visuals may include rectangular areas of a display screen labeled "spin", "bet max", "bet 1" "cash out". Control visuals may correspond to any other instructions. Control buttons may be clearly located, for example, near the top, bottom, left, or right side of a display screen. The player may then tilt the mobile gaming device in the same direction as is represented by the location of a control visual relative to the center of the display screen in order to convey the instruction indicated by the control visual. For example, if a control visual labeled "spin" is located on the right side of a display screen, the player may tilt the mobile gaming device to the right in order to spin the reels of a slot machine game (e.g., in order to start a new game).

8.3. BINARY SEARCH SETUP FOR PLAYING WITH MOTION. FOR EXAMPLE, THIS ALLOWS YOU TO MAKE FINE-GRAINED DECISIONS WITH LIMITED INPUTS (E.G., WITH ONLY RIGHT, LEFT, FORWARD, BACK). In various embodiments, a player may specify an instruction from a range or continuum of possible instructions using a limited set of possible motions (e.g., using only two motions, such as a motion to the left and a motion to the right). To begin with, any instruction may be possible. With each motion a player makes, the player may eliminate a portion of the instructions from consideration. For example, with each motion, the player may eliminate approximately half the remaining possible instructions from consideration. Eventually, after a sequence of motions, only a single instruction will remain. This instruction may then be executed by the mobile gaming device. In some embodiments, a set of possible instructions may be visually indicated with a list on a display screen. The player may tilt the mobile gaming device forward to select the top half of the remaining instructions on the list, and may tilt the mobile gaming device backwards to select the bottom half of the remaining instructions on the list. The remaining instructions may be highlighted, or the instructions which have been eliminated from consideration may disappear. After a sequence of motions from the player, only a single instruction may remain, and may be executed by the mobile gaming device.

9. IT IS POSSIBLE TO HAVE A DEVICE THAT A PERSON DOESN'T NEED TO LOOK AT. MOTION INPUTS CAN OBVIATE THE NEED TO PRESS BUTTONS. THE DEVICE CAN BUZZ TO TELL YOU A GAME IS OVER, AND PERHAPS HOW MUCH YOU'VE WON. In various embodiments, a mobile gaming device may include a device with no display screen. The device may include speakers or other audio output devices. In various embodiments, a mobile gaming device may include a display device, but the display device may not be in use. In various embodiments, a person may play a game using motion control. The person may be informed of a game outcome via voice output from the mobile gaming device. For example, the mobile gaming device may broadcast a synthetic voice telling the player that "the player has lost" or that "the player has won $100". A player may also be informed of an outcome with other audio effects. For example, the sound of chimes may represent a win while a buzzer may represent a loss. The player may then play another game. In this way, the player may proceed to play game after game, without ever looking at the device. A player may thus play, for example, in a dark room. A player may also play while driving or while his vision is otherwise occupied.

10. YOU CAN PRACTICE THIS DEVICE WHEN YOU ARE IN THE CASINO OR EVEN AT HOME. In various embodiments, a player may use motion control on a mobile gaming device in a practice mode, a learning mode, a free play mode, or in some other mode where the player has no money at risk or where the player has a reduced amount of money at risk (e.g., as compared to normal play). The use of motion control in a practice mode may allow the player to learn how to use motion control or may alleviate reservations the player might have with regard to motion control. In various embodiments, a switch, button, or other means of selection may allow a player to switch from practice mode to real mode and/or the other way around. In some embodiments, a mobile gaming device may automatically go into practice mode without

Petitioner Exhibit 1002-2487

is outside of designated or legal gaming areas, such as when it is off the casino floor. A mobile gaming device may detect its own location using positioning technologies, such as GPS, for example.

10.1. USE A VIDEO GAME CONTROLLER LIKE THE WII TO PRACTICE. In various embodiments, a device other than a mobile gaming device may be used in order to simulate the use of a mobile gaming device. For example, a device used in a computer game console may be used to simulate the use of a mobile gaming device. An exemplary such device is a controller for Nintendo's(R) Wii(TM) system which takes as inputs the motions a player makes with the controller. In various embodiments, for example, a Wii console or some other computer console may display graphics representative of casino game graphics or otherwise representative of graphics that might appear on the display screen of a mobile gaming device. The player may move the controller in the same way that he would move the actual mobile gaming device. The graphics displayed may then change as they would on an actual mobile gaming device. Thus, a player may simulate the experience of using a mobile gaming device with a controller for a computer game console. When the player later uses a real mobile gaming device in a casino, for example, the player may benefit from having practiced before.

11. CUSTOMIZE TO YOUR GESTURES. TRAIN THE DEVICE AS TO HOW EXTREME YOU WANT YOUR GESTURES. SOME PEOPLE WANT MODERATE GESTURES. OTHERS WANT TO MAKE EMPHATIC GESTURES. In various embodiments, a person may calibrate the mobile gaming device to recognize or to respond to various degrees or types of gestures. Some people may naturally make large or sweeping motions, while other people may prefer more subdued motions. A person may be asked, e.g., through prompts displayed on a mobile gaming device, to make one or more motions while holding the mobile gaming device. The mobile gaming device may note various characteristics of the motion based on sensor readings (e.g., based on readings from accelerometers stored in the mobile gaming device). For example, the mobile gaming device may note whether the motions made by the person have large or small displacements, rapid or gradual accelerations, long or short durations, and/or whether the motions made by a person have any of two alternate characteristics or have any of three or more alternate characteristics. The mobile gaming device, a casino server, or another device may then store information about the nature of a person's motions. When, in the future, the person provides motions as a means for conveying instructions, the motions may be registered or followed only if such motions matched those provided during the calibration phase. For example, if a person used large and expansive motions during calibration, the person may not be able to provide instruction using small subdued motions.

12. EXAMPLES OF MOTIONS. Following are some exemplary instructions that may be provided in a game and/or that may be provided to a mobile gaming device. Associated with the exemplary instructions are exemplary motions of a device, such as of a mobile gaming device, that may be used by a player to indicate a desire that the instructions be carried out.

12.1. HOW TO BET. To provide an instruction to bet one credit, a player may shake the mobile gaming device once. To add an extra credit, the player may shake the mobile gaming device again. To add another extra credit, the player may shake the mobile gaming device again, and so on.

12.2. HOW TO STAND. To provide an instruction to stand in a game of blackjack, a player may tilt a mobile gaming device to the left. To provide an instruction to hit, the player may tilt the gaming device to the right. To provide an instruction to split, the player may move the gaming device down then up.

12.3. HOW TO SELECT A GAME. To select a game, a player may tilt the mobile gaming device to the right. Each time the player tilts the mobile gaming device to the right, a different game from a list of games may be highlighted. To select the game

Petitioner Exhibit 1002-2488

desired game is highlighted, the player may tap the mobile gaming device against something.

12.4. HOW TO START A GAME. To start a game, a player may move the mobile gaming device in a clockwise circular motion in a plane parallel to the ground.

12.5. HOW TO MAKE A SELECTION IN A BONUS ROUND. To make a selection in a bonus round, a player may continue tilting the mobile gaming device to the right, with each tilt highlighting a different selection (e.g., a different door with a hidden present behind it). When the player's desired selection is highlighted, the player may tap the mobile gaming device against something to make the selection.

12.6. HOW TO CASH OUT. To cash out, a player may move the mobile gaming device up and down three times. Cashing out may include transferring a balance of credit stored locally on a mobile gaming device to a balance stored centrally, such as with a casino server. Cashing out may include causing a mobile gaming device or a nearby device (e.g., a device with which the mobile gaming device is in communication) to print out a ticket which is redeemable for cash.

13. USE MOTION OF THE MOBILE DEVICE TO CONTROL A STATIONARY GAMING DEVICE OR OTHER DEVICE. In various embodiments, the motion of a mobile gaming device may be used to control action at a stationary gaming device or at any other device. In various embodiments, the motion of a mobile gaming device may be used to provide instructions to a stationary gaming device or to any other device. The mobile gaming device may be in communication with the stationary gaming device, either directly (e.g., through direct wireless contact), or indirectly (e.g., with signals relayed through one or more intermediary devices, such as the casino server). In various embodiments, motions of the mobile gaming device may provide instructions to a stationary gaming device, where such instructions may include instructions to bet, to initiate a game, to cash out, to choose a particular choice from among several choices in a bonus round, to bet a particular amount, to discard a particular card, to make a particular decision in blackjack, to claim a jackpot, to call over a casino representative, or to take any other action. In various embodiments, the motions of a mobile gaming device may be translated in a direct or linear fashion to the motions of a cursor or pointer on the screen of a stationary gaming device. For example, when the mobile gaming device is moved to the right, the cursor may move to the right of the screen, and when the mobile gaming device is moved to the left, the cursor may move to the left of the screen. A player may activate or manipulate a control on the stationary gaming device by moving the mobile gaming device in such a way as to position the cursor on the stationary gaming device over the desired control. The player may then provide a final motion, such as shaking the mobile gaming device, to cause the control to be activated. Thus, for example, a player may move a mobile gaming device to the right in order to move a cursor on the screen of a stationary gaming device to the right to be positioned over a "bet" button (e.g., a rendition of a "bet" button). The player may then shake the mobile gaming device to actually place a bet of 1 credit. A player may use the mobile gaming device to control other devices as well, such as ATM machines or vending machines. For example, a player may use the motion of a mobile gaming device to select a product in a vending machine and to then purchase the product. For example, the products in a vending machine may have associated indicator lights. When the player moves the mobile gaming device the indicator light associated with one product may go off and the indicator light associated with another product may go on. The second product may lie in a direction from the first product which is the same direction that was indicated by the motion of the mobile gaming device. In some embodiments, a person may use the motions of a mobile device, such as a mobile gaming device, to control a point of sale terminal.

14. USE OF MOTION AND OTHER TYPES OF INPUT. In various embodiments, a player need not exclusively use motion control to play a game or to perform other actions with a mobile gaming device. For example, a player may employ a combination

Petitioner Exhibit 1002-2489

pressing a key pad, but may actually start a game using a motion, such as shaking the mobile gaming device. In some embodiments, a player may have a choice of ways in which to convey a given instruction. The same instruction may be conveyed through motion or through other means, such as through button presses. Thus, according to a player's fancy, the player may choose one way or the other for providing the same instruction.

The Following are Embodiments, not Claims:
A. A method comprising:

[0670] detecting a first signal from a motion sensor, in which the first signal endures throughout a first period of time;

[0671] determining whether a second signal has endured throughout the first period of time;

[0672] determining, if the second signal has endured throughout the first period of time, an instruction based on the first signal; and

[0673] executing the instruction in a gambling game if the second signal has endured throughout the first period of time.
B. The method of embodiment A in which detecting a first signal includes detecting a first signal from a motion sensor contained within a mobile gaming device, in which the first signal endures throughout a first period of time.
C. The method of embodiment B in which the motion sensor comprises an accelerometer.
D. The method of embodiment B in which the motion sensor comprises a camera.
E. The method of embodiment B further including detecting a second signal from a button on the mobile gaming device, in which the second signal is generated through the application of pressure to the button.
F. The method of embodiment E in which determining whether a second signal has endured throughout the first period of time includes determining whether continuous pressure has been applied to the button throughout the first period of time.
G. The method of embodiment E in which the instruction is one of: (a) an instruction to place a bet; (b) an instruction to place a bet of a certain amount; (c) an instruction to begin the gambling game; (d) an instruction to discard a card; (e) an instruction to receive another card; (f) an instruction to receive no further cards; (g) an instruction to select an option in a bonus round; (h) an instruction to cash out; (i) an instruction to select a pay line; and (j) an instruction to begin a bonus round.
H. The method of embodiment E in which the first signal is generated through motion of the mobile gaming device.
I. A method comprising:

[0682] detecting a first signal from a motion sensor of a mobile gaming device;

[0683] interpreting the first signal as a specification of a first bet in a first game to be played at the mobile gaming device, the first bet denominated in valueless currency;

[0684] detecting a second signal from the motion sensor;

[0685] interpreting the second signal as a specification of a second bet in a second game to be played at the mobile gaming device, the second bet denominated in valuable currency; and

[0686] determining an outcome of the second game only if the first game has been completed.

J. The method of embodiment I in which the valueless currency is not exchangeable for United States dollars, and in which the valuable currency is exchangeable for United States dollars.

K. The method of embodiment I in which the second signal has similar characteristics to the first signal.

L. The method of embodiment I further including displaying, prior to detecting the first signal, a message on a display screen of the mobile gaming device, the message providing instructions to move the mobile gaming device in a particular way in order specify the first bet.

M. The method of embodiment I further including:

[0691] asking the player to provide a first proof of his identity following the completion of the first game;

[0692] asking the player to provide a second proof of his identity prior to determining the outcome; and

[0693] verifying that the second proof matches the first proof.

N. The method of embodiment M in which the first proof is a first fingerprint supplied to the mobile gaming device, and in which the second proof is a second fingerprint supplied to the mobile gaming device.

O. A method comprising:

[0696] receiving a signal indicative of a bet at a mobile gaming device with a rectangular display screen;

[0697] determining five cards;

[0698] displaying a first of the five cards in a first corner of the display screen;

[0699] displaying a second of the five cards in a second corner of the display screen;

[0700] displaying a third of the five cards in a third corner of the display screen;

[0701] displaying a fourth of the five cards in a fourth corner of the display screen;

[0702] determining a particular card of the five cards to be discarded;

[0703] determining a sixth card;

[0704] replacing the particular card with the sixth card;

[0705] determining a payout based on the sixth card and based on cards of the five cards that were not discarded; and

[0706] adjusting a credit balance based on the payout.

P. The method of embodiment O further including displaying a fifth of the five cards in the center of the display screen.

Q. The method of embodiment O in which determining a particular card of the five cards to be discarded includes:

[0709] detecting a motion of the mobile gaming device;

Petitioner Exhibit 1002-2491

[0710] determining that the first of the five cards is to be discarded if the motion is a tilting of the mobile gaming device towards the first corner of the display screen;

[0711] determining that the second of the five cards is to be discarded if the motion is a tilting of the mobile gaming device towards the second corner of the display screen;

[0712] determining that the third of the five cards is to be discarded if the motion is a tilting of the mobile gaming device towards the third corner of the display screen; and

[0713] determining that the fourth of the five cards is to be discarded if the motion is a tilting of the mobile gaming device towards the fourth corner of the display screen.
R. The method of embodiment O in which determining a payout includes determining a payout based on the sixth card, based on cards of the five cards that were not discarded, and based on the rules of video poker.

[0715] The following sections I-X provide a guide to interpreting the present application.

I. Determining

[0716] The term "determining" and grammatical variants thereof (e.g., to determine a price, determining a value, determine an object which meets a certain criterion) is used in an extremely broad sense. The term "determining" encompasses a wide variety of actions and therefore "determining" can include calculating, computing, processing, deriving, investigating, looking up (e.g., looking up in a table, a database or another data structure), ascertaining and the like. Also, "determining" can include receiving (e.g., receiving information), accessing (e.g., accessing data in a memory) and the like. Also, "determining" can include resolving, selecting, choosing, establishing, and the like.

[0717] The term "determining" does not imply certainty or absolute precision, and therefore "determining" can include estimating, extrapolating, predicting, guessing and the like.

[0718] The term "determining" does not imply that mathematical processing must be performed, and does not imply that numerical methods must be used, and does not imply that an algorithm or process is used.

[0719] The term "determining" does not imply that any particular device must be used. For example, a computer need not necessarily perform the determining.

II. Forms of Sentences

[0720] Where a limitation of a first claim would cover one of a feature as well as more than one of a feature (e.g., a limitation such as "at least one widget" covers one widget as well as more than one widget), and where in a second claim that depends on the first claim, the second claim uses a definite article "the" to refer to the limitation (e.g., "the widget"), this does not imply that the first claim covers only one of the feature, and this does not imply that the second claim covers only one of the feature (e.g., "the widget" can cover both one widget and more than one widget).

[0721] When an ordinal number (such as "first", "second", "third" and so on) is used as an adjective before a term, that ordinal number is used (unless expressly specified otherwise) merely to indicate a particular feature, such as to distinguish [illegible]

Petitioner Exhibit 1002-2492

feature from another feature that is described by the same term or by a similar term. For example, a "first widget" may be so named merely to distinguish it from, e.g., a "second widget". Thus, the mere usage of the ordinal numbers "first" and "second" before the term "widget" does not indicate any other relationship between the two widgets, and likewise does not indicate any other characteristics of either or both widgets. For example, the mere usage of the ordinal numbers "first" and "second" before the term "widget" (1) does not indicate that either widget comes before or after any other in order or location; (2) does not indicate that either widget occurs or acts before or after any other in time; and (3) does not indicate that either widget ranks above or below any other, as in importance or quality. In addition, the mere usage of ordinal numbers does not define a numerical limit to the features identified with the ordinal numbers. For example, the mere usage of the ordinal numbers "first" and "second" before the term "widget" does not indicate that there must be no more than two widgets.

[0722] When a single device, article or other product is described herein, more than one device/article (whether or not they cooperate) may alternatively be used in place of the single device/article that is described. Accordingly, the functionality that is described as being possessed by a device may alternatively be possessed by more than one device/article (whether or not they cooperate).

[0723] Similarly, where more than one device, article or other product is described herein (whether or not they cooperate), a single device/article may alternatively be used in place of the more than one device or article that is described. For example, a plurality of computer-based devices may be substituted with a single computer-based device. Accordingly, the various functionality that is described as being possessed by more than one device or article may alternatively be possessed by a single device/article.

[0724] The functionality and/or the features of a single device that is described may be alternatively embodied by one or more other devices which are described but are not explicitly described as having such functionality/features. Thus, other embodiments need not include the described device itself, but rather can include the one or more other devices which would, in those other embodiments, have such functionality/features.

III. Terms

[0725] The term "product" means any machine, manufacture and/or composition of matter, unless expressly specified otherwise.

[0726] The term "process" means any process, algorithm, method or the like, unless expressly specified otherwise.

[0727] Each process (whether called a method, algorithm or otherwise) inherently includes one or more steps, and therefore all references to a "step" or "steps" of a process have an inherent antecedent basis in the mere recitation of the term 'process' or a like term. Accordingly, any reference in a claim to a 'step' or 'steps' of a process has sufficient antecedent basis.

[0728] The term "invention" and the like mean "the one or more inventions disclosed in this application", unless expressly specified otherwise.

[0729] The terms "an embodiment", "embodiment", "embodiments", "the embodiment",

Petitioner Exhibit 1002-2493

"the embodiments", "one or more embodiments", "some embodiments", "certain embodiments", "one embodiment", "another embodiment" and the like mean "one or more (but not all) embodiments of the disclosed invention(s)", unless expressly specified otherwise.

[0730] The term "variation" of an invention means an embodiment of the invention, unless expressly specified otherwise.

[0731] A reference to "another embodiment" in describing an embodiment does not imply that the referenced embodiment is mutually exclusive with another embodiment (e.g., an embodiment described before the referenced embodiment), unless expressly specified otherwise.

[0732] The terms "including", "comprising" and variations thereof mean "including but not limited to", unless expressly specified otherwise.

[0733] The terms "a", "an" and "the" mean "one or more", unless expressly specified otherwise.

[0734] The term "plurality" means "two or more", unless expressly specified otherwise.

[0735] The term "herein" means "in the present application, including anything which may be incorporated by reference", unless expressly specified otherwise.

[0736] The phrase "at least one of", when such phrase modifies a plurality of things (such as an enumerated list of things) means any combination of one or more of those things, unless expressly specified otherwise. For example, the phrase "at least one of a widget, a car and a wheel" means either (i) a widget, (ii) a car, (iii) a wheel, (iv) a widget and a car, (v) a widget and a wheel, (vi) a car and a wheel, or (vii) a widget, a car and a wheel. The phrase "at least one of", when such phrase modifies a plurality of things does not mean "one of each of" the plurality of things.

[0737] Numerical terms such as "one", "two", etc. when used as cardinal numbers to indicate quantity of something (e.g., one widget, two widgets), mean the quantity indicated by that numerical term, but do not mean at least the quantity indicated by that numerical term. For example, the phrase "one widget" does not mean "at least one widget", and therefore the phrase "one widget" does not cover, e.g., two widgets.

[0738] The phrase "based on" does not mean "based only on", unless expressly specified otherwise. In other words, the phrase "based on" describes both "based only on" and "based at least on". The phrase "based at least on" is equivalent to the phrase "based at least in part on".

[0739] The term "represent" and like terms are not exclusive, unless expressly specified otherwise. For example, the term "represents" does not mean "represents only", unless expressly specified otherwise. In other words, the phrase "the data represents a credit card number" describes both "the data represents only a credit card number" and "the data represents a credit card number and the data also represents something else".

[0740] The term "whereby" is used herein only to precede a clause or other set of words that express only the intended result, objective or consequence of something that is previously and explicitly recited. Thus, when the term "whereby" is used in a claim, the clause or other words that the term "whereby" modifies do not establish

Petitioner Exhibit 1002-2494

specific further limitations of the claim or otherwise restricts the meaning or scope of the claim.

[0741] The term "e.g." and like terms mean "for example", and thus does not limit the term or phrase it explains. For example, in the sentence "the computer sends data (e.g., instructions, a data structure) over the Internet", the term "e.g." explains that "instructions" are an example of "data" that the computer may send over the Internet, and also explains that "a data structure" is an example of "data" that the computer may send over the Internet. However, both "instructions" and "a data structure" are merely examples of "data", and other things besides "instructions" and "a data structure" can be "data".

[0742] The term "respective" and like terms mean "taken individually". Thus if two or more things have "respective" characteristics, then each such thing has its own characteristic, and these characteristics can be different from each other but need not be. For example, the phrase "each of two machines has a respective function" means that the first such machine has a function and the second such machine has a function as well. The function of the first machine may or may not be the same as the function of the second machine.

[0743] The term "i.e." and like terms mean "that is", and thus limits the term or phrase it explains. For example, in the sentence "the computer sends data (i.e., instructions) over the Internet", the term "i.e." explains that "instructions" are the "data" that the computer sends over the Internet.

[0744] Any given numerical range shall include whole and fractions of numbers within the range. For example, the range "1 to 10" shall be interpreted to specifically include whole numbers between 1 and 10 (e.g., 1, 2, 3, 4, . . . 9) and non-whole numbers (e.g., 1.1, 1.2, . . . 1.9).

[0745] Where two or more terms or phrases are synonymous (e.g., because of an explicit statement that the terms or phrases are synonymous), instances of one such term/phrase does not mean instances of another such term/phrase must have a different meaning. For example, where a statement renders the meaning of "including" to be synonymous with "including but not limited to", the mere usage of the phrase "including but not limited to" does not mean that the term "including" means something other than "including but not limited to".

IV. Disclosed Examples and Terminology are not Limiting

[0746] Neither the Title (set forth at the beginning of the first page of the present application) nor the Abstract (set forth at the end of the present application) is to be taken as limiting in any way as the scope of the disclosed invention(s). An Abstract has been included in this application merely because an Abstract of not more than 150 words is required under 37 C.F.R. $1.72(b).

[0747] The title of the present application and headings of sections provided in the present application are for convenience only, and are not to be taken as limiting the disclosure in any way.

[0748] Numerous embodiments are described in the present application, and are presented for illustrative purposes only. The described embodiments are not, and are not intended to be, limiting in any sense. The presently disclosed invention(s) are widely applicable to numerous embodiments, as is readily apparent from the

Petitioner Exhibit 1002-2495

disclosure. One of ordinary skill in the art will recognize that the disclosed invention(s) may be practiced with various modifications and alterations, such as structural, logical, software, and electrical modifications. Although particular features of the disclosed invention(s) may be described with reference to one or more particular embodiments and/or drawings, it should be understood that such features are not limited to usage in the one or more particular embodiments or drawings with reference to which they are described, unless expressly specified otherwise.

[0749] No embodiment of method steps or product elements described in the present application constitutes the invention claimed herein, or is essential to the invention claimed herein, or is coextensive with the invention claimed herein, except where it is either expressly stated to be so in this specification or expressly recited in a claim.

[0750] The preambles of the claims that follow recite purposes, benefits and possible uses of the claimed invention only and do not limit the claimed invention.

[0751] The present disclosure is not a literal description of all embodiments of the invention(s). Also, the present disclosure is not a listing of features of the invention(s) which must be present in all embodiments.

[0752] Devices that are described as in communication with each other need not be in continuous communication with each other, unless expressly specified otherwise. On the contrary, such devices need only transmit to each other as necessary or desirable, and may actually refrain from exchanging data most of the time. For example, a machine in communication with another machine via the Internet may not transmit data to the other machine for long period of time (e.g. weeks at a time). In addition, devices that are in communication with each other may communicate directly or indirectly through one or more intermediaries.

[0753] A description of an embodiment with several components or features does not imply that all or even any of such components/features are required. On the contrary, a variety of optional components are described to illustrate the wide variety of possible embodiments of the present invention(s). Unless otherwise specified explicitly, no component/feature is essential or required.

[0754] Although process steps, algorithms or the like may be described or claimed in a particular sequential order, such processes may be configured to work in different orders. In other words, any sequence or order of steps that may be explicitly described or claimed does not necessarily indicate a requirement that the steps be performed in that order. The steps of processes described herein may be performed in any order possible. Further, some steps may be performed simultaneously despite being described or implied as occurring non-simultaneously (e.g., because one step is described after the other step). Moreover, the illustration of a process by its depiction in a drawing does not imply that the illustrated process is exclusive of other variations and modifications thereto, does not imply that the illustrated process or any of its steps are necessary to the invention(s), and does not imply that the illustrated process is preferred.

[0755] Although a process may be described as including a plurality of steps, that does not imply that all or any of the steps are preferred, essential or required. Various other embodiments within the scope of the described invention(s) include other processes that omit some or all of the described steps. Unless otherwise specified explicitly, no step is essential or required.

[0756] Although a process may be described singly or without reference to other products or methods, in an embodiment the process may interact with other products or methods. For example, such interaction may include linking one business model to another business model. Such interaction may be provided to enhance the flexibility or desirability of the process.

[0757] Although a product may be described as including a plurality of components, aspects, qualities, characteristics and/or features, that does not indicate that any or all of the plurality are preferred, essential or required. Various other embodiments within the scope of the described invention(s) include other products that omit some or all of the described plurality.

[0758] An enumerated list of items (which may or may not be numbered) does not imply that any or all of the items are mutually exclusive, unless expressly specified otherwise. Likewise, an enumerated list of items (which may or may not be numbered) does not imply that any or all of the items are comprehensive of any category, unless expressly specified otherwise. For example, the enumerated list "a computer, a laptop, a PDA" does not imply that any or all of the three items of that list are mutually exclusive and does not imply that any or all of the three items of that list are comprehensive of any category.

[0759] An enumerated list of items (which may or may not be numbered) does not imply that any or all of the items are equivalent to each other or readily substituted for each other.

[0760] All embodiments are illustrative, and do not imply that the invention or any embodiments were made or performed, as the case may be.

V. Computing

[0761] It will be readily apparent to one of ordinary skill in the art that the various processes described herein may be implemented by, e.g., appropriately programmed general purpose computers, special purpose computers and computing devices. Typically a processor (e.g., one or more microprocessors, one or more microcontrollers, one or more digital signal processors) will receive instructions (e.g., from a memory or like device), and execute those instructions, thereby performing one or more processes defined by those instructions. Instructions may be embodied in, e.g., one or more computer programs, one or more scripts.

[0762] A "processor" means one or more microprocessors, central processing units (CPUs), computing devices, microcontrollers, digital signal processors, or like devices or any combination thereof, regardless of the architecture (e.g., chip-level multiprocessing/multi-core, RISC, CISC, Microprocessor without Interlocked Pipeline Stages, pipelining configuration, simultaneous multithreading).

[0763] Thus a description of a process is likewise a description of an apparatus for performing the process. The apparatus that performs the process can include, e.g., a processor and those input devices and output devices that are appropriate to perform the process.

[0764] Further, programs that implement such methods (as well as other types of data) may be stored and transmitted using a variety of media (e.g., computer readable media) in a number of manners. In some embodiments, hard-wired circuitry or custom hardware may be used in place of, or in combination with, some or all of the software

Petitioner Exhibit 1002-2497

instructions that can implement the processes of various embodiments. Thus, various combinations of hardware and software may be used instead of software only.

[0765] The term "computer-readable medium" refers to any medium, a plurality of the same, or a combination of different media, that participate in providing data (e.g., instructions, data structures) which may be read by a computer, a processor or a like device. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media include, for example, optical or magnetic disks and other persistent memory. Volatile media include dynamic random access memory (DRAM), which typically constitutes the main memory. Transmission media include coaxial cables, copper wire and fiber optics, including the wires that comprise a system bus coupled to the processor. Transmission media may include or convey acoustic waves, light waves and electromagnetic emissions, such as those generated during radio frequency (RF) and infrared (IR) data communications. Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, any other magnetic medium, a CD-ROM, DVD, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, an EPROM, a FLASH-EEPROM, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read.

[0766] Various forms of computer readable media may be involved in carrying data (e.g. sequences of instructions) to a processor. For example, data may be (i) delivered from RAM to a processor; (ii) carried over a wireless transmission medium; (iii) formatted and/or transmitted according to numerous formats, standards or protocols, such as Ethernet (or IEEE 802.3), SAP, ATP, Bluetooth- and TCP/IP, TDMA, CDMA, and 3G; and/or (iv) encrypted to ensure privacy or prevent fraud in any of a variety of ways well known in the art.

[0767] Thus a description of a process is likewise a description of a computer-readable medium storing a program for performing the process. The computer-readable medium can store (in any appropriate format) those program elements which are appropriate to perform the method.

[0768] Just as the description of various steps in a process does not indicate that all the described steps are required, embodiments of an apparatus include a computer/computing device operable to perform some (but not necessarily all) of the described process.

[0769] Likewise, just as the description of various steps in a process does not indicate that all the described steps are required, embodiments of a computer-readable medium storing a program or data structure include a computer-readable medium storing a program that, when executed, can cause a processor to perform some (but not necessarily all) of the described process.

[0770] Where databases are described, it will be understood by one of ordinary skill in the art that (i) alternative database structures to those described may be readily employed, and (ii) other memory structures besides databases may be readily employed. Any illustrations or descriptions of any sample databases presented herein are illustrative arrangements for stored representations of information. Any number of other arrangements may be employed besides those suggested by, e.g., tables illustrated in drawings or elsewhere. Similarly, any illustrated entries of the databases represent exemplary information only; one of ordinary skill in the art will understand that the number and content of the entries can be different from those described herein.

Petitioner Exhibit 1002-2498

Further, despite any depiction of the databases as tables, other formats (including relational databases, object-based models and/or distributed databases) could be used to store and manipulate the data types described herein. Likewise, object methods or behaviors of a database can be used to implement various processes, such as the described herein. In addition, the databases may, in a known manner, be stored locally or remotely from a device which accesses data in such a database.

[0771] Various embodiments can be configured to work in a network environment including a computer that is in communication (e.g., via a communications network) with one or more devices. The computer may communicate with the devices directly or indirectly, via any wired or wireless medium (e.g. the Internet, LAN, WAN or Ethernet, Token Ring, a telephone line, a cable line, a radio channel, an optical communications line, commercial on-line service providers, bulletin board systems, a satellite communications link, a combination of any of the above). Each of the devices may themselves comprise computers or other computing devices, such as those based on the Intel(R) Pentium(R) or Centrino(TM) processor, that are adapted to communicate with the computer. Any number and type of devices may be in communication with the computer.

[0772] In an embodiment, a server computer or centralized authority may not be necessary or desirable. For example, the present invention may, in an embodiment, be practiced on one or more devices without a central authority. In such an embodiment, any functions described herein as performed by the server computer or data described as stored on the server computer may instead be performed by or stored on one or more such devices.

[0773] Where a process is described, in an embodiment the process may operate without any user intervention. In another embodiment, the process includes some human intervention (e.g., a step is performed by or with the assistance of a human).

VI. Continuing Applications

[0774] The present disclosure provides, to one of ordinary skill in the art, an enabling description of several embodiments and/or inventions. Some of these embodiments and/or inventions may not be claimed in the present application, but may nevertheless be claimed in one or more continuing applications that claim the benefit of priority of the present application.

[0775] Applicants intend to file additional applications to pursue patents for subject matter that has been disclosed and enabled but not claimed in the present application.

VII. 35 U.S.C. $112, paragraph 6

[0776] In a claim, a limitation of the claim which includes the phrase "means for" or the phrase "step for" means that 35 U.S.C. $112, paragraph 6, applies to that limitation.

[0777] In a claim, a limitation of the claim which does not include the phrase "means for" or the phrase "step for" means that 35 U.S.C. $112, paragraph 6 does not apply to that limitation, regardless of whether that limitation recites a function without recitation of structure, material or acts for performing that function. For example, in a claim, the mere use of the phrase "step of" or the phrase "steps of" in referring to one or more steps of the claim or of another claim does not mean that 35 U.S.C. $112, paragraph 6, applies to that step(s).

[0778] With respect to a means or a step for performing a specified function in accordance with 35 U.S.C. $112, paragraph 6, the corresponding structure, material or acts described in the specification, and equivalents thereof, may perform additional functions as well as the specified function.

[0779] Computers, processors, computing devices and like products are structures that can perform a wide variety of functions. Such products can be operable to perform a specified function by executing one or more programs, such as a program stored in a memory device of that product or in a memory device which that product accesses. Unless expressly specified otherwise, such a program need not be based on any particular algorithm, such as any particular algorithm that might be disclosed in the present application. It is well known to one of ordinary skill in the art that a specified function may be implemented via different algorithms, and any of a number of different algorithms would be a mere design choice for carrying out the specified function.

[0780] Therefore, with respect to a means or a step for performing a specified function in accordance with 35 U.S.C. $112, paragraph 6, structure corresponding to a specified function includes any product programmed to perform the specified function. Such structure includes programmed products which perform the function, regardless of whether such product is programmed with (i) a disclosed algorithm for performing the function, (ii) an algorithm that is similar to a disclosed algorithm, or (iii) a different algorithm for performing the function.

[0781] Where there is recited a means for performing a function that is a method, one structure for performing this method includes a computing device (e.g., a general purpose computer) that is programmed and/or configured with appropriate hardware to perform that function. Also included is a computing device (e.g., a general purpose computer) that is programmed and/or configured with appropriate hardware to perform that function via other algorithms as would be understood by one of ordinary skill in the art.

VIII. Disclaimer

[0782] Numerous references to a particular embodiment do not indicate a disclaimer or disavowal of additional, different embodiments, and similarly references to the description of embodiments which all include a particular feature do not indicate a disclaimer or disavowal of embodiments which do not include that particular feature. A clear disclaimer or disavowal in the present application shall be prefaced by the phrase "does not include" or by the phrase "cannot perform".

IX. Incorporation By Reference

[0783] Any patent, patent application or other document referred to herein is incorporated by reference into this patent application as part of the present disclosure, but only for purposes of written description and enablement in accordance with 35 U.S.C. $112, paragraph 1, and should in no way be used to limit, define, or otherwise construe any term of the present application, unless without such incorporation by reference, no ordinary meaning would have been ascertainable by a person of ordinary skill in the art. Such person of ordinary skill in the art need not have been, in any way limited, by any embodiments provided in the reference.

[0784] Any incorporation by reference does not, in and of itself, imply any endorsement of, ratification of or acquiescence in any statements, opinions, arguments or characterizations contained in any incorporated patent, patent application or other

Petitioner Exhibit 1002-2500

document, unless explicitly specified otherwise in this patent application.

X. Prosecution History

[0785] In interpreting the present application (which includes the claims), one of ordinary skill in the art shall refer to the prosecution history of the present application, but not to the prosecution history of any other patent or patent application, regardless of whether there are other patent applications that are considered related to the present application, and regardless of whether there are other patent applications that share a claim of priority with the present application.

XI. Some Embodiments

[0786] In various embodiments, a distributed gaming system enables participants to engage in gaming activities from remote and/or mobile locations. The possible gaming activities include gambling, such as that provided by casinos. Gambling activities may include any casino-type gambling activities including, but not limited to, slot machines, video poker, table games (e.g., craps, roulette, blackjack, pai gow poker, Caribbean stud poker, baccarat, etc.), the wheel of fortune game, keno, sports betting, horse racing, dog racing, jai alai, and other gambling activities. The gaming activities can also include wagering on any type of event. Events can include, for example, sporting events, such as horse or auto racing, and athletic competitions such as football, basketball, baseball, golf, etc. Events can also include such things that do not normally involve wagering. Such events may include, without limitation, political elections, entertainment industry awards, and box office performance of movies. Gaming can also include non-wagering games and events. Gaming can also include lotteries or lottery-type activities such as state and interstate lotteries. These can include all forms of number-selection lotteries, "scratch-off" lotteries, and other lottery contests. The gaming system may be implemented over a communications network such as a cellular network or a private wireless and/or wireline network. Examples of the latter include WiFi and WiMax networks. In some embodiments, the gaming system communications network is entirely independent of the Internet. In some embodiments, the gaming system operation makes minimal use of the Internet, such that only information for which there are no security issues is transmitted via the Internet and/or such that information may be encrypted. In various embodiments, the communications network enables players to participate in gaming from remote locations (e.g., outside of the gaming area of a casino). Also, the system may enable players to be mobile during participation in the gaming activities. In various embodiments, the system has a location verification or determination feature, which is operable to permit or disallow gaming from the remote location depending upon whether or not the location meets one or more criteria. The criterion may be, for example, whether the location is within a pre-defined area in which gaming is permitted by law.

[0787] As shown in FIG. 1, for example, gaming system 10 may include at least one user 12. The system may include additional users such that there is at least a first user 12 and a second user 14. Multiple users may access a first gaming system 10, while other multiple users access a second gaming system (not shown) in communication with first gaming system 10. Users 12 and 14 may access system 10 by way of a gaming communication device 13. Gaming communication device 13 may comprise any suitable device for transmitting and receiving electronic communications. Examples of such devices include, without limitation, mobile phones, personal data assistants (PDAs), computers, mini-computers, etc. Gaming communication devices 13 transmit and receive gaming information to and from communications network 16. Gaming information is also transmitted between network 16 and a computer [illegible]

Petitioner Exhibit 1002-2501

server, which may reside within the domain of a gaming service provider 20. The location of computer 18 may be flexible, however, and computer 18 may reside adjacent to or remote from the domain of gaming service provider 20. Various embodiments may not include a gaming service provider. The computer 18 and/or gaming service provider 20 may reside within, adjacent to, or remote from a gaming provider (not shown in FIG. 1). The gaming service provider may be an actual controller of games, such as a casino. As an example, a gaming service provider may be located on the grounds of a casino and the computer 18 may be physically within the geographic boundaries of the gaming service provider. As discussed, however, other possibilities exist for remote location of the computer 18 and the gaming service provider 20. Computer 18 may function as a gaming server. Additional computers (not expressly shown) may function as database management computers and redundant servers, for example.

[0788] In various embodiments, software resides on both the gaming communication device 13 and the computer 18. Software resident on gaming communication device 13 may be operable to present information corresponding to gaming activities (including gambling and non-gambling activities discussed herein) to the user. The information may include, without limitation, graphical representations of objects associated with the activities, and presentation of options related to the activities and selectable by the user. The gaming communication device software may also be operable to receive data from the computer and data input by the user. Software resident on the computer may be able to exchange data with the gaming communication device, access additional computers and data storage devices, and perform all of the functions described herein as well as functions common to known electronic gaming systems.

[0789] Gaming information transmitted across network 16 may include any information, in any format, which is necessary or desirable in the operation of the gaming experience in which the user participates. The information may be transmitted in whole, or in combination, in any format including digital or analog, text or voice, and according to any known or future transport technologies, which may include, for example, wireline or wireless technologies. Wireless technologies may include, for example, licensed or license-exempt technologies. Some specific technologies which may be used include, without limitation, Code Division Multiple Access (CDMA), Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), WiFi (802.11x), WiMax (802.16x), Public Switched Telephone Network (PSTN), Digital Subscriber Line (DSL), Integrated Services Digital Network (ISDN), or cable modem technologies. These are examples only and one of ordinary skill will understand that other types of communication techniques are also contemplated. Further, it will be understood that additional components may be used in the communication of information between the users and the gaming server. Such additional components may include, without limitation, lines, trunks, antennas, switches, cables, transmitters, receivers, computers, routers, servers, fiber optical transmission equipment, repeaters, amplifiers, etc.

[0790] In some embodiments, the communication of gaming information takes place without involvement of the Internet. However, in some embodiments, a portion of the gaming information may be transmitted over the Internet. Also, some or all of the gaming information may be transmitted partially over an Internet communications path. In some embodiments, some information is transmitted entirely or partially over the Internet, but the information is either not gaming information or is gaming information that does not need to be maintained secretly. For instance, data that causes a graphical representation of a table game on the user's gaming communication device might be transmitted at least partially over the Internet, while wagering information transmitted by the user might be transmitted entirely over a non-Internet

communications network.

[0791] According to some embodiments, as shown in FIG. 2 for example, the communications network comprises a cellular network 22. Cellular network 22 comprises a plurality of base stations 23, each of which has a corresponding coverage area 25. Base station technology is generally known and the base stations may be of any type found in a typical cellular network. The base stations may have coverage areas that overlap. Further, the coverage areas may be sectorized or non-sectorized. The network also includes mobile stations 24, which function as the gaming communication devices used by users to access the gaming system and participate in the activities available on the gaming system. Users are connected to the network of base stations via transmission and reception of radio signals. The communications network also includes at least one voice/data switch, which may be connected to the wireless portion of the network via a dedicated, secure landline. The communications network may also include a gaming service provider, which is likewise connected to the voice/data switch via a dedicated, secure landline. The voice/data switch may be connected to the wireless network of base stations via a mobile switching center (MSC), for example and the landline may be provided between the voice/data switch and the MSC.

[0792] Users access the gaming system by way of mobile stations which are in communication with, and thus part of, the communications network. The mobile station may be any electronic communication device that is operable in connection with the network as described. For example, in this particular embodiment, the mobile station may comprise a cellular telephone.

[0793] In various embodiments, in the case of a cellular network for example, the gaming system is enabled through the use of a private label carrier network. Each base station is programmed by the cellular carrier to send and receive private secure voice and/or data transmissions to and from mobile station handsets. The handsets may be pre-programmed with both gaming software and the carrier's authentication software. The base stations communicate via private T1 lines to a switch. A gaming service provider leases a private T1 or T3 line, which routes the calls back to gaming servers controlled by the gaming service provider. Encryption can be installed on the telephones if required by a gaming regulation authority, such as a gaming commission.

[0794] The cellular network may be a private, closed system. Mobile stations communicate with base stations and base stations are connected to a centralized switch located within a gaming jurisdiction. At the switch, voice calls are transported either locally or via long distance. Specific service provider gaming traffic is transported from the central switch to a gaming server at a host location, which can be a casino or other location.

[0795] As subscribers launch their specific gaming application, the handset will only talk to certain base stations with cells or sectors that have been engineered to be wholly within the gaming jurisdiction. For example, if a base station is close enough to pick up or send a signal across state lines, it will not be able to communicate with the device. When a customer uses the device for gaming, the system may prohibit, if desired, the making or receiving voice calls. Moreover, voice can be eliminated entirely if required. Further, the devices may not be allowed to "connect" to the Internet. This ensures a high level of certainty that bets/wagers originate and terminate within the boundaries of the gaming jurisdiction and the "private" wireless system cannot be circumvented or bypassed. Although in some embodiments some data and/or voice traffic may be communicated at least partially over the Internet, the communication path may not

Petitioner Exhibit 1002-2503

include the Internet in other embodiments. Alternatively, in some embodiments, certain non-gaming information may be transported over a path which includes the Internet, while other information relating to the gaming activities of the system is transported on a path that does not include the Internet.

[0796] As shown in FIG. 3, a gaming communication device 32 is in communication with a gaming service provider over a network 34. The gaming service provider preferably has one or more servers, on which are resident various gaming and other applications. As shown in FIG. 3, some example gaming applications include horse racing and other sports, financial exchange, casino and/or virtual casino, entertainment and other events exchange, and news and real time entertainment. Each of these applications may be embodied in one or more software modules. The applications may be combined in any possible combination. Additionally, it should be understood that these applications are not exhaustive and that other applications may exist to provide an environment to the user that is associated with any of the described or potential activities.

[0797] In another embodiment, as shown in FIG. 4, for example, the communications network comprises a private wireless network. The private wireless network may include, for example, an 802.11x (WiFi) network technology to cover "Game Spots" or "Entertainment Spots." In FIG. 4, various WiFi networks are indicated as networks 41. Networks 41 may use other communications protocols to provide a private wireless network including, but not limited to, 802.16x (WiMax) technology. Further, networks 41 may be interconnected. Also, a gaming system may comprise a combination of networks as depicted in FIG. 4. For example, there is shown a combination of private wireless networks 16, a cellular network comprising a multi-channel access unit or sectorized base station 42, and a satellite network comprising one or more satellites 46.

[0798] With respect to the private wireless network, because the technology may cover small areas and provide very high-speed throughput, the private wireless network is particularly well-suited for gaming commission needs of location and identity verification for the gaming service provider products. The gaming spots enabled by networks 41 may include a current casino area 48, new areas such as swimming pools, lakes or other recreational areas 49, guest rooms and restaurants such as might be found in casino 48 or hotels 45 and 47, residential areas 40, and other remote gaming areas 43. The configuration of the overall gaming system depicted in FIG. 4 is intended only as an example and may be modified to suit various embodiments.

[0799] In some embodiments, the system architecture for the gaming system includes:
(1) a wireless LAN (Local Access Network) component, which consists of mostly 802.11x (WiFi) and/or 802.16x WiMax technologies; robust security and authentication software; gaming software; mobile carrier approved handsets with Windows(R) or Symbian(R) operating systems integrated within; and
(a) CDMA-technology that is secure for over-the-air data protection;
(b) at least two layers of user authentication, (that provided by the mobile carrier and that provided by the gaming service provider);
(c) compulsory tunneling (static routing) to gaming servers;
(d) end-to-end encryption at the application layer; and
(e) state-of-the-art firewall and DMZ technologies;
(2) an MWAN (Metropolitan Wireless Access Network), which consists of licensed and license-exempt, point-to-point links, as well as licensed and license-exempt, point-to-multi-point technologies;
(3) private MAN (Metropolitan Access Network) T1 and T3 lines for private connectivity;

Petitioner Exhibit 1002-2504

where wireless services cannot reach; and
(4) redundant private-line communications from the mobile switch back to the gaming server.

[0809] Each of the "Game Spots" or "Entertainment Spots" is preferably connected via the MWAN/MAN back to central and redundant game servers. For accessing the private wireless networks 41, the gaming communication devices may be WiFi- or WiMax-enabled PDAs or mini-laptops, and do not have to be managed by a third-party partner.

[0810] In various embodiments, the gaming system includes a location verification feature, which is operable to permit or disable gaming from a remote location depending upon whether or not the location meets one or more criteria. A criterion may be, for example, whether the location is within a pre-defined area in which gaming is permitted by law. As another example, a criterion may be whether the location is in a no-gaming zone, such as a school. The location verification technology used in the system may include, without limitation, "network-based" and/or "satellite-based" technology. Network-based technology may include such technologies as multilateration, triangulation and geo-fencing, for example. Satellite-based technologies may include global positioning satellite (GPS) technology, for example.

[0811] As previously discussed, the cellular approach preferably includes the use of at least one cellular, mobile, voice and data network. For gaming in certain jurisdictions, such as Nevada for example, the technology may involve triangulation, global positioning satellite (GPS) technology, and/or geo-fencing to avoid the potential for bets or wagers to be made outside Nevada state lines. In some embodiments, the network would not cover all of a particular jurisdiction, such as Nevada. For instance, the network would not cover areas in which cellular coverage for a particular base station straddled the state line or other boundary of the jurisdiction. This is done in order to permit the use of location verification to insure against the chance of bets originating or terminating outside of the state. Triangulation may be used as a method for preventing gaming from unapproved locations. Triangulation may be accomplished, for example, by comparing the signal strength from a single mobile station received at multiple base stations, each having GPS coordinates. This technology may be used to pinpoint the location of a mobile station. The location can then be compared to a map or other resource to determine whether the user of the mobile station is in an unapproved area, such as a school. Alternatively, GPS technology may be used for these purposes.

[0812] As shown in FIG. 5, the gaming system includes a plurality of gaming communication devices 54, 55, and 56. Device 54 is located outside the gaming jurisdiction 58. Devices 55 and 56 are both located inside gaming jurisdiction 58. However only device 56 is located within geo-fence 57, which is established by the coverage areas of a plurality of base station 53. Thus, geo-fencing may be used to enable gaming via device 56 but disable gaming via devices 54 and 55. Even though some gaming communication devices that are within the gaming jurisdiction 58, such as device 55, are not permitted access to the gaming system, the geo-fence 57 ensures that no gaming communication devices outside jurisdiction 58, such as device 54, are permitted access.

[0813] Geo-fencing may not specify location. Rather, it may ensure that a mobile station is within certain boundaries. For instance, geo-fencing may be used to ensure that a mobile station beyond state lines does not access the gaming system. Triangulation on the other hand may specify a pinpoint, or near-pinpoint, location. For example, as shown in FIG. 5, device 56 is triangulated between [illegible]

Petitioner Exhibit 1002-2505

stations 53 to determine the location of device 56. Triangulation may be used to identify whether a device, such as a mobile station, is located in a specific spot where gambling is unauthorized (such as, for example, a school). Preferably, the location determination technology utilized in conjunction with the present invention meets the Federal Communication Commission's (FCC's) Phase 2 E911 requirements. Geological Institute Survey (GIS) mapping may also be utilized to compare identified coordinates of a gaming communication device with GIS map features or elements to determine whether a device is in an area not authorized for gaming. It should be noted that any type of location verification may be used such as triangulation, geo-fencing, global positioning satellite (GPS) technology, or any other type of location determining technology, which can be used to ensure, or provide an acceptable level of confidence, that the user is within an approved gaming area.

[0814] In various embodiments, location verification is accomplished using channel address checking or location verification using some other identifying number or piece of information indicative of which network or portion of a network is being accessed by the gaming communication device. Assuming the usage of an identifying number for this purpose, then according to one method of location checking, as an example, a participant accesses the gaming system via a mobile telephone. The identifying number of the mobile telephone, or of the network component being accessed by the mobile telephone, identifies the caller's connection to the mobile network. The number is indicative of the fact that the caller is in a defined area and is on a certain mobile network. A server application may be resident on the mobile telephone to communicate this information via the network to the gaming service provider. In a some embodiments, the identifying number or information is passed from a first network provider to a second network provider. For example, a caller's home network may be that provided by the second provider, but the caller is roaming on a network (and in a jurisdiction) provided by the first provider. The first provider passes the identifying information through to the second provider to enable the second provider to determine whether the caller is in a defined area that does or does not allow the relevant gaming activity. In various embodiments, the gaming service provider either maintains, or has access to, a database that maps the various possible worldwide mobile network identifying numbers to geographic areas. Various embodiments contemplate using any number or proxy that indicates a network, portion of a network, or network component, which is being connected with a mobile telephone. The identifying number may indicate one or more of a base station or group of base stations, a line, a channel, a trunk, a switch, a router, a repeater, etc.

[0815] In various embodiments, when the user connects his mobile telephone to the gaming server, the gaming server draws the network identifying information and communicates that information to the gaming service provider. The software resident on the gaming communication device may incorporate functionality that will, upon login or access by the user, determine the user's location (based at least in part on the identifying information) and send a message to the gaming service provider. The identifying number or information used to determine location may be country-specific, state-specific, town-specific, or specific to some other definable boundaries.

[0816] In connection with any of the location determination methods, the gaming system may periodically update the location determination information. This may be done, for example, during a gaming session, at pre-defined time intervals to ensure that movement of the gaming communication device to an unauthorized area is detected during play, and not just upon login or initial access.

[0817] Thus, depending on the location determination technology being used, the

Petitioner Exhibit 1002-2506

decision whether to permit or prohibit a gaming activity may be made at the gaming communication device, at the gaming server, or at any of the components of the telecommunication network being used to transmit information between the gaming communication device and the gaming server (such as at a base station, for example).

[0818] An aspect of the private wireless network related to preventing gaming in unauthorized areas is the placement of sensors, such as Radio Frequency Identification (RFID) sensors on the gaming communication devices. The sensors trigger alarms if users take the devices outside the approved gaming areas. Further, the devices may be "tethered" to immovable objects. Users might simply log in to such devices using their ID and password.

[0819] In various embodiments, a gaming system may include the ability to determine the location of the gaming communication device within a larger property, such as a casino complex. This may allow certain functionalities of the device to be enabled or disabled based upon the location of the device within the property. For example, government regulations may prohibit using the device to gamble from the guest rooms of a casino complex. Therefore, particular embodiments may include the ability to determine the location of the device within the property and then disable the gambling functionality of the device from a guest room, or other area where gambling is prohibited. FIG. 6 illustrates an example of a wireless gaming system in which the location of a gaming communication device 604 may be determined in accordance various embodiments.

[0820] As shown in FIG. 6, a wireless gaming system comprises a wireless network that at least partially covers casino complex 600 in which one or more gaming communication devices 604 may be used to participate in a variety of gaming activities. The wireless network may comprise at least three signal detection devices 602, although various embodiments may include fewer or greater than three signal detection. As shown in FIG. 6, the wireless network comprises four signal detection devices 602, each located at one corner of casino complex 600. In various embodiments, these signal detection devices may comprise wireless access points, wireless routers, wireless base stations, satellites, or any other suitable signal detection device. Furthermore, although signal detection devices 602 are illustrated as being located on the boundaries of casino complex 600, signal detection devices may be located anywhere inside or outside of casino complex 600, provided the signal detection devices are operable to receive signals originating from a gaming communication device 604 inside casino complex 600. In various embodiments, signal detection devices 602 may also be used to transmit, as well as receive, signals to gaming communication device 604.

[0821] In various embodiments, casino complex 600 may be divided into one or more zones 608, which represent different areas of the casino complex, such as the lobby, guest rooms, restaurants, shops, entertainment venues, and pool areas. For example, as shown in FIG. 6, zone 608a may correspond to the casino lobby, zone 608b may correspond to guest rooms, zone 608c may correspond to restaurants, and zone 608d may correspond to the gaming floor of the casino. Each zone 608 may be further divided into one or more sub-zones 606, each specifying a particular location within zone 608. Sub-zones 606 may be arranged in a grid formation, each sub-zone 606 having a uniform size. In some embodiments, each sub-zone may comprise 9 square feet (i.e., 3 feet by 3 feet). In some embodiments, each sub-zone may comprise 100 square feet (i.e., 10 feet by 10 feet). The choice of the size of an area covered by a sub-zone may depend on administrator preferences, technical limitations of the wireless network, and governmental regulations, as well as other considerations.

Petitioner Exhibit 1002-2507

[0822] Particular embodiments may use this mapping of casino complex 600 into a plurality of zones 608 and sub-zones 606 to determine the location of gaming communication device 604 within the complex. These embodiments may utilize the signal received by signal detection devices 602 from gaming communication device 604 to determine the location of the device.

[0823] In various embodiments, the location of gaming communication device 604 may be determined based upon the strength of the signal received by each signal detection device 602 from device 604. In various embodiments, this may be accomplished using a Received Signal Strength Indication (RSSI) value or any other suitable indication of signal strength. Generally, the closer a sub-zone is to a signal detection device, the stronger the signal the signal detection device will receive from a gaming communication device located in that sub-zone. Therefore, given a plurality of signal strength readings taken from different points in the casino complex (i.e., signal detection devices 602), these different signal strength readings may be used to determine the location of the device.

[0824] With this in mind, each sub-zone 606 of casino complex 600 may be associated with a reference set of signal strengths received by the signal detection devices from a device located in that particular sub-zone. Typically, these values are generated, and periodically recalibrated, by taking a reference reading from a gaming communication device located that sub-zone. After each sub-zone is associated with a reference set of signal strengths, these reference signal strengths may be compared with the signal strengths received by the signal detection devices from a gaming communication device. Since each sub-zone has a unique set of signal strengths, this comparison may be used to identify the particular zone in which the gaming communication device is located.

[0825] In various embodiments, the location of gaming communication device 604 may be determined based upon an elapsed time between the transmission of the signal from device 604 and the receipt of the signal by each signal detection device 602. In various embodiments, this elapsed time may be determined based on a Time Difference of Arrival (TDOA), or any other suitable technology. As before in the case of signal strengths, each sub-zone 606may be associated with a predetermined, or reference, set of elapsed times from transmission to receipt of a signal from a gaming communication device. This set of elapsed times will be different for each sub-zone of the casino complex, as the time it takes a signal to reach each signal detection device will depend on the proximity of the sub-zone to each base station. By comparing the time from transmission to receipt of a signal received by the signal detection devices from a gaming communication device, the sub-zone in which the device is located may be determined.

[0826] Once the location of the gaming communication device has been determined, particular embodiments may then enable and/or disable particular functions of the device based on this determination. For example, as mentioned previously, particular embodiments may disable the gaming communication device's gambling functionality from a user's guest room, while still allowing the user to use other device functions, such as purchasing merchandise or services, or buying tickets to an entertainment event. Once the user leaves his or her guest room, the gambling functionality of the gaming communication device may be enabled. Similarly, particular embodiments may prevent the gaming communication device from being used to make financial transactions from the casino floor. Once the user leaves the casino floor, such functionality may be enabled. Similarly, other functionalities of the gaming

Petitioner Exhibit 1002-2508

communication device may be enabled or disabled based upon the location of the device within the property in accordance with various embodiments.

[0827] In various embdoiments, the various functionalities of the gaming communication device may be enabled or disabled based upon the zone 608 in which the device is located. In such embodiments, each zone 608 of the casino complex may be associated with a set of allowed activities. For example, the "lobby" zone 608a of the casino complex may have all activities allowed, while the "guest room" zone 608b of the property may have all activities allowed except gambling. Based upon the gaming communication device's location, the functionality of the gaming communication device may be limited to the set of allowed activities for the zone in which the device is located. As the gaming communication device travels from zone to zone, the location of the device may be re-determined, and the functionality of the device may be updated to reflect the set of allowed activities for the zone in which the device is now located.

[0828] Various embodiments may also use the location determination to send location-specific information to the gaming communication device. For example, a reminder that an entertainment event to which the user has tickets is about to begin may be sent to the user's device if the device (and therefore the user) is located in a different part of the casino complex. In another embodiment, a user may be alerted that the user's favorite dealer is on the casino floor if the user is located in his or her guest room.

[0829] In various embodiments, the location of the gaming communication device may be used to deliver goods and services purchased or ordered by the user of the device. For example, in various embodiments, the user may purchase food and beverages using the device. The location of the device may then be used to deliver the food and beverages to the user, even if the user relocates to another sub-zone after placing his or her order.

[0830] The determination of the gaming communication device's location may also be used to provide the user with directions to another part of the casino complex. For example, a user that is located on the casino floor that wishes to go to a specific restaurant within the complex may be given direction based upon his or her location. These directions may then be updated as the user progresses towards his or her desired location. In the event the user gets off-course, the location determination, which may be updated during the user's travel, may be used to alert the user that he/she has gotten off-course and then plot a new course to the desired destination.

[0831] It should be understood that the foregoing descriptions encompass but some of the implementation technologies that may be used, according to various embodiments. Other technologies may be used and are contemplated, according to various embodiments. Various embodiments may be performed using any suitable technology, either a technology currently existing or a technology which has yet to be developed.

User Profiles

[0832] According to various embodiments, the wireless gaming system can incorporate a user profile element. One or more user profiles may be created, maintained, and modified, for example, on one or more of the servers of the gaming system. Generally, the user profiles include information relating to respective users. The information may be maintained in one or more databases. The information may be accessible to the gaming server and/or to one or more mobile devices. The devices which may access the information may, according to certain embodiments, include gaming devices.

Petitioner Exhibit 1002-2509

gaming management devices. Gaming management devices may include wireless devices used by casino staff to provide gaming services or gaming management services.

[0833] Various embodiments include software and/or hardware to enable the provision, modification, and maintenance of one or more user profiles. Thus, one or more user profiles may each comprise a set of data maintained in a data storage device. The data set(s) for each respective user profile may reflect any of a number of parameters or pieces of information, which relate to the particular user(s) corresponding to the profile(s). Although not intended to be exhaustive, such information may include, for example, gaming activity preferences, such as preferred game and/or game configuration, preferred screen configuration, betting preferences, gaming location preferences, dining and other service preferences, and so forth. The information may also include user identity information, such as name, home address, hotel name and room number, telephone numbers, social security numbers, user codes, and electronic files of fingerprint, voice, photograph, retina scan, or other biometric information. User profile information may also include information relating to the user, but not determined by the user or the user's activities. Such information may include any information associated with, or made part of, a profile. For example, an entity such as a casino, may include as part of a profile certain rules governing the distribution of promotions or offers to the user. User profile information can include any codes, account numbers, credit information, approvals, interfaces, applications, or any other information which may be associated with a user. Thus, user profile information may include any information that is particular to a given user. For example, profile information may include the location(s) at which a particular user has played, skill levels, success levels, types of games played, and betting styles, and trends of information relating to the user's activities.

[0834] In various embodiments, user profile information may include concierge or other service information that is associated with a user. Concierge services may include restaurant services, entertainment services, hotel services, money management services, or other appropriate services that may be offered to the user of a gaming device. For example, restaurant services may include, without limitation, services that allow the user to order drinks, order food, make reservations, or perform other restaurant related activities. As another example, entertainment services may include, without limitation, services that allow the user to purchase show tickets, arrange appointments or services, virtually shop, arrange transportation, or perform other entertainment related activities. Hotel services may include, for example, services that allow the user to check in, check out, make spa appointments, check messages, leave messages, review a hotel bill, or perform other guest-related activities. Money management services may include, for example, services that allow the user to transfer funds, pay bills, or perform other money management activities.

[0835] The gaming system may be configured to establish a new profile for any user who is using a gaming device for the first time. Alternatively, a new profile may be established for a prior user who has not played for a predetermined time period. The gaming system may set up the profile, monitor user activities, adjust the profile, and adjust information (such as graphics) displayed to the user. The gaming system may be configured to use the profile information to alter the presentation of gaming information to the user. For example, if a prior user has returned to the gaming system, the system may consult the profile for the user and determine that in the prior session of gaming the user lost money on craps but won money on blackjack. Based on this information, the system may adjust the default gaming screen and present a blackjack table for the user. As a further example, the profile information may indicate that the player typically

user's prior blackjack time was spent on $25 minimum tables. The system may, accordingly, make a further adjustment to the gaming environment and make the blackjack table being presented a $25 table. In this sense, the gaming system enables personalized wireless gaming based on one or more criteria maintained in a user profile.

[0836] The user profiles may be established, maintained, and periodically updated as necessary to enable a gaming provider to provide an enhanced, current, and/or customized gaming experience. Updates may be undertaken based on any suitable trigger, such as the occurrence of an event, the occurrence of a user activity, or the passage of a certain predetermined time period. Any or all of the profile information may be updated.

Alerts

[0837] In some embodiments, the gaming system may be configured to initiate one or more alerts to one or more users based on any number of criteria. For instance, an alert may be based on the location of a user. The system may also be configured to keep track of other non-location dependent parameters. The initiation of an alert may depend on a time parameter. Gaming alerts can also be based on this and/or other information maintained in a user profile. Alerts can be prioritized for presentation and the content and display of the alerts may be customized by the user or another entity. As a related concept, the system may be configured to provide directions and/or maps. Another related concept involves enabling a user to view a certain activity or area remotely. The alert may be generated in response to the existence of data within a user profile. Additionally, the content and presentation of the alert may be determined based on information in the user profile. Thus, when the alerts occur and what the alerts indicate may be customized or tailored according to user preferences (or any other information maintained about the user (e.g., in a user profile).

[0838] In some embodiments, an alert may be presented or displayed to the user in a format determined, at least in part, by any of the parameters described or contemplated herein. For example, if the user is located outdoors, the display may be automatically brightened in order to allow the user to more easily view the alert. The alert may be presented in any one or a combination of textual, visual, oral, or other information exchange formats. Alerts presented to users on the screen of a gaming communication device, for example, may be configured in any desirable manner. Preferably, the information is displayed in a way as to most effectively utilize the screen real estate to convey the alert message. Thus, different alerts of differing types, or having differing priorities, can be displayed differently on the gaming device. For example, a more important alert can be displayed as a popup while secondary alerts scroll at the bottom of the screen. The player can register for alerts and determine his own particular alert configuration preferences.

[0839] According to some embodiments, directional information may be provided to one or more users. The directional information may be associated with an alert. The directional information may be based on any of the parameters described herein (e.g., profiles, alerts, locations, changes in play or other activities, etc). Directions may be given to activities, locations, seats, tables, recreational spots, restaurants, change cages, information booths, casinos, hotels, sports venues, theaters, etc. For example directions may be given to a particular table or gaming area, a casino other than the one where the user is presently located or where another user is located, a restaurant that is specified in a user profile, a sports book area of a casino, a hotel room, etc.

Petitioner Exhibit 1002-2511

[0840] The directions can be presented orally, textually, and/or graphically (e.g., as map with zoom capabilities). An example of how directions would be provided involves a user profile indicating that the user likes to play high-limit blackjack on Saturday nights, but that the user does not have a particular casino preference. If the user enters any casino for which the system is operable, the system provides the user with an alert inviting the player to the high-limit blackjack tables and directional information in the form of a visual route. Another example involves a user leaving a sports book in a casino and the user has indicated that he wants to play craps. The device gives walking directions to the craps tables. Another example involves a user that has a preferred list of dinner restaurants. At a predetermined time (e.g., 8:00 pm), the system presents the user with the list, lets the user make a selection and a reservation. The system then provides the user with verbal directions from the user's current location to the selected restaurant. The system may also be configured to provide ancillary information based, at least in part, on the alert, the profile, or the directional information being provided. For example, the system may notify a user that the user will need a cab, or will need to take the tram, or will need a jacket and tie, or will need an umbrella, etc. depending on where the user is going and the route he is taking.

[0841] According to various embodiments, the system enables a user to view a certain activity or area remotely. For example, cameras (or other viewing devices) may be disposed throughout a casino property (or other relevant area). At kiosks, or on the wireless gaming devices, users can "peek" into one or more selected areas to see the activity in the selected area(s). For example, from the pool, a user can tell if the craps tables have changed limits or are filling up with people. From the craps table, a user can see if the restaurant or bar is becoming crowded.

[0842] According to various embodiments, the operation of the alerts module and the alerts methods are integrated with various techniques for managing user profile information. An example of this aspect is that the system may be configured to recognize that a user has certain preferred dealers or stickmen when playing certain casino games. When those dealers or stickmen are on duty, and if the user is located in a certain area, or within a certain distance, an alert may be sent inviting the user to participate in the gaming activity at the particular table where the dealer or stickman is on duty.

[0843] Thus, when user profile information indicates that a one or more predetermined criteria are met, the system may send an alert to the corresponding user or to another user. For example, the system may "learn" that a player is a fan of certain sports teams. The system monitors information about upcoming events that involve those teams and, at a predetermined time, checks to see if the user has placed a bet on the event(s). If not, the system invites the user to visit a sports book to make a bet. As another example, the system knows a user prefers $10 minimum tables and alerts the user to the opening of a seat at such a table. As another example, the alerts can be triggered by information which is not directly related to or associated with the particular user (e.g., non-user specific information). For instance an alert might be triggered by a certain time or the occurrence of a certain event (e.g., the odds given on a certain sports event changing by a certain predetermined amount).

Service Applications

[0844] According to various embodiments, gaming services may be provided as an application add-on to a pre-existing communication or data service. Thus, gaming service applications may be made available to customers of a pre-existing communication or data service. For example, customers of a particular wireless

Petitioner Exhibit 1002-2512

telephone or data service may be offered any one or combination of the various gaming service applications discussed herein as an additional feature that is bundled with the telephone or data service. Although this document may refer to the communication service bundled with offered gaming service applications as including pre-existing communication services, it is recognized that the gaming services applications may be offered and accepted as part of a package with newly-activated communications service plan. In still other embodiments, the gaming service may be established first and the communication service may be added later.

[0845] The gaming service applications bundled with, or otherwise offered in conjunction with communication services, may be customized to meet the needs of the customers, service providers, or both. For example, a service provider may elect to make certain gaming service applications available to only a subset of the service providers' customers. Accordingly, not all customers associated with a service provider may be offered gaming services. As an another example of customized gaming service applications, a communication service may offer customers a number of gaming service plans which may provide different levels of service. For example, certain services such as advertisement services and/or promotional services may be free to customers of the communications service. Such levels of service may be customer-selected, service provider-selected, or both.

[0846] Customers may be billed separately for add-on gaming services, or in conjunction with the invoice the customer already receives for the pre-existing communications service. For instance, in certain embodiments, gaming services may be billed as an add-on in the same way that Caller ID services, call waiting services, and call messaging services result in fees that are in addition to the basic fees associated with communication services.

Peer-To-Peer Wireless Gaming

[0847] According to various embodiments, gaming services enable peer-to-peer wireless gaming. Specifically, the system may enable multiple players to participate in the same gaming activity at the same time from dispersed locations. This may be particularly desirable in the case of certain games such as, but without limitation, horse racing, poker, and blackjack. The system may also enable a single player to participate in multiple positions with respect to a particular game. For example, a user may be permitted to play multiple hands of blackjack. Particular aspects include such features as providing assistance to a user in finding a particular activity. For example, a first player may want to play poker at a six-person table. The gaming system may be used to identify such a poker table that has a position available for the first user's participation. Additionally or alternatively, a first player might want to play poker at the same table as a second player, and the system may be configured to assist the first player in finding a game in which the second player is already participating.

[0848] Location determination techniques may be incorporated to enable peer-to-peer gaming or related services. For example, a "buddy network" may be established to track members of a selected group. For example, a group of friends might all be in a gambling jurisdiction but be located at various dispersed places within that jurisdiction. The gaming system allows the establishment of a private buddy network of peers for this group of friends. The system enables one or more members of the group to track one or more other members of the group. In various embodiments, the system may also allow messages from and to one or more group members. For example, the system also allows members to invite other members to participate in certain wireless gaming activities. Additionally or alternatively, the system may allow members to

Petitioner Exhibit 1002-2513

group to bet on the performance of another member of the group who is participating in a virtual or actual game.

[0849] Location determination techniques may also be incorporate to establish an "alert system." The alert system may be used to invite certain types of players to participate in a gaming activity. Criteria may then be used to identify users of gaming devices that meet the criteria. For example, a gaming participant may wish to initiate a gaming activity with other users of gaming devices that qualify as "high rollers" or "high stakes gamers." As other examples, a celebrity user may wish to initiate a gaming activity with other celebrities, or a senior citizen may wish to initiate a gaming activity with other senior citizens. In each instance, the user may identify criteria that may then be used to identify other gaming participants that meet these criteria for the initiation of a peer-to-peer gaming event.

[0850] It should be understood that the foregoing descriptions encompass but some of the implementation technologies that may be used, according to various embodiments. Other technologies may be used and are contemplated, according to various embodiments. Various embodiments may be performed using any suitable technology, either a technology currently existing or a technology which has yet to be developed.

Gaming and Wireless System

[0851] Various embodiments include a gaming system including hand-held personal gaming devices. The gaming system is adapted to present one or more games to a user of one of the hand-held gaming devices.

[0852] In various embodiments, the gaming system includes a portable gaming device or interface. The portable gaming device has a display for displaying game information to a player, at least one input device for receiving input from the player and is capable of receiving and sending information to a remote device/location. The gaming system also includes a game server for generating game data, transmitting game data to the portable gaming device and receiving information, such as player input, from the portable gaming device. The gaming system further includes a payment transaction server for validating payment and establishing entitlement of a player to play a game via the portable gaming device as provided by the game server.

[0853] In various embodiments, the gaming system includes one or more stationary gaming machines or other devices capable of printing tickets having a value associated therewith. The portable gaming device includes a ticket reader for reading ticket information for use by the payment transaction server in verifying the associated value for permitting the player to play the game.

[0854] In one or more embodiments, the portable gaming devices communicate with other devices (such as the game server) via a wireless communication channel. Appropriate relays and transceivers are provided for permitting the wireless communication.

[0855] In one or more embodiments, the portable gaming device includes a plurality of interfaces for changing the configuration of the gaming device or interacting with one or more transaction servers. In some embodiments, a login interface is provided for receiving login information regarding a user of the device. In various embodiments, the number of interfaces or other functions or features displayed or permitted to be accessed are configured depending upon the user of the device. In the event a gaming representative identifies himself, interfaces permitting access to [illegible]

Petitioner Exhibit 1002-2514

functions may be provided. In the event a player identifies themselves, such control functions may not be accessible, but instead only consumer-related functions may be accessible such as game play.

[0856] In one or more embodiments the gaming system includes one or more transaction servers, such as a food transaction server. Using an interface of the portable gaming device a player or other user may request services from the food transaction server. For example, a player may request food, drink, a restaurant reservation or other service.

[0857] One or more embodiments comprise a method of playing a game via a portable gaming device associated with a gaming network. In some embodiments, a player obtains a portable gaming device, such as by checking out the device from the hostess station of a restaurant or the front desk of a hotel/casino. The player provides value to the gaming operator, such as a credit card or cash deposit. This value is associated with the server and matched with a ticket number, player tracking number or other identifier.

[0858] The game device is configured for player play using the login interface. The act of logging in may be performed by the player or the gaming operator. The player next establishes entitlement to obtain services, such as the playing of a game, by showing the existence of value. In some embodiments, the player scans his ticket using the ticket reader of the device. The scanned information is transmitted to the payment transaction server for verifying entitlement of the player to play a game or obtain other services. In the event the entitlement is verified, then the player is permitted to engage in the play of a game or request service.

[0859] In the event a player wishes to play a game, the player indicates such by selecting a particular game using a game play interface. Upon receipt of such an instruction, the game server generates game data and transmits it to the personal gaming device. The transmitted data may comprise sound and video data for use by the personal gaming device in presenting the game. The player is allowed to participate in the game by providing input to the game server through the personal gaming device. The game server determines if the outcome of the game is a winning or losing outcome. If the outcome is a winning outcome, an award may be given. This award may be cash value which is associated with the player's account at the payment transaction server. If the outcome is a losing outcome, then a bet or wager placed by the player may be lost, and that amount deducted from the player's account at the transaction server.

[0860] FIG. 8 is a block diagram of a gaming system in accordance with various embodiments.

[0861] As illustrated, the gaming system B20 includes a plurality of gaming machines B22a, B22b, B22c, B22d, B22e, B22f, B22g, B22h, B22i, B22j. In some embodiments, these gaming machines B22a, B22b, B22c, B22d, B22e, B22f, B22g, B22h, B22i, B22j are of the stationary type. In general, the gaming machines B22a, B22b, B22c, B22d, B22e, B22f, B22g, B22h, B22i, B22j are arranged to present one or more games to a player. In various embodiments, the games are of the type requiring the placement of a wager or bet and are of the type by which a player receiving a winning outcome is provided an award, such as a monetary award. These devices may comprise for example, video poker and slot machines. In addition, the gaming system B20 includes one or more hand-held, portable gaming devices (PGDs) B24. The PGD B24 is also arranged to present one or more games to a player, and as described herein, may be

Petitioner Exhibit 1002-2515

used as an access point for a variety of other services. The device referred to herein as a "personal gaming device" may be referred to by other terminology, such as a portable gaming interface, personal game unit or the like, but regardless of the name of the device, such may have one or more of the characteristics herein.

[0862] In addition, in various embodiments, the PGD B24 is in communication with at least one gaming server B28. As described below, in various embodiments, the one or more games which are presented via the PGD B24 to the player are provided by the gaming server B28.

[0863] The gaming machines B22a, B22b, B22c, B22d, B22e, B22f, B22g, B22h, B22i, B22j and each PGD B24 is in communication with a payment system referred to herein as the "EZ-Pay" system. This system includes a server B26 for receiving and transmitting information. In general, the EZ Pay system is utilized to accept payment from a player for the playing of games and obtaining of other goods and services, and for paying a player winnings or awards.

[0864] In the embodiments illustrated, the gaming system B20 includes other servers B30, B32 for transmitting and/or receiving other information. In some embodiments, one server B30 comprises a prize transaction server. Another server B32 comprises a food transaction server. In a some embodiments, information may be transmitted between the PGD B24 and these servers B30, B32.

[0865] The EZ Pay system, according to various embodiments, will now be described in more detail with reference to FIG. 9. The EZ Pay system may constitute an award ticket system which allows award ticket vouchers to be dispensed in lieu of the traditional coin awards or reimbursements when a player wins a game or wishes to cash out. These tickets may also be used by gaming machines and other devices for providing value, such as for payment of goods or services including as a bet or ante for playing a game.

[0866] FIG. 9 illustrates some embodiments of such a system in block diagram form. As illustrated, a first group of gaming machines B22a, B22b, B22c, B22d, and B22e is shown connected to a first clerk validation terminal (CVT) B34 and a second group of gaming machines B22f, B22g, B22h, B22i, and B22j is shown connected to a second CVT B36. All of the gaming machines print ticket vouchers which may be exchanged for cash or accepted as credit or indicia in other gaming machines. When the CVTs B34,B36 are not connected to one another, a ticket voucher printed from one gaming machine may only be used as indicia of credit in another gaming machine which is in a group of gaming machines connected to the same CVT. For example an award ticket printed from gaming machine B22a might be used as credit of indicia in gaming machines B22b, B22c, B22d, and B22e, which are connected to the common CVT B34, but may not be used in gaming machines B22f, B22g, B22h, B22i, and B22j since they are each connected to the CVT B36.

[0867] The CVTs B34,B36 store ticket voucher information corresponding to the outstanding ticket vouchers that are waiting for redemption. This information is used when the tickets are validated and cashed out. The CVTs B34,B36 store the information for the ticket vouchers printed by the gaming machines connected to the CVT. For example, CVT B34 stores ticket voucher information for ticket vouchers printed by gaming machines B22a, B22b, B22c, B22d, and B22e. When a player wishes to cash out a ticket voucher and the CVTs B34,B36 are not connected to one another, the player may redeem a voucher printed from a particular gaming machine at the CVT associated with the gaming machine. To cash out the ticket voucher, the player

Petitioner Exhibit 1002-2516

voucher is validated by comparing information obtained from the ticket with information stored with the CVT. After a ticket voucher has been cashed out, the CVT marks the ticket as paid in a database to prevent a ticket voucher with similar information from being cashed multiple times.

[0868] Multiple groups of gaming machines connected to the CVTs B34,B36 may be connected together in a cross validation network B38. The cross validation network typically comprises one or more concentrators B40 which accept input from two or more CVTs and enables communications to and from the two or more CVTs using one communication line. The concentrator B40 is connected to a front end controller B42 which may poll the CVTs B34,B36 for ticket voucher information. The front end controller B42 is connected to an EZ pay server B26 which may provide a variety of information services for the award ticket system including accounting B44 and administration B46.

[0869] The cross validation network allows ticket vouchers generated by any gaming machine connected to the cross validation network to be accepted by other gaming machines in the cross validation network B38. Additional, the cross validation network allows a cashier at a cashier station B48, B50, B52 to validate any ticket voucher generated from a gaming machine within the cross validation network B38. To cash out a ticket voucher, a player may present a ticket voucher at one of the cashier stations B48, B50, B52. Information obtained from the ticket voucher is used to validate the ticket by comparing information on the ticket with information stored on one of the CVTs B34,B36 connected to the cross validation network B38. As tickets are validated, this information may be sent to another computer B54 providing audit services.

[0870] As described above, the gaming system B20 may also include one or more hand-held PGDs B24. In various embodiments, the PGD B24 is a portable device capable of transmitting and receiving information via a wireless communication link/network.

[0871] Referring again to FIG. 8, the gaming system B20 may include a printer B56, wireless communication relays B58 and B60, and wireless transceivers B62, B64, B66 and B68 connected to the remote transaction servers B26, B28, B30 and B32. In various embodiments, a player may obtain the PGD B24, and after being provided with the appropriate authority, may play one or more games and/or obtain other services including food services or accommodation services.

[0872] FIG. 10 illustrates the PGD B24 and a block diagram of a game and service system which may be implemented by the gaming system B20 illustrated in FIG. 8. In various embodiments, the game and service system B100 is comprised of at least one PGD B24 and a number of input and output devices. The PGD B24 is generally comprised of a display screen B102 which may display a number of game service interfaces B106. These game service interfaces B106 are generated on the display screen B102 by a microprocessor of some type (not shown) within the PGD B24. Examples of a hand-held PGD B24 which may accommodate the game service interfaces B106 shown in FIG. 10 are manufactured by Symbol Technologies, Incorporated of Holtsville, N.Y. The interface or menu data may be stored in a local memory, or the data may be transmitted to the PGD B24 from a remote location (such as a data server). This reduces the memory requirement of the device.

[0873] The game service interfaces B106 may be used to provide a variety of game service transactions and gaming operations services, including the presentation for play by a user of one or more games. The game service interfaces B106, including the

Petitioner Exhibit 1002-2517

login interface B105, an input/output interface B108, a transaction reconciliation interface B110, a ticket validation interface B115, a prize services interface B120, a food services interface B125, an accommodation services interface B130, a gaming operations interface B135, and a game play interface B137 may be accessed via a main menu with a number of sub-menus that allow a game service representative or player to access the different display screens relating to the particular interface.

[0874] In one or more embodiments, some or all of the interfaces may be available to a user of the PGD B24. For example, in one or more embodiments, the PGD B24 may have a dual purpose of both being usable by a player to play games and engage in other activities, and also be used by gaming operations personnel for use in providing services to players and performing administrative functions. In various embodiments, certain PGDs B24 may be specially configured for use only by players, and other PGDs B24 may be specially configured for use only by gaming or other personnel. In such event, the interfaces B106 may be custom programmed.

[0875] In one or more embodiments, only certain interfaces B106 may be displayed, depending on the status of the user of the PGD B24. In some embodiments, the particular interfaces B106 which are displayed and thus accessible for use are determined by the status of the user as indicated through a login function. In various embodiment, when the PGD B24 is operable (such as when a power button is activated) the default status for the PGD B24 is the display of the login interface B105. Once a user of the PGD B24 has logged in, then the status of the PGD display is changed.

[0876] In one or more embodiments, the login interface B105 may allow a game service representative to enter a user identification of some type and verify the user identification with a password. When the display screen B102 is a touch screen, the user may enter the user/operator identification information on a display screen comprising the login interface B105 using an input stylus B103 and/or using one or more input buttons B104. Using a menu on the display screen of the login interface, the user may select other display screens relating to the login and registration process. For example, another display screen obtained via a menu on a display screen in the login interface may allow the PGD B24 to scan a finger print of the game service representative for identification purposes or scan the finger print of a game player.

[0877] In the event a user identifies themselves as a gaming operator or representative, then the PGD B24 may be arranged to display one or more other interfaces such as those listed above and described in detail below. In one or more embodiments, the default status or login may be a "player" mode login.

[0878] In various embodiments, the login interface B105 may allow a player to identify themselves to configure the PGD B24 to permit the player to access a plurality of player services, such as playing games and the like. In various embodiments, the login interface B105 includes a request that the user identify themselves as a "player" or "authorized personnel." In the event "authorized personnel" is selected, then the above-referenced user identification (including password) may be requested. If "player" is selected, then in various embodiments the player is requested to provide an EZ pay ticket. As described in more detail below, in various embodiments, a player who wishes to play one or more games or obtain other goods or services uses an EZ pay ticket to provide the credit or payment therefor. The ticket may be obtained from a cashier or by play of another gaming device (such as devices B22a, B22b, B22c, B22d, B22e, B22f, B22g, B22h, B22i, B22j in FIG. 8). The ticket may be verified through the EZ pay system described above.

Petitioner Exhibit 1002-2518

[0879] In various embodiments, the PGD B24 includes a ticket reader B145 and a card reader B140. In some embodiments, the ticket reader B145 may be of a variety of types. In some embodiments, the reader comprises a bar-code reading optical scanner. In this arrangement, a user of the PGD B24 may simply pass the bar-coded ticket in front of the bar-code reader. In some embodiments, the card reader B140 comprises a magnetic-stripe card type reader for reading information associated with a magnetic stripe of a card, such as a player tracking card.

[0880] After having provided the appropriate authorization, access may be provided to the user of the PGD B24 of one or more of the following interfaces B106.

[0881] In one or more embodiments, an authorized user may be provided with access to the input/output interface B108. In a various embodiments, such access is only provided to a game service operator and not a player. In one or more embodiments, the input/output interface B108 permits a user to select, from a list of devices stored in memory on the PGD B24, a device from which the PGD may input game service transaction information or output game service transaction information. For example, the PGD B24 may communicate with the ticket reader B145. As another example, the PGD B24 may input information from the card reader B140. Such input may be useful, for example, if a game service operator wishes to verify the authenticity of a player tracking card or the like.

[0882] The PGD B24 may output game and service transaction information to a number of devices. For example, to print a receipt, the PGD B24 may output information to a printer B150. In this game service transaction, the PGD B24 may send a print request to the printer B150 and receive a print reply from the printer B150. The printer B150 may be a large device at some fixed location or a portable device carried by the game service representative. As another example, the output device may be the card reader B140 that is able to store information on a magnetic card or smart card. Other devices which may accept input or output from the PGD B24 are personal digital assistants, microphones, keyboard, storage devices, gaming machines and remote transaction servers.

[0883] The PGD B24 may communicate with the various input mechanisms and output mechanisms using both wire and wire-less communication interfaces. For example, the PGD B24 may be connected to the printer B150 by a wire connection of some type. However, the PGD B24 may communicate with a remote transaction server B160 via a wire-less communication interface including a spread spectrum cellular network communication interface. An example of a spread spectrum cellular network communication interface is Spectrum 24 offered by Symbol Technologies of Holtsville, N.Y., which operates between about 2.4 and 2.5 Gigahertz. The information communicated using the wire-less communication interfaces may be encrypted to provide security for certain game service transactions such as validating a ticket for a cash pay out. Some devices may accommodate multiple communication interfaces. Such a spread spectrum network is but one possible communication scheme.

[0884] Another type of interface that may be stored on the PGD B24 is the award ticket validation interface B115. In some embodiments, this interface is only available to an authorized game service representative, and not a player. Some embodiments of the award ticket interface B115 may accommodate the EZ pay ticket voucher system and validate EZ pay tickets as previously described. However, when other ticket voucher systems are utilized, the award ticket validation interface B115 may be designed to interface with the other ticket voucher systems. Using the award ticket validation

Petitioner Exhibit 1002-2519

interface B115, a game service representative may read information from a ticket presented to the game service representative by a game player using the ticket reader and then validate and pay out an award indicated on the ticket.

[0885] In various embodiments, the award ticket contains game service transaction information which may be verified against information stored on a remote transaction server B160. To validate the ticket may require a number of game service transactions. For example, after obtaining game service transaction information from the award ticket, the PGD B24 may send a ticket validation request to the remote transaction server B160 using the spread spectrum communication interface and receive a ticket validation reply from the remote server B160. In particular, the validation reply and the validation request may be for an EZ pay ticket. After the award ticket has been validated, the PGD B24 may send a confirmation of the transaction to the remote server B160. Details of the game service transaction information validation process are described with the reference to FIG. 12. In various embodiments, the award ticket interface may be configured to validate award information from a smart card or some other portable information device or validate award information directly from a gaming machine.

[0886] As game and service transactions are completed, game and service transaction information may be stored on a storage device B155. The storage device B155 may be a remote storage device or a portable storage device. The storage device B155 may be used as a back-up for auditing purposes when the memory on the PGD B24 fails and may be removable from the PGD B24.

[0887] A type of game service interface that may be stored on the PGD B24 is the prize service interface B120. As an award on a gaming machine (i.e., machines B22a, B22b, B22c, B22d, B22e, B22f, B22g, B22h, B22i, B22j in FIG. 8) or while playing a game via the PGD B24, a game player may receive a ticket (such as issued by other machine) that is redeemable for merchandise including a bicycle, a computer or luggage or receive such an award directly (such as while playing the PGD B24 itself). Using the prize service interface B120, a game service representative or player may validate the prize service ticket and then check on the availability of certain prizes. For example, when the prize service ticket indicates the game player has won a bicycle, the game service representative may check whether the prize is available in a nearby prize distribution center. Alternatively, a player may be permitted to do the same thing. In some embodiments, a player may be awarded a prize of a particular level, there being one or more particular prizes on that level. In such events, the player may use the interface B120 to determine what prizes are currently available in the prize level just awarded. The PGD B24 may validate a prize ticket and check on the availability of certain prizes by communicating with a remote prize server. Further, the game service representative may have the prize shipped to a game player's home or send a request to have the prize sent to a prize distribution location. The game service transactions needed to validate the prize ticket including a prize validation request and a prize validation reply, to check on the availability of prizes and to order or ship a prize may be implemented using various display screens located within the prize interface. The different prize screens in the prize service interface B120 may be accessed using a menu located on each screen of the prize service interface. In some embodiments, the prize service interface B120 may be configured to validate prize information from a smart card or some other portable information device or validate award information directly from a gaming machine.

[0888] A type of game service interface that may be stored on the PGD B24 is the food service interface B125. As an award on a gaming machine or as [illegible]

Petitioner Exhibit 1002-2520

particular amount of game play, a game player may receive a free food or drink. Using the food service interface B125, the player may redeem the food or drink award, or a game service representative may validate such an award (for example, the award may be provided to a player of a gaming device B22a in the form of a ticket) and check on the availability of the award. For example, when the game player has received an award ticket valid for a free meal, the food service interface may be used to check on the availability of a dinner reservation and make a dinner reservation. As another example, the PGD B24 may be used to take a drink or food order by the player thereof. Such an order may be processed via the remote food server B32 (see also FIG. 8). The transactions needed to validate a food ticket or award, to check on the availability of food services, request a food service and receive a reply to the food service request may be implemented using various display screens located within the food service interface B125. These display screens may be accessed using a menu located on each screen of the food service interface. In some embodiments, the food service interface may be configured to validate food service information from a smart card or some other portable information device.

[0889] Another type of game service interface that may be stored on the PGD B24 is an accommodation service interface B130. As an award for game play or as compensation for a particular amount of game play, a game player may receive an award in the form of an accommodation service such as a room upgrade, a free night's stay or other accommodation prize. using the accommodation service interface B130, the player may check on the availability of certain accommodation prizes. For example, when the game player has received an award for a room upgrade, the accommodation service interface may be used to check on the availability of a room and to make a room reservation. Regardless of whether the player has won an accommodation award, the player may utilize the accommodation service interface B130 to reserve a room (such as an additional night's stay) or an upgrade to a room. In some embodiments, a player of a game may be issued a ticket (such as from a free-standing game device B22a, B22b, B22c, B22d, B22e, B22f, B22g, B22h, B22i, B22j in FIG. 8), and a gaming representative may use the accommodation service interface B130 in order to validate the player's award ticket and check on the availability of the award and institute the award. As another example, the PGD B24 may be used to order a taxi or some other form of transportation for a player at a gaming machine preparing to leave the game playing area. The game playing area may be a casino, a hotel, a restaurant, a bar or a store.

[0890] The PGD B24 may validate the accommodation service award and check on the availability of certain accommodation awards by communicating with a remote accommodation server. The transactions needed to validate the accommodation ticket, check on the availability of accommodation services, request an accommodation service and receive a reply to the accommodation service request may be implemented using various display screens located within the accommodation service interface. These display screens may be accessed using a menu located on each screen of the accommodation service interface. In some embodiments, the accommodation service interface may be configured to validate accommodation service information from a smart card or some other portable information device.

[0891] A type of game service interface that may be stored on the PGD B24 is a gaming operations service interface B135. Using the gaming service interface B135 on the PGD B24, a game service representative may perform a number of game service transactions relating to gaming operations. For example, when a game player has spilled a drink in the game playing area, a game service representative may send a request to maintenance to have someone clean up the accident. Using the gaming

Petitioner Exhibit 1002-2521

from maintenance regarding their request. The maintenance request and maintenance reply may be sent and received via display screens selected via a menu on the screens of the gaming operations service interface. As another example, when a game service representative observes a damaged gaming machine such as a broken light, the game service representative may send a maintenance request for the gaming machine using the PGD B24. In one or more embodiments, a player may be permitted various options through the gaming service interface B135. For example, a player may be permitted to request a gaming service representative or attendant using the interface B135.

[0892] A type of game service interface that may be stored on the PGD B24 is a transaction reconciliation interface B110. In various embodiments, the PGD B24 contains a memory storing game service transaction information. The memory may record the type and time when a particular game service transaction is performed. At certain times, the records of the game service transactions stored within the PGD B24 may be compared with records stored at an alternate location. For example, for an award ticket validation, each time an award ticket is validated and paid out, a confirmation is sent to a remote server B160. Thus, information regarding the award tickets, which were validated and paid out using the PGD B24, should agree with the information regarding transactions by the PGD stored in the remote server B160. The transaction reconciliation process involves using the transaction reconciliation interface B110 to compare this information. In various embodiments, only a gaming service representative (and not a player) is permitted access to the transaction reconciliation interface B110.

[0893] A type of game service interface that may be stored on the PGD B24 is a voice interface B138. Using the spread spectrum cellular or other communication network incorporated into the PGD, a player and/or game service representative may use the PGD B24 as a voice communication device. This voice interface B138 may be used to supplement some of the interfaces previously described. For example, when a game player spills a drink the game service representative may send maintenance request and receive a maintenance reply using the voice interface B138 on the PGD B24. As another example, when a game player requests to validate a food service such as free meal, such a request may be made by the player or a game service representative at a restaurant or other location using the voice interface B138 on the PGD B24. In some embodiments, a player may be permitted to contact a player of another PGD B24, such as by inputting a code number assigned to the PGD B24 through which communication is desired. Such would permit, for example, a husband and wife using two different PGDs B24 to communicate with one another. The voice interface B138 may also permit a player to contact the front desk of a hotel/casino, an operator of a switchboard at the gaming location or the like.

[0894] A type of game service interface that may be stored on the PGD B24 is a game play interface B137. In various embodiments, a player is permitted to access the game play interface B137 in order to select from one or more games for play. The game play interface B137 may include a menu listing one or more games which the player may play via the PGD B24. In various embodiments, game play is facilitated with the game server B28 (see FIG. 8).

[0895] In one or more embodiments, the gaming control code is not resident at the PGD B24, but instead at a secure, remote server. Referring to FIG. 8, game play data is transmitted from the game server B28 to the PGD B24, and from the PGD B24 to the game server B28. Preferably, the PGD B24 is adapted to receive and process data, such as by receiving video data and processing the data to present the information on the display B102. Likewise, the PGD B24 is arranged to accept input and transmit the

Petitioner Exhibit 1002-2522

input or instruction to the game server B28. This arrangement has the benefit that nearly all aspects of the play of a game can be monitored, as it requires the game play data to pass to or from a remote location. This avoids, for example, storage of the gaming software at the PGD B24 where it might be tampered with, copied or the like.

[0896] In one or more embodiments, each PGD B24 has a unique identifier which is utilized to identify which PGD B24 data is transmitted from and to which data is to be transmitted to. In some embodiments, the game server B28 may thus be used to present the same or different games to a plurality of players using different PGDs B24, with the game data regarding a particular game being played at a particular PGD B24 being directed to that PGD B24 using its particular identifier.

[0897] As will be appreciated by those of skill in the art, the PGD B24 may have a variety of configurations. As stated above, the PGD B24 may be used in the gaming system B20 in which gaming code is not stored directly at the PGD. In such an embodiment, the PGD B24 may have a much more limited amount of data memory. In some embodiments, the PGD B24 includes a processor for executing control code, such as that necessary to operate the display B102, accept input from the stylus B103 or input buttons B104 or the like. In addition, the PGD B24 preferably includes a buffer memory for accepting data transmitted from the game server B28. This data may comprise data for displaying game information, such as video and sound content.

[0898] Various aspects of the use of the PGD B24 described above will now be described. In one or more embodiments, the PGD B24 may be used directly by a player. In various embodiments, a player may use the PGD B24 to play one or more games, and obtain products and services, such as food.

[0899] A method of use of the PGD B24, according to some embodiments, is illustrated in FIGS. 11(a) and 11(b). In general, a player must first obtain a PGD B24. For example, a player may check out a PGD B24 from a gaming operator. The player then establishes entitlement to use the PGD B24. In some embodiments, the player must indicate player status at the login interface, and obtain a valid ticket in order to activate the PGD B24. Once activated, the player is permitted to engage in a variety of transactions using the interfaces B106, such as playing a game, redeeming prizes and awards, placing food and drink orders, placing reservations, seeking gaming operator support and seeking a variety of other goods and services as described in more detail below.

[0900] One example of a method of use of the PGD B24 by a player will be described with reference to FIG. 11(a). In a first step B400, the player first obtains the PGD B24. In some embodiments, a gaming operator may have certain locations at which a player may obtain the PGD B24, such as the front desk of a hotel/casino, the hostess stand at a restaurant, from a gaming attendant or other location as desired. In some embodiments, a gaming operator may actually permit a player to retain the PGD B24, such as by renting, selling or giving the PGD B24 away to a player.

[0901] In a step B402, the PGD B24 is activated. In some embodiments, this step includes turning on the PGD B24 (such as with a power switch) and logging in. In some embodiments, when the PGD B24 is turned on, the login interface B105 is automatically displayed. The login interface B105 may include "player" and "authorized personnel" buttons which may be activated using the stylus B103. The player may indicate "player" status by selecting the player button with the stylus B103.

[0902] In some embodiments, the gaming operator may log the player in. For example,

Petitioner Exhibit 1002-2523

when a player obtains the PGD B24 from a hostess at a restaurant, the hostess may log in the player in player mode. In some embodiments, the gaming operator may have certain PGDs B24 which are for use by players and certain others which are for use by gaming personnel. In such event, the PGDs B24 which are configured for player status may automatically be configured for player mode after being turned on.

[0903] In a step B404, a player establishes entitlement to use the PGD B24. In some embodiments, this step comprises the player providing a valid ticket which is verifiable using the EZ pay portion of the gaming system B20. In some embodiments, a player may have obtained a ticket through play of a gaming machine, such as gaming machines B22a, B22b, B22c, B22d, B22e, B22f, B22g, B22h, B22i, B22j of the gaming system B20. In some embodiments, a player may be issued a ticket by a game service representative. For example, a player may provide credit at a cashier cage (such as with a credit card or cash) and be issued a ticket. A player may also pay cash or the like to a restaurant hostess and be issued a ticket.

[0904] Once the player has a ticket, the ticket may be scanned using the ticket reader B145 of the PGD B24. For example, the player may pass the ticket in front of the ticket reader B145. Once the information is read by the PGD B24, the data may be transmitted to the EZ pay server B26 for validation. Preferably, this validation confirms that the particular ticket is authorized, including the fact that it is outstanding and has value associated therewith.

[0905] In one or more embodiments, entitlement may be established in other manners. For example, in some embodiments, entitlement may be established with a player tracking or identification card which may be read using the card reader B140 of the PGD B24.

[0906] Establishing entitlement to use the PGD B24 may ensure that the player has funds for paying to obtain services and products available by use of the PGD B24. In one or more embodiments, however, this step may be eliminated. For example, in some embodiments, a player may be permitted to use the PGD B24 and then pay for goods or services in other manners. In some embodiments, a player may, for example, order food and then pay the server for the food using a room charge or cash at the time the food is delivered. In some embodiments, a player may use a credit card to pay to play games or to pay for food or the like. In such event, a credit card may be read by the card reader B140 at the time the services or products are to be provided or are ordered by the player.

[0907] In a step B406, the player is then permitted to select one or more selections from the interfaces B106. As stated above, a player may not be permitted access to all of the interfaces B106. In any event, a player may select, such as with the stylus B103, a service from the group of interfaces B106. An example of the engagement of a particular activity using the PGD B24 will be described below with reference to FIG. 11(b).

[0908] Once a player no longer desires to engage in any more activities using the PGD B24, the use session of the PGD B24 is ended in a step B408, and in one or more embodiments, the PGD B24 is returned to the gaming operator. In various embodiments, once a player no longer wishes to use the PGD B24, the player returns the PGD B24 to the gaming operator. At that time, the gaming operator may confirm that all transactions using the PGD B24 are closed or complete, and pay the player any winnings. In some embodiments, a player B24 is issued a new ticket representing the player's credit (including any payments made in order to first use the PGD B24), the

Petitioner Exhibit 1002-2524

any winnings, less any expenditures).

[0909] An example of a method of using the PGD B24 wherein the player has selected the option of game play using the game play interface B137 will be described in detail with reference to FIG. 11(b). In a step B410 (which step comprises a particular embodiment of step B406 of FIG. 11(a)), a player has selected the event or service of "game play" using the game play interface B137.

[0910] In some embodiments, when a player has selected the game play interface B137, a menu may be displayed to the player of the one or more games which the player may be permitted to play. In some embodiments, when the player selects the game play interface B137, a signal is transmitted from the PGD B24 to the remote game server B28 instructing the game server B28 that the player wishes to play a game. In response, the game server B28 may send the latest game menu to the PGD B24 for display. In this arrangement, the menu of games which is available may be continuously updated at one or more central locations (such as the server B28) instead of at each PGD B24.

[0911] If the system B20 permits the player to select a game from a menu of games, then the method includes the step of the player selecting a particular game to be played. Once a game is selected, or if only a single game option is provided, then game play begins. In some embodiments, the game server B28 transmits data to the PGD B24 for use by the PGD B24 in presenting the game, such as video and audio content.

[0912] In some embodiments, in a step B412 a player is required to place a bet or ante to participate in a game. In some embodiments, the player may place the bet or ante using the EZ pay system. As stated above, the player preferably establishes entitlement to use the PGD B24 with an EZ pay ticket or other entitlement, which ticket demonstrates that the player has monies or credits on account which may be used to pay for goods and services. These services include game play services.

[0913] In some embodiments, when the player establishes entitlement to use the PGD B24, the value of the player's credits or monies are displayed to the player so that the player is visually reminded of these amounts. When a player begins play of a game, the player may input a bet and ante which is no more than the value of the credits or monies which the player has on account. Once a player has placed a bet or ante, that information is transmitted to the EZ pay server B26 and is deducted from the player's account. A new credit value is then displayed at the PGD B24 to the player.

[0914] In various embodiments, a player may provide credit for a bet or ante in other manners. For example, a player may swipe a credit card through the card reader B140 in order to provide the necessary credit for the bet or ante.

[0915] In a step B414, the player is then permitted to engage in the game. In some embodiments, game play comprises the game server B28 executing game code and transmitting information to the PGD B24 for presenting certain aspects of the game to the player. When necessary, the player is permitted to provide input, and the input data is transmitted from the PGD B24 to the game server B28.

[0916] As one example of a game, the game may comprise video poker. In this embodiment, the game server B28 executes code for randomly generating or selecting five cards. Data representing video images of the cards is transmitted to the PGD B24, where the images of the five dealt cards are displayed on the display screen B112.

Petitioner Exhibit 1002-2525

[0917] The instruction "draw" or "stay" may be displayed to the player. At that time, the player may select one or more of the cards to hold or replace. In the event the player elects to replace any card, that instruction is transmitted to the game server B28 which then randomly generates or selects replacement cards. The replacement card data is transmitted to the PGD B24 and images of the replacement cards are displayed.

[0918] In the event the hand of five cards (including any replacement cards) is determined by the game server B28 to comprise a predetermined winning hand, then the player may be paid a winning amount. If not, then the player loses his bet or ante. This step comprises step B416 of the method, that of determining the outcome of the game.

[0919] If the outcome is a winning outcome, then the player may be paid a winning by crediting the player's account through the EZ pay server B26. In that event, the player's credits value as displayed is updated to reflect the player's winnings.

[0920] A player may then elect to play the game again, play a different game, or select one or more other services offered. In some embodiments, a "return to main menu" button or the like may be displayed to the player at all times, permitting the player to return to a display including the various interfaces B106.

[0921] In some embodiments, when the player has completed use of the PGD B24, the player returns the PGD B24 to the gaming operator. For example, the player may return the PGD B24 to a cashier cage or a game service operator. In various embodiments, the game service operator or other party then issues the player a ticket for any credit or value which remains in the player's account. The PGD B24 may then be deactivated so that it readied for use by another player. In some embodiments, the PGD B24 may be deactivated by turning its power off. In some embodiments, a "logout" interface or option may be provided which causes the PGD B24 to return to a default state seeking the login of a player or user.

[0922] The PGD B24 may be used by a game service operator. Several examples of a method of such use are detailed below in conjunction with FIGS. 8 and 9.

[0923] When a game service representative contacts a game player seeking a game service in the game playing area B70 (see FIG. 8), the game service representative uses an appropriate game service interface on the display screen of the PGD B24, as described with reference to FIG. 10, to provide the game service requested by the game player. For example, when a game player requests an EZ pay ticket validation, the game service representative brings the EZ pay ticket validation interface onto the display screen of the PGD B24 using menus available on the display screen B102. Then, the game service representative scans the EZ pay ticket using a ticket reader connected to the PGD B24 to obtain unique ticket information. Next, the PGD B24 sends an EZ pay ticket validation request using the wire-less communication interface to the EZ pay server B26.

[0924] In various embodiments, the ticket validation request is composed of one or more information packets compatible with the wire-less communication standard being employed. Using a wireless link B72, the one or more information packets containing the ticket validation request are sent to the transceiver B62 connected to the EZ pay server. The transceiver B62 is designed to receive and send messages from the one or more PGDs B24 in the game playing area B70 in a communication format used by the PGDs. Depending on the location of the PGD B24 in the game playing area B70, the

Petitioner Exhibit 1002-2526

communication path for the information packets to and from the PGD B24 may be through one or more wire-less communication relays including B58 and B60. For example, when the PGD B24 is located near gaming machine B22a, the communication path for a message from the PGD B24 to the EZ pay server B26 may be from the PGD B24 to the relay B60, from the relay B60 to the relay B58, from the relay B58 to the transceiver B62 and from the transceiver B62 to the EZ pay server B26. As the location of the PGD B24 changes in the game playing area B70, the communication path between the PGD B24 and the EZ pay server B26 may change.

[0925] After receiving an EZ pay ticket validation reply from the EZ pay server B26, the EZ pay ticket may be validated using an appropriate display screen on the PGD B24. After cashing out the ticket, the game service representative may send a confirmation of the transaction to the EZ pay server B26 using the PGD B24. The transaction history for the PGD B24 may be stored on the PGD B24 as well as the EZ pay server B26. Next, a receipt for the transaction may be printed out. The receipt may be generated from a portable printer carried by the game server representative ad connected to the PGD B24 in some manner or the receipt may be generated from a printer B56 at a fixed location.

[0926] After providing a number of game services comprising a number of game service transactions to different game players in the game playing area B70 using the PGD B24, a game service representative may log-off of the PGD B24 and return it to location for secure storage. For example, at the end of a shift, the game service representative may check the PGD B24 at some of the locations, the device is unassigned to the particular game service representative and then may be assigned to another game service representative. However, before the PGD B24 is assigned to another game service representative, the transaction history stored on the PGD B24 may be reconciled with a separate transaction history stored on a transaction server such as the EZ pay server B26.

[0927] The assigning and unassigning of the PGD B24 to a game service representative and the transaction reconciliation are performed for security and auditing purposes. Another security measure which may be used on the PGD B24 is a fixed connection time between the PGD B24 and a transaction server. For example, after the PGD B24 has been assigned to a game service representative and the game service representative has logged on the PGD B24, the PGD B24 may establish a connection with one or more transaction servers including the EZ pay server B26, a server B28, a server B30, or a server B32. The connection between a transaction server and the PGD B24 allows the PGD B24 to send information to the transaction server and receive information from the transaction server. The length of this connection may be fixed such that after a certain amount of time the connection between the PGD B24 and the transaction server is automatically terminated. To reconnect to the transaction server, the login and registration process must be repeated on the PGD B24.

[0928] A transaction server may provide one or more game service transactions. However, the PGD B24 may connect with multiple transaction servers to obtain different game service transactions. For example, server B30 may be a prize transaction server allowing prize service transactions and server B415 may be a food transaction server allowing food service transactions. When a game service representative receives a prize service request from a game player, the PGD B24 may be used to contact the prize transaction server B30 using a wire-less communication link between the PGD B24 and a transceiver B64 connected to the prize transaction server B30. Similarly, when a game service representative receives a food service request from a game player, the PGD B24 may be used to contact the [illegible]

Petitioner Exhibit 1002-2527

server B32 using a wire-less communication link between the PGD B24 and a transceiver B66 connected to the food transaction server B32.

[0929] The different transaction servers including the servers B26, B28, B30, B32 may be on separate networks or linked in some manner. For example, server B32 is connected to network B74, server B26 is connected to network B38, server B30 is connected to network B76, and server B28 is connected to network B78. In this embodiment, a network link B80 exists between network B76 and network B38. Thus, server B26 may communicate with server B30 via the network link B80. A communication link between different servers may allow the servers to share game service transaction information and allow different communication paths between the PGDs and the transaction servers. Likewise, a network link B82 exists between network B78 and network B38, permitting the game server to communicate with the EZ pay server B26.

[0930] FIG. 12 is a flow chart depicting a method for providing a game service using a hand-held device. In step B500, a game service representative receives the PGD B24 and logs in to the device to assign the device. The check out process and assign process are for security and auditing purposes. In a step B505, the game service representative contacts a game player in the game playing area requesting a game service of some type. In a step B510, the game service representative selects an appropriate interface on the PGD B24 using menus on the display screen B102 of the PGD that allow the game service representative to provide a requested game service. In a step B515, the game service representative inputs game service transaction information required to perform a game service transaction. For example, to validate an award ticket, the game service representative may read information from the ticket using a ticket reader. As another example, to provide a food service including dinner reservation, the game service representative may enter a game player's name to make the reservation.

[0931] In a step B520, the transaction information obtained in step B515 is validated as required. For example, when a player attempts to cash out an award ticket, the information from the award is validated to ensure the ticket is both genuine (e.g. the ticket may be counterfeit) and has not already been validated. The validation process requires a number of transfers of information packets between the PGD B24 and the transaction server. The details of the validation process for an award ticket validation are described with reference to FIG. 13. When the transaction information is valid, in a step B522, a game service transaction is provided. For example, a room reservation may be made for a player requesting an accommodation service. A confirmation of the game service transaction may be sent to the transaction server for transaction reconciliation in a step B545. In one or more embodiments, the method may include the step of generating a receipt regarding the game service transaction.

[0932] In a step B535, after providing the service, a game player may request another game service. When a game player requests an additional game service, the game service representative returns to step B510 and selects an appropriate interface for the game service. When a game player does not request an additional service and it is not the end of a shift, in a step B530, the game service representative returns to step B505 and contacts a new game player. In a step B540, when a shift has ended, the game service representative logs out of the PGD B24 and checks the device at a secure location so that the PGD may be assigned to a different game service representative. In step B545, before the PGD B24 is assigned to a different game service representative, a transaction history reconciliation is performed to ensure that the transaction history stored on the PGD is consistent with the transaction history

Petitioner Exhibit 1002-2528

confirmed with a transaction server during the game service representative's shift. The transaction history on the PGD B24 may be stored on a removable memory storage device on the PGD. Thus, the memory may be removed from the device for transaction reconciliation and replaced with a new memory. Thus, the device with the new memory may be assigned to a new game service representative while the transaction history from the previous game service representative assigned to the device is reconciled.

[0933] FIG. 13 is a flow chart depicting a method for validating information for providing a personal game service. In the embodiment shown in the figure, a ticket is validated in a manner consistent with an EZ pay ticket system. The EZ pay ticket is usually used for award tickets. However, the system may be adapted to provide tickets for other services include food services, prize services or accommodation services. In a step B600, a request for game service transaction information read from a ticket is sent via a wire-less communication interface on the PGD B24 to the appropriate transaction server as described with reference to FIG. 8. In a step B605, the server identifies which clerk validation ticket (CVT) B34,B36 owns the ticket. When a CVT owns a ticket, the CVT has stored information regarding the status of a particular ticket issued from a gaming machine connected to the CVT B34,B36. In a step B610, the server sends a request to pay the ticket to the CVT identified as the owner of the ticket. Typically, the pay request indicated a service on the ticket has been requested. For a cash ticket, a pay request means a request to cash out the ticket has been made. For a free meal, a pay request means a request to obtain the meal has been made. In a step B615, the CVT receives the pay request for the ticket and marks the ticket pending. While the ticket is pending, any attempts to validate a ticket with similar information is blocked by the CVT.

[0934] In a step B620, the CVT B34,B36 sends back a reply with context information to the server. As an example, the context information may be the time and place when the ticket was issued. The information from the CVT to the server may be sent as one or more data packets according to a communication standard shared by the CVT and server. In a step B625, after receiving the validation reply from the CVT, the server marks the pay request pending and sends a pay order to the PGD B24. While the pay request is pending, the server will not allow another ticket with the same information as the ticket with the pay request pending to be validated.

[0935] In a step B630, the game service representative may choose to accept or reject the pay order form the server. When the game service representative accepts the pay order from the server, in a step B640, the PGD B24 sends a reply to the transaction server confirming that the transaction has been performed. The transaction server marks the request paid which prevents another ticket with identical information from being validated. In a step B645, the server sends a confirmation to the CVT which allows the CVT to mark the request from pending to paid. When the game service representative rejects the pay order from the server, in a step B650, the PGD B24 sends a reply to the server to mark the pay request from pending to unpaid. When the ticket is marked unpaid, it may be validated by another PGD B24 or other validation device. In a step B655, the server sends the reply to the CVT to mark the pay request from pending to unpaid which allows the ticket to be validated.

[0936] In one or more embodiments of the invention, a ticket may be used to provide credit/value for establishing entitlement to a service or a good, such as the right to play a game or obtain food. The PGD B24 may include a card reader B140. In such an arrangement, a user of the PGD B24 may use a credit card or other magnetic stripe type card for providing creditvalue. In various embodiments, the PGD B24 may include one or more other types of devices for obtaining/receiving information, such as a bar-

Petitioner Exhibit 1002-2529

card reader. In such arrangements, the PGD B24 device may read information from the credit card, smart card or other device. These cards may comprise the well known credit or debit cards. This information may be used to provide the credit/value. In the example of a credit card, the user's account information may be read from the card and transmitted from the PGD B24 to the controller B42. Credit card/credit validation information may be associated with a credit card server (not shown). This credit card server may be associated with a bank or other entity remote from the casino or place of use of the PGD B24 and the controller B42. A communication link may be provided between the controller B42 and remote server for sending credit card information there over.

[0937] In some embodiments, when a player utilizes a smart card or credit card the amount of associated credit or value may be transmitted to the EZ Pay server B26, and then the credited amount may be treated in exactly the same manner as if the credit/value had been provided by a ticket. When a player wishes to cash out, the EZ Pay server B26 has a record of the original amount credited and the amounts of any awards, losses or payments, and may then issue the player a ticket representing the user's total credit.

[0938] In accordance with the invention, a gaming system is provided which includes one or more portable gaming devices. The portable gaming devices permit a player to play one or more games at a variety of locations, such as a hotel room, restaurant or other location. These locations may be remote from traditional gaming areas where free-standing, generally stationary gaming machines are located.

[0939] In one or more embodiments, a player may use the portable gaming device to not only play games, but obtain other products and services. In addition, in one or more embodiments, the portable gaming device may be used by game service representatives to perform a variety of functions and provide a variety of services to a player.

[0940] It should be understood that the foregoing descriptions encompass but some of the implementation technologies that may be used, according to various embodiments. Other technologies may be used and are contemplated, according to various embodiments. Various embodiments may be performed using any suitable technology, either a technology currently existing or a technology which has yet to be developed.

Wireless Interactive System

[0941] According to various embodiments, a wireless interactive gaming system includes one or more wireless gaming devices, a receiver, and a central processor. The wireless interactive gaming system may also include a terminal which is in communication with the central processor.

[0942] In a gaming environment that employs a wireless interactive gaming system, a player receives a wireless gaming device from a game official who represents a gaming establishment or the "house". The wireless gaming device is capable of receiving wager information as commands entered by the player and transmitting the received wager information along with identification information to the receiver by wireless transmission.

[0943] The wireless interactive gaming system may support a number of wireless gaming devices within one gaming establishment. The range for the wireless transmission from a wireless gaming device may be up to 100 feet.

[0944] According to various embodiments, a player inputs information into a wireless gaming device, e.g., by pressing push buttons or keys on the device. The wireless gaming device may include any number, e.g. from 5 to 20, of buttons in a keypad-type arrangement. Buttons may be marked with the digits 0 through 9 and may also include a "$" (dollar sign) key and an "enter" key, so that the player may easily input wager information. In various embodiments, the wireless gaming device includes at least eight player selection buttons (e.g., digits) and at least five special function buttons, (e.g., to request the player's balance). In various embodiments, the player can input some or all of the wager information into the wireless gaming device by swiping a smart card, which contains a microprocessor chip or a magnetic stripe with encoded information, through a smart card reader on the wireless gaming device.

[0945] In various embodiments, the wireless gaming device may include an identifier. The identifier may be, e.g., a series of alphanumeric characters, a bar code, or a magnetic stripe affixed to the device. In various embodiments, the identifier may be a digital code stored in a secure memory, e.g., an electronically erasable programmable read only memory (EEPROM). The identifier may thus be readable directly by the game official if it is a series of alphanumeric characters, or it may be read automatically by a bar code reader or a magnetic stripe reader. In various embodiments, the identifier may be programmed in EEPROM or read from EEPROM through an RS-232 port, which may be directly connected to encoder and decoder circuitry in a terminal.

[0946] A wireless gaming device may store an encryption key. The encryption key may be used to encrypt information that is transmitted to the receiver from the device. Encryption of the information transmitted to the receiver may limits tampering with the wireless gaming device and may prevent unauthorized or counterfeit devices from being used with the system.

[0947] In various embodiments, the encryption key may be stored in the EEPROM. The EEPROM may have the advantage of being a memory device which is difficult to access if the appropriate encoding circuitry is not available. Thus, it is contemplated that the encoding circuitry that downloads the encryption key into the device may be securely held by the game official.

[0948] Alternately, the encryption key stored in the EEPROM may be updated and changed for each player who receives a wireless gaming device by directly connecting the device to encoding and decoding circuitry in the terminal through a port at the time the wireless gaming device is delivered to the player. Moreover, other digital information related to the game being played may be downloaded from the terminal to the EEPROM through a direct connection with the wireless gaming device.

[0949] In various embodiments, a microprocessor controls the operation of a wireless gaming device. The microprocessor receives digital wager information entered by the player using buttons or keys of the wireless gaming device. The microprocessor stores an identification code associated with the wireless gaming device that is a digital equivalent of the identifier of the wireless gaming device. The microprocessor also executes software applications for encrypting the identification code and the player's wager information for transmission to the receiver. The software contains an algorithm that encrypts a data packet including the identification code and wager information using the encryption key.

[0950] In various embodiments, a wireless gaming device has a unique address, i.e. identification code, for communications with the receiver and stations (players).

Petitioner Exhibit 1002-2531

identification that is programmed into the device by the central processor. The wireless gaming device may include a wager amount register, which is maintained and updated using the keys on the device. The value stored in the wager amount register may be included in transmissions from the device to the central processor. The value of the wager amount register may default to a predetermined value, e.g. $1, when the device is initialized, and can be further adjusted by the player. The wireless gaming device may also include an account balance register, which is maintained in the device and is updated by the central processor periodically. The value of the account balance register should default to $0 when the device is initialized.

[0951] The wireless gaming device may include player function keys. The player function keys may be used to accomplish the following functions:
1. Transmit a message to the receiver;
2. Request account balance information;
3. Adjust the state of the device;
4. Affect the data to be sent in the next transmitted message;
5. Increment the wager amount register by a predetermined amount, e.g., $10, $5 or $1;
6. Reset the wager amount register to the default value, e.g., $1.

[0958] The firmware of the wireless gaming device may only allow for one press of buttons or keys every 100 ms. In various embodiments, key presses are not queued; thus, when a key press message is queued to be sent, no other player input is accepted until the queued message has been sent.

[0959] The wireless gaming device may include a transmitter. The transmitter may receive encrypted digital information from the microprocessor and convert it to a signal for wireless transmission to the receiver. The transmitter transmits signals wirelessly, e.g., using radio frequency signals or infrared signals. Communications between the receiver and the wireless gaming device may be asynchronous at 2400 bits per second.

[0960] The wireless gaming device may include an identifying circuit that drives the transmitter to periodically send an identification signal to the receiver. The use of the identifying circuit permits the receiver and the central processor to be assured that the wireless gaming device is still active, functioning and present in the gaming establishment. Thus, if the wireless gaming device were removed from the gaming establishment, the receiver and central processor would no longer receive and detect the periodic identification signal sent by the identifying circuit and the transmitter, and the game official may be alerted that the wireless gaming device has been removed from the gaming establishment.

[0961] The wireless gaming device may contain a real-time clock that permits the microprocessor to monitor the current time and date. The clock may consist of a timing circuit. The microprocessor can use the time and date information obtained from clock to perform calculations and other functions based on the current time and date.

[0962] The wireless gaming device may also include a tag, such as an electronic or magnetic component, which activates an alarm when passed through a sensing apparatus located at the entrance and/or exit of the gaming establishment. Activation of the alarm by passing the wireless gaming device with the tag through the sensing apparatus notifies the game official of an attempted removal of the wireless gaming device from the gaming establishment.

[0963] The wireless gaming device may be powered by a battery source contained within the device. A portable power source such as battery source permits extended cordless operation of the wireless gaming device throughout a gaming environment. The battery source may be part of a removable, rechargeable battery pack that allows the device to be recharged when it is not in use.

[0964] In some embodiments, the wireless gaming device displays information such as game information on a device display, such as a liquid crystal display (LCD) with a back-light. The LCD can be used to display the values stored in the wager amount register and in the account balance register. The wireless gaming device may include a display receiver which receives digital information transmitted from the receiver or from the central processor.

[0965] The device may also include a bicolor light emitting diode (LED). The bicolor LED is capable of displaying at least two colors, e.g., red and green.

The green light may flash each time the wireless gaming device sends a transmission to the receiver, for a period of time to ensure that it is visible to the player. The red light may illuminate when a key is pressed on the wireless gaming device, and remain lit until the transmission is received by the receiver; no additional key entry will be enabled when the red light is lit. The wireless gaming device may also include additional light emitting diodes, for example to indicate when the account balance register is being updated and the balance information is being displayed on the LCD.

[0966] The receiver is capable of receiving signals transmitted from the transmitter in the wireless gaming device. The receiver contains a decoder, which converts the received signals, e.g., into digital information. This digital information contains at least the identification code of the wireless gaming device and the player's wager information. The receiver sends the digital information obtained by the decoder to the central processor. Communications between the central processor and the receiver may be by an RS-232 electrical interface data serial communications link, with communications being asynchronous at either 9600 or 19,200 bytes per second, in various embodiments.

[0967] The receiver may receive signals from many wireless devices either simultaneously or in rapid succession, e.g., using multiplexing techniques, so that many players can place wagers using their wireless gaming devices during a short time interval. The receiver differentiates signals received from the various devices by the identification codes which are present in the signals received by the receiver.

[0968] The central processor receives the identification code of a wireless gaming device and the player's wager information from the receiver. The central processor also decrypts this information using the encryption key. The central processor is capable of receiving data from multiple wireless gaming devices in an apparently simultaneous manner.

[0969] In various embodiments, an account for the player is stored in a database of the central processor. The database stores the monetary value of the balance of the account associated with the identifier of the wireless gaming device.

[0970] The central processor manages the player's account in the database based on signals received from the player's wireless gaming device as the player places wagers and when prizes are awarded during play of the game. The central processor subtracts money from the player's account balance when the player places a wager and adds

Petitioner Exhibit 1002-2533

account balance may be automatically increased by the central processor when the player wins a game on which he has placed a wager.

[0971] The central processor also stores and is capable of executing software applications containing algorithms to calculate players' account balances, wagers, and winnings. The central processor should be able to execute all of the algorithms which define the actions performed on the players' accounts during the progress of the game, as wagers are entered, as winnings paid out, and when funds are added to the players' accounts.

[0972] Algorithms in the software in the central processor may also calculate odds and payouts for certain games, such as lottery-type games, during play of the game. The odds and payouts at a particular point in time may depend on the characteristics of the game being conducted by the central processor, and may change as the game progresses. These algorithms may be executed by the central processor to provide exact calculations of the odds of specific game events occurring and the associated prizes for a player's correctly predicting the occurrence of one of those events. The algorithms may be executed continuously, so that real-time odds and payout can be calculated as the game progresses.

[0973] The central processor may perform various actions on players' accounts, resulting in various impacts on the accounts. For example, if the player wins a game, his account is credited for the payout based on his wager. If the player places a wager using the wireless gaming device, his account is debited by the amount of the wager. If the game official receives additional funds from the player, the balance of the player's account is credited by the amount of the funds. If the game official closes the player's account and disburses funds to him, the balance of the player's account is debited by the amount disbursed.

[0974] The central processor may be located in the gaming establishment that houses the receiver. In various embodiments, the central processor may be located remotely from the receiver, communicating with the receiver via electronic digital telephone communication or wireless transmission, such as a serial communication link. Additionally, the central processor may perform a multitude of functions for various receivers in a variety of gaming environments.

[0975] In some embodiments, communication among the central processor, the receiver, and the wireless gaming device involves a polling scheme. Polling enables many wireless gaming devices to communicate with a receiver without interference between them. Such a polling scheme may include the transmission of digital signals in the form of strings of hexadecimal characters. Preferably, all communications between the central processor, the receiver and the wireless gaming device are encrypted.

[0976] In such a polling scheme, hexadecimal characters may be reserved for specific control protocols. For example, an attention character is a header character used to begin all transmissions from the central processor to the receiver, and serves to delineate messages and synchronize the receipt of messages in the receiver. The same function is implied when the attention character follows in response to a message transmission. An acknowledgement character is another header character which provides acknowledgement to the transmitting device that the previous message's data has been received and verified. The acknowledgement character can also function as an attention character to begin a subsequent message. An end of message character is used to indicate the end of a transmission. Also, a complement next byte character allows for use of reserved protocol characters within a normal transmission message

Petitioner Exhibit 1002-2534

by avoiding a false control signal when a message data byte matches one of the control characters. When a message byte that needs to be sent matches one of the protocol control characters, the complement next byte character is sent, followed by the one's complement of the matching message byte.

[0977] Verification of received data may be accomplished using a single byte checksum of the message information. This checksum may be the one's complement of the sum of the original message data, not including the header character. If the checksum results in a value equal to one of the protocol control characters, it will be treated in accordance with the function of the complement next byte character.

[0978] In the polling scheme described above, there are three different modes of communication over the link between the central processor and the receiver. First, the central processor may send messages intended for the receiver. Second, the central processor may send messages intended for the wireless gaming device. Third, the wireless gaming device may send messages intended for the central processor. In various embodiments, messages sent by the central processor may be in the form of a character string formatted with a header character, followed by the identification code of the intended device, the command or message, an end of message character, and a checksum character. Messages received by the receiver or the wireless gaming device may be acknowledged by transmission of an acknowledgement character, but the central processor need not acknowledge messages sent from the wireless gaming devices. Messages sent by the central processor to be received by the wireless gaming device may be broadcast to all of the wireless gaming devices. A device address may be reserved as a broadcast address for all of the wireless gaming devices, and all devices will receive messages sent to this address; in this case, no acknowledgement need be returned from any of the wireless gaming devices.

[0979] Each command or message may begin with a command code to signal how the information contained in the message is to be used. Command codes for messages sent by the central processor to the receiver and the wireless gaming device include the following:
1. Send a device address list to the receiver;
2. Send account balance information to the addressed device;
3. Send command to disable the addressed device;
4. Send command to enable the addressed device.

[0984] In various embodiments, messages sent between the receiver and the wireless gaming device may be in the form of a character string formatted with a header character, followed by the identification code of the intended device, the current wager amount, the request, command or data, an end of message character, and a checksum character. Command codes for requests, commands and data sent between the receiver and the wireless gaming device include the following:
1. Read user identification;
2. Read device address;
3. Read balance register;
4. Read wager amount register;
5. Provide device status;
6. Write user identification;
7. Write device address;
8. Write balance register;
9. Write wager amount;
10. Perform self test.

[0995] These command codes may be used to program the device addresses and user identification information into the wireless gaming devices, as well as to initialize the device to the default state, i.e., the player's account balance of $0. The account balance register and the user identification may each comprise two characters, the least significant byte and the most significant byte, allowing for the use a greater range of numbers for these values.

[0996] Various embodiments include methods by which the central processor communicates with a wireless gaming device. The central processor transmits a string of hexadecimal characters, including, e.g., a header character, followed by the device's identification code, followed by a request, command or data, followed by an end of message character, followed by a checksum character. After the central processor transmits the character string, the wireless gaming device receives the string, recognizes its identification code, and executes any instructions in the string. When the central processor sends an instruction to all wireless gaming devices simultaneously, all currently active devices receive and execute the instruction. The wireless gaming device does not send an acknowledgement message to the central processor, although the receiver may receive a transmission from the wireless gaming device that the instruction was received properly. The central processor also communicates with the receiver in a similar manner, except that the receiver may send an acknowledgement message to the central processor which includes the acknowledgement control protocol character.

[0997] Similarly, the wireless gaming device communicates with the receiver and the central processor using, e.g., hexadecimal character strings. The receiver regularly and periodically polls the active wireless gaming device for information requests or wagering requests. If the player has entered a request into the wireless gaming device since the last time the wireless gaming device was polled, then the player's request will be transmitted to the receiver.

[0998] Various embodiments include methods by which the wireless gaming device receives and relays player requests to the central processor. First, the player enters a request into the wireless gaming device using buttons or keys. The player then presses a button labeled, e.g., "enter" or "send," instructing the wireless gaming device to send the request the next time the receiver polls the wireless gaming device. When this button has been pressed, the red light of the bicolor LED is illuminated, thereby informing the player that the request is waiting to be sent. The request is converted into a hexadecimal character string, including, e.g., a header character, an identification code (or, alternatively, a separate identification string reserved for a specific player), the current wager amount, the player's request (e.g., to change the wager amount or to send a balance update), an end of message character, and a checksum character. The next time the receiver polls the device, the transmitter of the device transmits the character string to the receiver. When the wireless gaming device is polled by the receiver, the green light of bicolor LED flashes, informing the player that the request has been transmitted. The receiver receives the request string, and transmits the string to the central processor. The central processor then acts on the player's request.

[0999] Using the terminal, the game official may process wagering transactions and distribute wireless gaming devices. In various embodiments, the terminal may include a bar code reader and/or a magnetic stripe reader for rapid entry of the identifier of a wireless gaming device prior to delivering the wireless gaming device to the player. Reading devices provide information in the form of digital data to the terminal. The terminal includes a keyboard by which the game official can manually enter data to be sent to the central processor. Using either reading device, the keyboard, and

Petitioner Exhibit 1002-2536

combination of these, the game official communicates with the central processor to establish a player's account, increase the balance of the account when the player tenders funds to the game official, and decrease the balance of the account when the player seeks to collect the cash value of his account balance.

[1000] The player establishes a balance of the account associated with his wireless gaming device, identified by an identifier, when he receives the wireless gaming device from the game official. The player may increase the monetary value of the balance of the account by paying additional funds, in the form of cash or credit, to the game official, who accesses the account stored in the central processor through the terminal to increase the balance of the account.

[1001] The wireless gaming device is returned to the game official after the player has played one or more games. The readers may be used to read the identifier for closing out the player's account stored in the database of the central processor. The terminal includes a terminal display which notifies the game official of the balance of the player's account, so that the player may be paid the cash value of the remaining balance of his account.

[1002] In some embodiments, an account status display device is located in the gaming establishment to display players' account information. In various embodiments, the display device may be, e.g., a liquid crystal display or a cathode ray tube display. The display device is controlled by the central processor, which sends information to the display device for display to the players.

[1003] A player may look at the display device to confirm that wagers transmitted from the wireless gaming device were received by the receiver and sent to the central processor, to determine the monetary balance of the player's account, and to verify that the player's winnings have been credited to his account. The display device displays key information necessary for a player to participate in a game. The information displayed for each player may include the account number, the player's account balance, the player's last wager, and the player's last prize award or win.

[1004] The display device is divided into specific areas, e.g., a display area, each area showing the account information for one player. The size of the display area may be determined by the size of the display device and the number of players who possess wireless display devices. It is contemplated that only active accounts will be displayed on the display device. If additional display devices are required to display the information concerning a large number of accounts, the central processor may be configured to drive multiple similar display devices.

[1005] The display device may also be used to display the odds and payouts for game wagers. Alternately, a separate display device driven by the central processor may be used to display the odds and payout information. Further, the odds and payouts may be displayed on the device display 21.

[1006] Procedures for using the wireless interactive gaming system, according to some embodiments, are now described. In some embodiments, a player tenders money in the form of cash or credit, e.g., $100, to a game official in the gaming establishment to establish an account. The game official chooses a wireless gaming device and uses, e.g., the bar code reader on the terminal to enter the identifier of the wireless gaming device into the terminal. The game official also inputs the amount of money tendered, i.e. $100, into the terminal via keyboard. The game official hands the wireless gaming device to the player and tells the player that his account is, e.g., $100. [illegible]

Petitioner Exhibit 1002-2537

Alternately, the player may identify his account number directly from the identifier on the wireless gaming device. The information entered by the game official into the terminal is sent to the central processor, which establishes an account record for the player in the database.

[1007] For this example, the central processor may be conducting a racing game in which players choose a winning racing element on which to place a wager for the next racing game to be displayed in the gaming establishment. To place a wager, the player presses buttons on the wireless gaming device.

[1008] In some embodiments, the player first presses the button that corresponds to the number assigned to the racing element that he chooses, e.g., "3", and then the wager amount, e.g., "$" and "5", for a $5 wager. The player then presses the "enter" key to transmit his wager to the central processor.

[1009] In an alternate embodiment, the game may be simplified so that all wagers are placed for a fixed amount, e.g., $1, by pressing a single button on the wireless gaming device. By pressing the button that corresponds to the number assigned to the chosen racing element, e.g., "3", the player places a $1 bet on racing element number 3. The player can then place a larger wager on racing element number 3, by pressing the "3" button the number of times corresponding to the number of $1 bets he desires to make, e.g., by pressing "3" five times to wager $5 on racing element number 3.

[1010] Each time the player enters a wager, the wireless gaming device forms a data packet containing the player's wager information and the identification code of the wireless gaming device. The data packet is encrypted and transmitted by the transmitter via wireless communication.

[1011] The decoder in the receiver receives the encrypted data packet transmitted by the transmitter. The encrypted data packet is sent to the central processor, where it is decrypted. The central processor uses the information it has obtained to update the player's account in the database by subtracting the wagered amount from the player's account balance and registers the player's wager on the game.

[1012] After the game has been played, the central processor awards prizes to winning players based on the wagers they have made and the odds associated with the winning outcome of the game. If the player in possession of the wireless gaming device is a winner, the central computer updates the player's account in the database by adding the monetary amount of the prize to the player's account balance. Otherwise, the player's account remains unchanged.

[1013] When the player has finished playing games in the gaming establishment, he returns the wireless gaming device to the game official. The game official again inputs the identifier of the wireless gaming device into the terminal, e.g., by using the bar code reader of the terminal. The terminal accesses the player's account information stored in the database of the central processor to obtain the player's remaining account balance. The terminal display displays the player's remaining account balance to the game official, who then tenders the monetary value of that amount to the player. The account is closed, and the transaction is recorded in the central processor.

[1014] It should be understood that the foregoing descriptions encompass but some of the implementation technologies that may be used, according to various embodiments. Other technologies may be used and are contemplated, according to various embodiments. Various embodiments may be performed using any [illegible] technology,

Petitioner Exhibit 1002-2538

either a technology currently existing or a technology which has yet to be developed.

Hand-Held Wireless Game Player

[1015] Various embodiments include a hand-held wireless game player for playing a game of chance. The hand-held wireless game player may be generally characterized as including: 1) a wire-less communication interface; 2) a display screen; 3) one or more input mechanisms; and 4) a microprocessor configured i) to present the game of chance on the display screen using operating instructions received via the wireless communication interface from a master gaming controller located on a gaming machine and ii) to send information from input signals generated from the one or more input mechanisms to the master gaming controller via the wire-less communication interface. The wireless game player may be played in a plurality of venue locations physically separate from the location of the gaming machine where the plurality of venue locations are selected from the group consisting of a keno parlor, a bingo parlor, a restaurant, a sports book, a bar, a hotel, a pool area and a casino floor area. The game of chance played on the wireless game player may be selected from the group consisting of slot games, poker, pachinko, multiple hand poker games, pai-gow poker, black jack, keno, bingo, roulette, craps and a card game. Other games are also contemplated, in various embodiments.

[1016] In various embodiments, the wireless communication interface may use a wireless communication protocol selected from the group consisting of IEEE 802.11a, IEEE 802.11b, IEEE 802.11x, hyperlan/2, Bluetooth, and HomeRF. The wireless game player may also comprise a wire network interface for connecting the wireless game player to a wire network access point. In addition, the wireless game player may also comprise a peripheral interface for connecting to a peripheral gaming device where the peripheral interface is a serial interface, a parallel interface, a USB interface, a FireWire interface, an IEEE 1394 interface. The peripheral gaming device may be a printer, a card reader, a hard drive and a CD-DVD drive.

[1017] In various embodiments, the one or more inputs mechanisms on the wireless game player may be selected from the group consisting of a touch screen, an input switch, an input button and biometric input device where the biometric input device may be a finger print reader. The wireless game player may also include a detachable memory interface designed to receive a detachable memory where the detachable memory unit stores graphical programs for one or more games of chance played on the wireless game player. The wireless game player may also comprise one or more of the following: 1) an audio output interface for receiving a head phone jack, 2) an antenna, 3) a sound projection device, 4) a battery, 5) a power interface for supplying power to the wireless game player from an external power source and for charging the battery from the external power source, 6) a memory unit where the memory unit may store graphical programs for one or more games of chance played on the wireless game player, 7) an electronic key interface designed to receive an electronic key, and 8) a video graphics card for rendering images on the display screen where the video graphics card may be used to render 2-D graphics and 3-D graphics.

[1018] It should be understood that the foregoing descriptions encompass but some of the implementation technologies that may be used, according to various embodiments. Other technologies may be used and are contemplated, according to various embodiments. Various embodiments may be performed using any suitable technology, either a technology currently existing or a technology which has yet to be developed.

Espacenet

Claims: JP2010528716 (A) — 2010-08-26

GAME WITH HAND MOTION CONTROL

Claims not available for JP2010528716 (A)
Claims of corresponding document: US2008300055 (A1)

A high quality text as facsimile in your desired language may be available amongst the following family members:

US2008300055 (A1) WO2008150809 (A1) US2018018014 (A1) US2020033938 (A1) US2022107682 (A1)

- Original claims
- Claims tree

The EPO does not accept any responsibility for the accuracy of data and information originating from other authorities than the EPO; in particular, the EPO does not guarantee that they are complete, up-to-date or fit for specific purposes.

What is claimed is:

1. A method comprising:
receiving a first wireless signal from a first device;
receiving a second wireless signal from a second device;
determining from the first wireless signal a first player identifier;
determining from the second wireless signal a second player identifier;
displaying a message that asks a player to identify himself;
receiving via tactile input an indication of a third player identifier;
determining that the third player identifier matches the first player identifier;
receiving a third wireless signal from the first device;
interpreting the third wireless signal as a command in a gambling game; and
carrying out the command in the gambling game.

2. The method of 1 in which the first device is one of: (a) a wristband; (b) a watch; (c) a bracelet; (d) an armband; and (e) a mobile gaming device.

3. The method of 1 in which determining from the first wireless signal a first player identifier includes determining from the first wireless signal a name of a first player.

4. The method of 1 in which the first player identifier and the second player identifier correspond to different players.

5. The method of 1 in which receiving via tactile input an indication of a third player identifier includes receiving an indication of a third player identifier, in which the third

Petitioner Exhibit 1002-2540

player identifier has been inputted using buttons.

6. The method of 1 in which receiving via tactile input an indication of a third player identifier includes receiving an indication of a third player identifier, in which the third player identifier has been inputted using a joystick.

7. The method of 1 in which receiving via tactile input an indication of a third player identifier includes receiving an indication of a third player identifier, in which the third player identifier has been inputted using a touch screen.

8. The method of 1 in which receiving via tactile input an indication of a third player identifier includes receiving an indication of a third player identifier, in which the third player identifier has been inputted using a track ball.

9. The method of 1 in which the third wireless signal encodes a set of motions made by the first device.

10. The method of 1 in which interpreting the third wireless signal includes interpreting the third wireless signal as a command to discard a card in a game of video poker.

11. The method of 1 in which interpreting the third wireless signal includes interpreting the third wireless signal as a command to initiate a slot machine game.

12. An apparatus comprising:
a band formed into a loop;
a power source attached to the band;
a motion sensor attached to the band;
an electromagnetic transmitter attached to the band;
an audio speaker attached to the band;
a haptics transducer attached to the band;
a processor attached to the band; and
an electromagnetic receiver attached to the band.

13. The apparatus of 12 in which the haptics transducer is operable to generate vibrations in response to an electric signal from the processor.

14. The apparatus of 12 in which the motion sensor is an accelerometer.

15. The apparatus of 12 in which the processor is operable to:
receive a first electronic signal from the motion sensor;
determine a first command for a first gambling game based on the first electronic signal;
transmit the first command to the electromagnetic transmitter; and
direct the electromagnetic transmitter to transmit the first command to a first gaming device.

16. The apparatus of 12 in which the processor is operable to:
receive from the electromagnetic receiver instructions that have been received wirelessly by the electromagnetic receiver;
receive a second electronic signal from the motion sensor;
follow the instructions in order to determine a second command for a second gambling game based on the second electronic signal;
transmit the second command to the electromagnetic transmitter; and
direct the electromagnetic transmitter to transmit the second command to a second gaming

Petitioner Exhibit 1002-2541

device.

17. The apparatus of 12 further including a switch attached to the band,
in which the switch has two stable positions, and in which the processor is operable to detect the position of the switch and to direct the electromagnetic transmitter to transmit signals only if the switch is in a first of the two stable positions.

18. The apparatus of 12 further including a piezoelectric sensor attached to the band.

19. An apparatus comprising:
a housing, the housing including a top surface that is parallel to the ground;
a coin hopper disposed within the housing;
a bill validator attached to the housing;
a display screen attached to the housing;
a processor disposed within the housing;
a wireless receiver attached to the housing;
a wireless transmitter attached to the housing;
a first light source attached to the top surface of the housing, in which the first light source is operable to emit light of a first frequency; and
a second light source attached to the top surface of the housing at least one foot from the first light source, in which the second light source is configured to emit light of a second frequency which is different from the first frequency.

20. The apparatus of 19 in which the processor is operable to:
conduct gambling games; and
alter the course of a gambling game based on wireless signals received at the wireless receiver.

(19)日本国特許庁(JP)　(12)公表特許公報(A)　(11)特許出願公表番号
特表2010-528716
(P2010-528716A)
(43)公表日　平成22年8月26日(2010.8.26)

(51)Int.Cl.		F I			テーマコード（参考）
A63F 13/00	(2006.01)	A63F	13/00	F	2C001
A63F 13/06	(2006.01)	A63F	13/06		

審査請求 未請求　予備審査請求 未請求　（全 195 頁）

(21)出願番号	特願2010-510470 (P2010-510470)
(86)(22)出願日	平成20年5月28日 (2008.5.28)
(85)翻訳文提出日	平成22年1月27日 (2010.1.27)
(86)国際出願番号	PCT/US2008/065000
(87)国際公開番号	WO2008/150809
(87)国際公開日	平成20年12月11日 (2008.12.11)
(31)優先権主張番号	11/754,944
(32)優先日	平成19年5月29日 (2007.5.29)
(33)優先権主張国	米国 (US)

(71)出願人　506361856
シーエフピーエイチ，　エル．エル．シー．
アメリカ合衆国　ニューヨーク州　１００２２　ニューヨーク　イースト・５９ス・ストリート　１１０
(74)代理人　100070150
弁理士　伊東　忠彦
(74)代理人　100091214
弁理士　大貫　進介
(74)代理人　100107766
弁理士　伊東　忠重

最終頁に続く

(54)【発明の名称】手のモーションコントロールを有するゲーム

(57)【要約】
様々な実施形態において、リストバンドのモーションがゲームをコントロールするために用いられる。第１の装置から第１のワイヤレス信号を受信する工程と、第２の装置から第２のワイヤレス信号を受信する工程と、前記第１のワイヤレス信号から、第１のプレーヤ識別子を決定する工程と、前記第２のワイヤレス信号から、第２のプレーヤ識別子を決定する工程と、プレーヤに自身を同定させるように要求するメッセージを表示する工程と、触知性の入力部を介して、第３のプレーヤの識別子の指示を受信する工程と、前記第３のプレーヤの識別子が前記第１のプレーヤの識別子と一致することを決定する工程と、前記第１の装置から第３のワイヤレス信号を受信する工程と、前記第３のワイヤレス信号を、ギャンブルゲームにおけるコマンドとして解釈する工程と、前記ギャンブルゲームにおける前記コマンドを実行する工程とを含む方法を提供する。
【選択図】なし

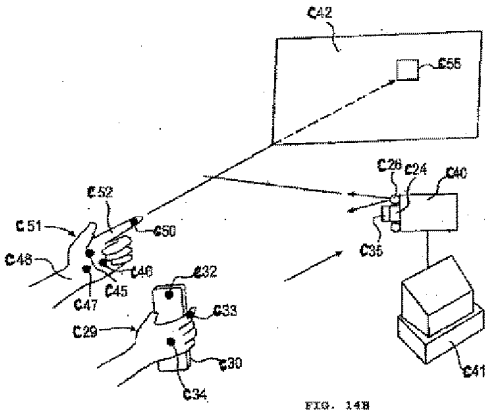


FIG. 14B

Petitioner Exhibit 1002-2543

【特許請求の範囲】
【請求項1】
第１の装置から第１のワイヤレス信号を受信する工程と、
第２の装置から第２のワイヤレス信号を受信する工程と、
前記第１のワイヤレス信号から、第１のプレーヤ識別子を決定する工程と、
前記第２のワイヤレス信号から、第２のプレーヤ識別子を決定する工程と、
プレーヤに自身を同定させるように要求するメッセージを表示する工程と、
触知性の入力部を介して、第３のプレーヤの識別子の指示を受信する工程と、
前記第３のプレーヤの識別子が前記第１のプレーヤの識別子と一致することを決定する工程と、
前記第１の装置から第３のワイヤレス信号を受信する工程と、
前記第３のワイヤレス信号を、ギャンブルゲームにおけるコマンドとして解釈する工程と、
前記ギャンブルゲームにおける前記コマンドを実行する工程と
を含む、方法。
【請求項2】
前記第１の装置は、（ａ）リストバンド、（ｂ）時計、（ｃ）ブレスレット、（ｄ）アームバンド、および（ｅ）携帯ゲーム装置のうちの１つである、請求項１に記載の方法。
【請求項3】
前記第１のワイヤレス信号から、第１のプレーヤの識別子を決定する工程が、前記第１のワイヤレス信号から、第１のプレーヤの名前を決定する工程を含む、請求項１に記載の方法。
【請求項4】
前記第１のプレーヤの識別子および前記第２のプレーヤの識別子が異なるプレーヤに対応する、請求項１に記載の方法。
【請求項5】
前記触知性の入力部を介して、第３のプレーヤの識別子の指示を受信する工程が、第３のプレーヤの識別子の指示を受信する工程を含み、前記第３のプレーヤの識別子はボタンを用いて入力される、請求項１に記載の方法。
【請求項6】
前記触知性の入力部を介して、第３のプレーヤの識別子の指示を受信する工程が、第３のプレーヤの識別子の指示を受信する工程を含み、前記第３のプレーヤの識別子はジョイスティックを用いて入力される、請求項１に記載の方法。
【請求項7】
前記触知性の入力部を介して、第３のプレーヤの識別子の指示を受信する工程が、第３のプレーヤの識別子の指示を受信する工程を含み、前記第３のプレーヤの識別子はタッチスクリーンを用いて入力される、請求項１に記載の方法。
【請求項8】
前記触知性の入力部を介して、第３のプレーヤの識別子の指示を受信する工程が、第３のプレーヤの識別子の指示を受信する工程を含み、前記第３のプレーヤの識別子はトラックボールを用いて入力される、請求項１に記載の方法。
【請求項9】
前記第３のワイヤレス信号は、前記第１の装置によってなされる一連のモーションをエンコードする、請求項１に記載の方法。
【請求項10】
前記第３のワイヤレス信号を解釈する工程が、前記第３のワイヤレス信号を、ビデオポーカーのゲームにおいて、カードを捨てるコマンドとして解釈する工程を含む、請求項１に記載の方法。
【請求項11】

Petitioner Exhibit 1002-2544

前記第３のワイヤレス信号を解釈する工程が、前記第３のワイヤレス信号を、スロットマシンゲームを開始するコマンドとして解釈する工程を含む、請求項１に記載の方法。
【請求項12】
ループに形成されるバンドと、
前記バンドに取り付けられる電源と、
前記バンドに取り付けられるモーションセンサと、
前記バンドに取り付けられる電磁送信器と、
前記バンドに取り付けられるオーディオスピーカと、
前記バンドに取り付けられる触覚変換器と、
前記バンドに取り付けられるプロセッサと、
前記バンドに取り付けられる電磁受信器と
を備える、装置。
【請求項13】
前記触覚変換器は、前記プロセッサからの電気信号に応答して振動を生成するように動作可能である、請求項１２に記載の装置。
【請求項14】
前記モーションセンサが加速度計である、請求項１２に記載の装置。
【請求項15】
前記プロセッサは、
前記モーションセンサから、第１の電気信号を受信し、
前記第１の電気信号に基づいて、第１のギャンブルゲームのための第１のコマンドを決定し、
前記第１のコマンドを前記電磁送信器に送信し、
前記電磁送信器に、前記第１のコマンドを第１のゲーム装置に送信するようにさせるように動作可能である、請求項１２に記載の装置。
【請求項16】
前記プロセッサは、
前記電磁受信器によってワイヤレスで受信された命令を、前記電磁受信器から受信し、
前記モーションセンサから、第２の電気信号を受信し、
前記第２の電気信号に基づいて、第２のギャンブルゲームのための第２のコマンドを決定するために、前記命令に従い、
前記第２のコマンドを前記電磁送信器に送信し、
前記電磁送信器に、前記第２のコマンドをゲーム装置に送信するようにさせるように動作可能である、請求項１２に記載の装置。
【請求項17】
前記バンドに取り付けられるスイッチをさらに含む、請求項１２に記載の装置であって、
前記スイッチは２つの安定した位置を有し、
前記プロセッサは、前記スイッチの位置を検出し、かつ、前記スイッチが前記２つの安定した位置のうちの第１の位置にある場合にのみ、前記電磁送信器に信号を送信するようにさせるように動作可能である、装置。
【請求項18】
前記バンドに取り付けられる圧電センサをさらに備える、請求項１２に記載の装置。
【請求項19】
地面と平行する上表面を含むハウジングと、
前記ハウジング内に配置されたコインホッパーと、
前記ハウジングに取り付けられた紙幣鑑別機と、
前記ハウジングに取り付けられたディスプレイスクリーンと、
前記ハウジング内に配置されたプロセッサと、
前記ハウジングに取り付けられたワイヤレス受信器と、

Petitioner Exhibit 1002-2545

前記ハウジングに取り付けられたワイヤレス送信器と、
前記ハウジングの前記上表面に取り付けられ、第１の周波数の光を発するように動作可能である、第１の光源と、
前記ハウジングの前記上表面に取り付けられ、前記第１の光源から少なくとも１フィート離れ、前記第１の周波数とは異なる第２の周波数の光を発するように構成される、第２の光源と
を備える、装置。
【請求項20】
前記プロセッサは、
ギャンブルゲームを実行し、
前記ワイヤレス受信器において受信されたワイヤレス信号に基づいて、ギャンブルゲームを進行するように動作可能である、請求項１９に記載の装置。
【発明の詳細な説明】
【技術分野】
【0001】
本出願は、「Ｇａｍｅ　Ｗｉｔｈ　Ｈａｎｄ　Ｍｏｔｉｏｎ　Ｃｏｎｔｒｏｌ」と題された、２００７年５月２９日に出願の米国特許出願第１１／７５４，９４４号の優先権の利益を主張する。上述の出願の全体は本明細書において参照することにより援用される。本出願は手のモーションコントロールを有するゲームに関する。
【背景技術】
【0002】
本出願は手のモーションコントロールを有するゲームに関する。
【図面の簡単な説明】
【0004】
【図1】図１は、一部の実施形態に係るゲームシステムを示す。
【図2】図２は、一部の実施形態に係る通信ネットワークを示す。
【図3】図３は、一部の実施形態に係るゲーム通信装置と通信するゲームサービス・プロバイダを示す。
【図4】図４は、一部の実施形態に係るゲームネットワークを示す。
【図5】図５は、一部の実施形態に係るゲームシステムを示す。
【図6】図６は、一部の実施形態に係るワイヤレスゲームシステムを示す。
【図7】図７は、一部の実施形態に係る宣伝コンテンツを有する携帯ゲーム装置を示す。
【図8】図８は、一部の実施形態に係るゲームシステムのブロック図である。
【図9】図９は、一部の実施形態に係る、図８に示されるゲームシステムの一部を形成する支払いシステムのブロック図である。
【図10】図１０は、一部の実施形態に係る、図８に示されるゲームシステムの携帯ゲーム装置の概略図である。
【図11a】図１１（ａ）は、一部の実施形態に係る、プレーヤによる携帯ゲーム装置の使用方法のフロー図である。
【図11b】図１１（ｂ）は、一部の実施形態に係る、プレーヤによる携帯ゲーム装置の特定の使用方法のフロー図である。
【図12】図１２は、一部の実施形態に係る、ゲームサービス・オペレータによる、携帯ゲーム装置の使用方法のフロー図である。
【図13】図１３は、一部の実施形態に係る、携帯ゲーム装置の使用方法のフロー図である。
【図14a】いくつかの一カメラベースの実施形態を示す。
【図14b】いくつかの３－Ｄ（３次元の）検出の実施形態を示す。
【図14c】２つのカメラ「双眼鏡」ステレオカメラを備えるいくつかの実施形態を示す。
【図14d】いくつかの実施形態に従ういくつかのステップを示す。
【図14e】いくつかの実施形態に従うカラーマッピングのためのプロセスを示す。
【図15】いくつかの実施形態に従うマルチカメラコントロールシステムの実装のハードウ

Petitioner Exhibit 1002-2546

ェア構成要素、およびその物理的なレイアウトを示す。
【図16A】いくつかの実施形態に従う、カメラと図１５の様々な画像領域との間の幾何学的関係を示す。
【図16B】いくつかの実施形態に従う、図１５カメラのうちの１つに取り込まれた画像を示す。
【図17】いくつかの実施形態に従う、マルチカメラコントロールシステムと関連したマイクロコンピュータプログラム内で実行されるプロセスを示すフロー図である。
【図18】いくつかの実施形態に従う、図１７に示されたプロセスの一部分、特に、カメラによって取り込まれた画像信号から物体を検出してその位置を抽出することに関係するプロセスをより詳細に示すフロー図である。
【図19A】いくつかの実施形態に従う、カメラによって取得され、図１８に示されるプロセスの一部によって生成された、グレースケールビットマップ画像として提示されたサンプル画像データを示す。
【図19B】いくつかの実施形態に従う、図１８に示されるプロセスの一部によって生成されたグレースケールビットマップ画像として提示されたサンプル画像データを示す。
【図19C】いくつかの実施形態に従う、図１８に示されるプロセスの一部によって生成されたグレースケールビットマップ画像として提示されたサンプル画像データを示す。
【図19D】いくつかの実施形態に従う、図１８に示されるプロセスの一部によって生成されたグレースケールビットマップ画像として提示されたサンプル画像データを示す。
【図19E】いくつかの実施形態に従う、図１８に示されるプロセスの一部によって生成された、サンプル中の追跡されている物体に属する可能性が高い画素を識別するバイナリのビットマップ画像として提示されたサンプルデータを示す。
【図20】いくつかの実施形態に従う、図１８に記載されるプロセスの一部、特に追跡されている物体に属する可能性が高いとして識別された画素のマップが与えられたとき、例えば図１９Ｅに示されるデータが与えられたとき、その物体を分類して識別することに関係するプロセスをより詳細に示すフロー図である。
【図21A】いくつかの実施形態に従う、図２０に示されるプロセスがこのサンプル中で物体に属するとして選択したデータサンプルの識別とともに、図１９Ｅに提示される、バイナリのビットマップ画像として提示されたサンプルデータを示す。
【図21B】いくつかの実施形態に従う、図２０に概略が示されたプロセスが、物体に属するとして選択したデータサンプルの識別とともに、棒グラフとして提示された図１９Ｅに提示されるサンプルデータを示す。グラフの中の特定の点が識別されている。
【図21C】いくつかの実施形態に従う、物体およびこのサンプルにおけるその物体の鍵となる部分に属するとして図２０に示されるプロセスが選択したデータサンプルの識別とともに、バイナリのビットマップ画像として提示された異なるセットのサンプルデータを示す。
【図22】いくつかの実施形態に従う、図１８に示されるプロセスの一部、特に、物体が塞いでいるバックグラウンド領域の記載を発生および維持することに関係するプロセスをより詳細に示すフロー図である。
【図23A】いくつかの実施形態に従う、式３が基礎を置く配置、すなわち物体が検知された画像面上の位置が与えられたときに、カメラの視野内でのその物体の位置を画定する角度を示す。
【図23B】いくつかの実施形態に従う、式４、５および６が基礎を置く配置、すなわちカメラの位置と追跡されている物体との間の関係を示す。
【図24】いくつかの実施形態に従う、式８、すなわち位置を精緻化するために、物体の位置の変化が与えられたときに座標に加えられてもよい減衰量を示すグラフである。
【図25A】いくつかの実施形態に従う、注目する物体が画面ポインタを二次元でコントロールするシステムによってコントロールされるアプリケーションプログラムの一例である。
【図25B】いくつかの実施形態に従う、現実の座標と図２５Ａのアプリケーションプログ

Petitioner Exhibit 1002-2547

ラムによって使用される画面座標との間のマッピングを示す。
【図26A】いくつかの実施形態に従う、注目する物体が三次元のバーチャル・リアリティ環境内で画面ポインタをコントロールする、マルチカメラコントロールシステムによってコントロールされるアプリケーションプログラムの一例である。
【図26B】いくつかの実施形態に従う、注目する物体が三次元のバーチャル・リアリティ環境内で画面ポインタをコントロールする、マルチカメラコントロールシステムによってコントロールされるアプリケーションプログラムの一例である。
【図27A】いくつかの実施形態に従う、起動しようとする意図と関連していてもよいジェスチャを識別するためのジェスチャ検出方法によって使用される検出面への、領域の分割を示す。
【図27B】カーソル方向を選択することに関連していてもよいジェスチャを識別するためのジェスチャ検出方法によって使用される検出ボックスへの、いくつかの実施形態に従う注目する領域の分割を示す。
【図27C】いくつかの実施形態に従う、カーソル方向を選択することと関連していてもよいジェスチャを識別するためのジェスチャ検出によって使用される方向検出ボックスへの、領域の代替的な分割を示す。
【図27D】いくつかの実施形態に従う、図２７Ｃの隣あう区画の関係をより詳細に示す。
【図28】装置がニュートラル位置にある状態の、いくつかの実施形態に従う装置の外観を示す。
【図29】いくつかの実施形態に従う、図２８の実装の内部構造の一例を示す。
【図30】いくつかの実施形態に従う、別の例示的な実装に係る方法を示す流れ図である。
【図31】図３１Ａ～図３１Ｄは、いくつかの実施形態に従う、ニュートラル軸の周りに画定される傾斜領域の例を示す。
【図32】いくつかの実施形態に従う、別の例示的な実装に係る例示的な装置の外側上面図を示す。
【図33】図３３Ａ～３３Ｅは、いくつかの実施形態に従う、例示的なインジケータを示す。
【図34】図３４Ａおよび３４Ｂは、いくつかの実施形態に従う、それぞれ、ニュートラル位置で示された図３２の装置の正面図および側面図を示す。
【図35】図３５Ａおよび３５Ｂは、いくつかの実施形態に従う、図３２の装置がそれぞれネガティブロール配向およびポジティブロール配向で操作される状態の図３２の装置の正面図を示す。
【図36】図３６Ａおよび３６Ｂは、いくつかの実施形態に従う、図３２の装置がそれぞれポジティブピッチ配向およびネガティブピッチ配向で操作される状態の図３２の装置の側面図を示す。
【図37】いくつかの実施形態に従う、コントロールが選択されたときの出力である文字およびケースに対応する信号を出力するために使用される装置配向の１つの可能なマッピングを示す表である。
【図38】図３８Ａおよび３８Ｂは、いくつかの実施形態に従う、別の例示的な実装に従って表示されるシンボルのメニューを示す。
【図39】いくつかの実施形態に従う、ゲームシステムＦ１を示す外観図である。
【図40】図３９に示されるゲーム装置Ｆ３の機能ブロック図である。
【図41】図３９に示されるコントローラＦ７の外観を示す斜視図である。
【図42】コアユニットＦ７０に接続しようとされている、またはコアユニットＦ７０から切断されようとしている図４１に示されるコントローラＦ７の接続ケーブルＦ７９の状態を示す斜視図である。
【図43】上方後ろ側から見た図４１に示されるコアユニットＦ７０の斜視図である。
【図44】底面の正面側から見た図４１に示されるコアユニットＦ７０の斜視図である。
【図45】図４１に示されるコアユニットＦ７０の上側のケーシングが取り外されている状態を示す斜視図である。

Petitioner Exhibit 1002-2548

【図46】図４１に示されるコアユニットＦ７０の下側のケーシングが取り外されている状態を示す斜視図である。
【図47】図４１に示されるサブユニットＦ７６第１の例を示す斜視図である。
【図48】図４７に示されるサブユニットＦ７６の上側のケーシングが取り外されている状態の斜視図である。
【図49】図４９Ａ、４９Ｂ、および４９Ｃは、図４１に示されるサブユニットＦ７６の第２の例の、それぞれ上面図、底面図および左側面図である。
【図50】上方前側から見た図４１に示されるサブユニットＦ７６の斜視図である。
【図51】図４１に示されるサブユニットＦ７６の第１の変形の一例を示す上面図である。
【図52】図４１に示されるサブユニットＦ７６の第２の変形の一例を示す上面図である。
【図53】図４１に示されるサブユニットＦ７６の第３の変形の一例を示す上面図である。
【図54】図４１に示されるサブユニットＦ７６の第４の変形の一例を示す上面図である。
【図55】図４１に示されるコントローラＦ７の構造を示すブロック図である。
【図56】図４１に示されるコントローラＦ７を用いてコントロールされているゲームの状態を示す略図である。
【図57】コアユニットＦ７０の前面側から見た場合の、右手でコアユニットＦ７０を保持しているプレーヤの例示的な状態を示す。
【図58】コアユニットＦ７０の左側から見た場合の、右手でコアユニットＦ７０を保持しているプレーヤの例示的な状態を示す。
【図59】ＬＥＤモジュールＦ８Ｌの視角、ＬＥＤモジュールＦ８Ｒの視角、および画像ピックアップエレメントＦ７４３の視角を示す略図である。
【図60】サブユニットＦ７６の右側から見た場合の、左手でサブユニットＦ７６を保持しているプレーヤの例示的な状態を示す。
【図61】ゲーム装置Ｆ３がシューティングゲームを実行しているときにモニタＦ２上に表示される例示的なゲーム画像を示す。

Petitioner Exhibit 1002-2549

【図1】

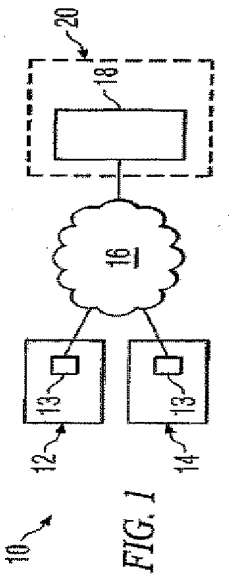


FIG. 1

【図2】

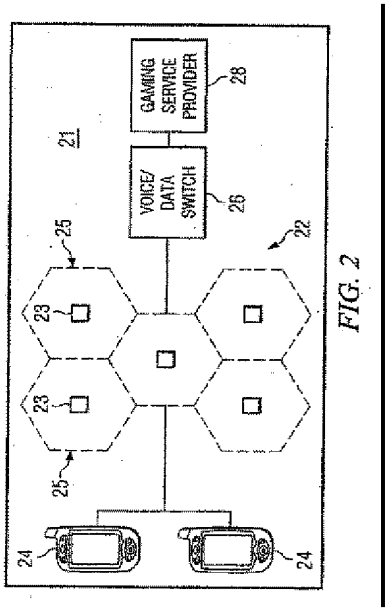

GAMING SERVICE PROVIDER
28
21
VOICE/ DATA SWITCH
26
22
25
23
23
25
24
24

FIG. 2

【図3】

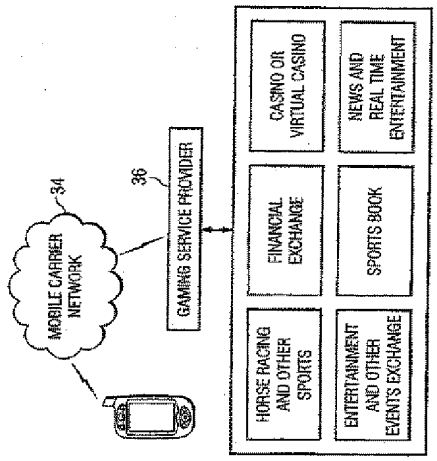

MOBILE CARRIER NETWORK
34
36
GAMING SERVICE PROVIDER
HORSE RACING AND OTHER SPORTS
FINANCIAL EXCHANGE
CASINO OR VIRTUAL CASINO
ENTERTAINMENT AND OTHER EVENTS EXCHANGE
SPORTS BOOK
NEWS AND REAL TIME ENTERTAINMENT

FIG. 3

【図4】

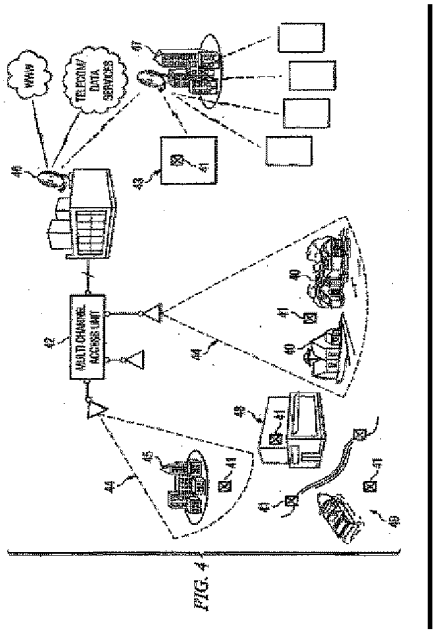


FIG. 4

【図5】

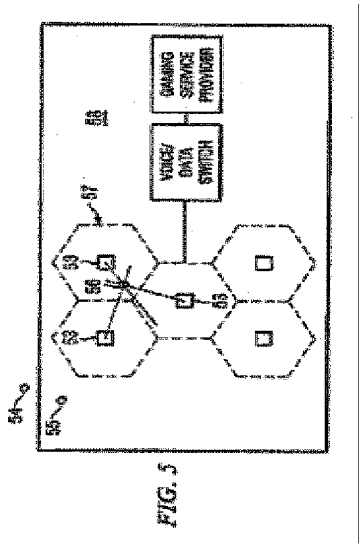

GAMING SERVICE PROVIDER
VOICE/ DATA SWITCH
50
57
53
56
52
54
55

FIG. 5

【図6】

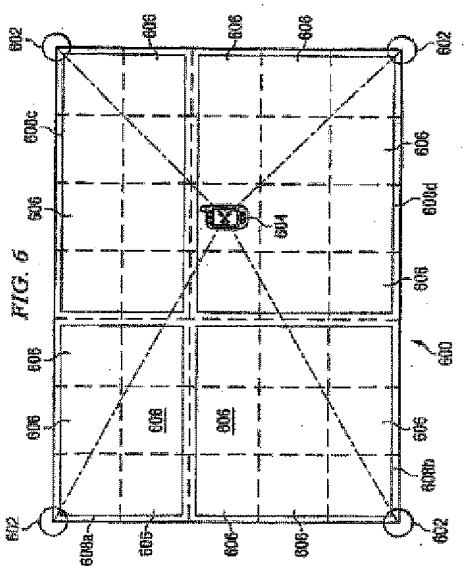

602
606
606
606
602
608c
606
606
604
606
608d
608
606
650
606
606
606
606
608b
602
608a
606
606
606
602

FIG. 6

【図7】

この図は公序良俗違反のため不掲載とする

【図8】

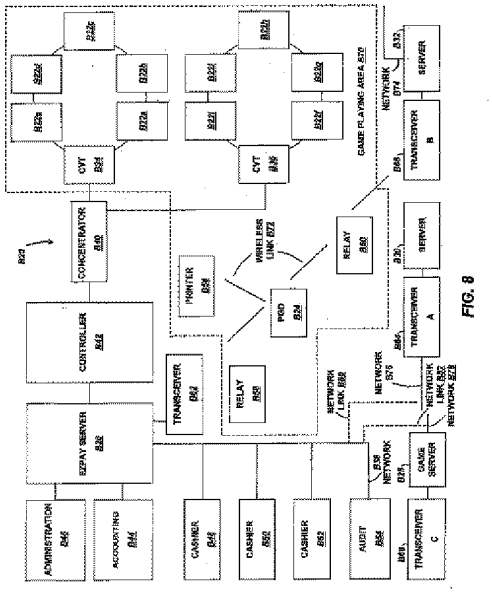

GAME PLAYING AREA 870
CVT
CONCENTRATOR
WIRELESS LINK 872
RELAY
POD
TRANSCEIVER A
SERVER
NETWORK 874
TRANSCEIVER B
CONTROLLER
TRANSCEIVER
RELAY
NETWORK LINK 880
NETWORK LINK 882
NETWORK LINK 878
GAME SERVER
NETWORK
CVT
TRANSCEIVER C
AUDIT
CASHIER
CASHIER
CASHIER
ACCOUNTING
ADMINISTRATION

FIG. 8

【図9】

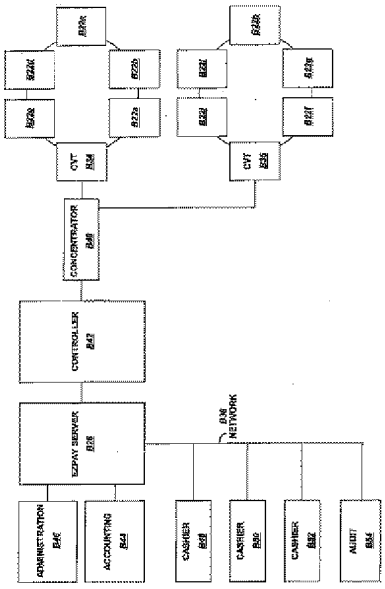

CONCENTRATOR
CONTROLLER
EZPAY SERVER
ADMINISTRATION
ACCOUNTING
CASHIER
CASHIER
CASHIER
AUDIT
CVT
CVT

FIG. 9

【図10】

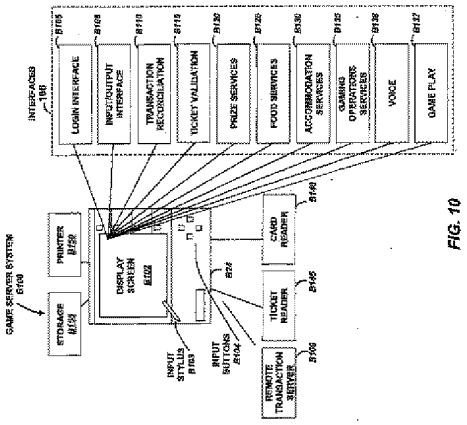
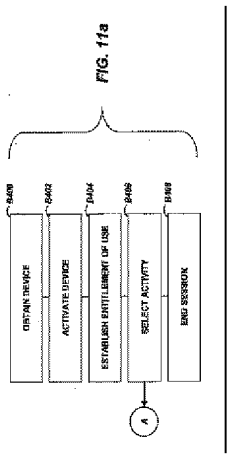
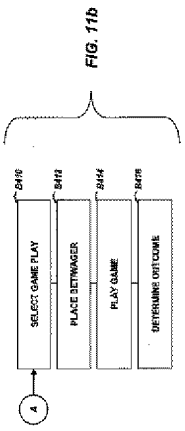

INTERFACES
LOGIN INTERFACE
INPUT/OUTPUT INTERFACE
TRANSACTION RECONCILIATION
TICKET VALIDATION
PRIZE SERVICES
FOOD SERVICES
ACCOMMODATION SERVICES
GAMING OPERATIONS SERVICES
VOICE
GAME PLAY
GAME SERVER SYSTEM
PRINTER
STORAGE
DISPLAY SCREEN
CARD READER
TICKET READER
INPUT SYSTEM
INPUT BUTTONS
REMOTE TRANSACTION SYSTEM

FIG. 10

【図11a】


FIG. 11a
OBTAIN DEVICE
ACTIVATE DEVICE
ESTABLISH ENTITLEMENT OF USE
SELECT ACTIVITY
END SESSION
A

【図11b】


FIG. 11b
SELECT GAME PLAY
PLACE WAGER
PLAY GAME
DETERMINE OUTCOME
A

【図12】

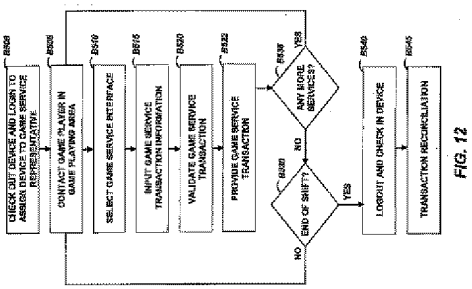

CHECK OUT DEVICE AND LOGIN TO ASSIGN DEVICE TO GAME SERVICE REPRESENTATIVE
CONTACT GAME PLAYER IN GAME PLAYING AREA
SELECT GAME SERVICE INTERFACE
INPUT GAME SERVICE TRANSACTION INFORMATION
VALIDATE GAME SERVICE TRANSACTION
PROVIDE GAME SERVICE TRANSACTION
ANY MORE SERVICES?
YES
NO
END OF SHIFT?
YES
NO
LOGOUT AND CHECK IN DEVICE
TRANSACTION RECONCILIATION

FIG. 12

【図13】

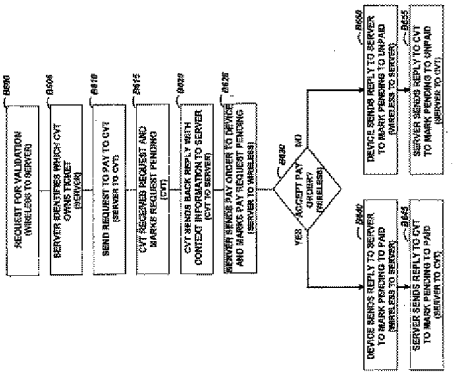

REQUEST FOR VALIDATION (WIRELESS TO SERVER)
SERVER IDENTIFIES WHICH CVT OWNS TICKET (SERVER)
SEND REQUEST TO PAY TO CVT (SERVER TO CVT)
CVT REGARDS REQUEST AND MARKS REQUEST PENDING (CVT)
CVT SENDS BACK REPLY WITH CONTEXT INFORMATION TO SERVER (CVT TO SERVER)
SERVER SENDS PAY ORDER TO DEVICE AND MARKS PAY REQUEST PENDING (SERVER TO WIRELESS)
ACCEPT PAY ORDER? (WIRELESS)
YES
NO
DEVICE SENDS REPLY TO SERVER TO MARK PENDING TO PAID (WIRELESS TO SERVER)
SERVER SENDS REPLY TO CVT TO MARK PENDING TO PAID (SERVER TO CVT)
DEVICE SENDS REPLY TO SERVER TO MARK PENDING TO UNPAID (WIRELESS TO SERVER)
SERVER SENDS REPLY TO CVT TO MARK PENDING TO UNPAID (SERVER TO CVT)

FIG. 13

【図14A】

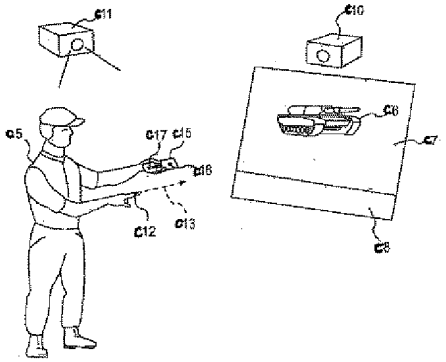


FIG. 14A

Petitioner Exhibit 1002-2564

【図14B】

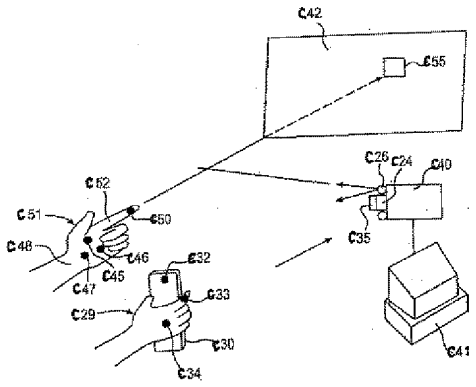

C42
C55
C26
C24
C40
C62
C51
C50
C48
C46
C32
C45
C47
C33
C29
C30
C34
C35
C41

FIG. 14B

【図14C】

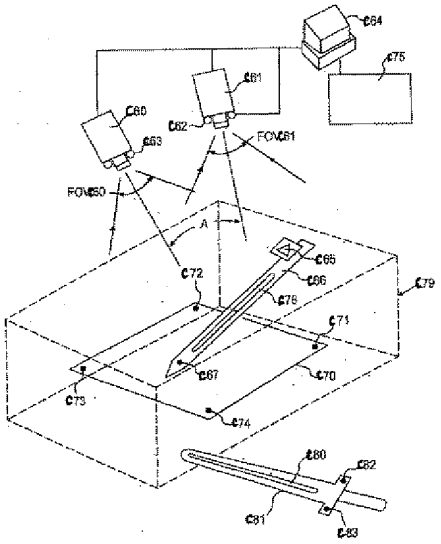

64
75
61
60
62
63
FOV61
FOV60
A
72
65
66
76
79
71
67
70
73
74
80
82
81
83

FIG. 14C

【図14D】

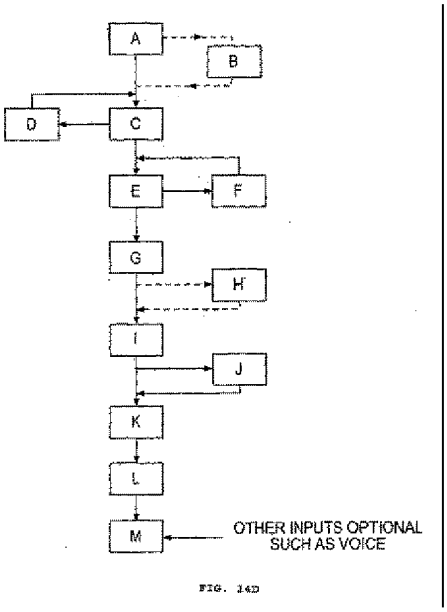


FIG. 14D

【図14E】

MAPPING ONE RGB COMPONENT OF A COLOR
HERE, THE RED COMPONENT IS USED. THE SAME
PROCESS CAN BE USED FOR THE GREEN AND BLUE
COMPONENTS AS WELL.

Ar - IS THE RED COMPONENT OF THE AQUA COLOR

Or - IS THE RED COMPONENT OF THE ORANGE COLOR

Pr - IS THE RED COMPONENT OF THE PIXEL COLOR

Cr - IS THE RED COMPONENT OF THE COLOR ADJUSTED
TO BE BETWEEN A AND O

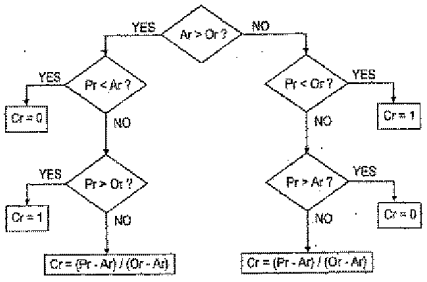


FIG. 14E

【図15】

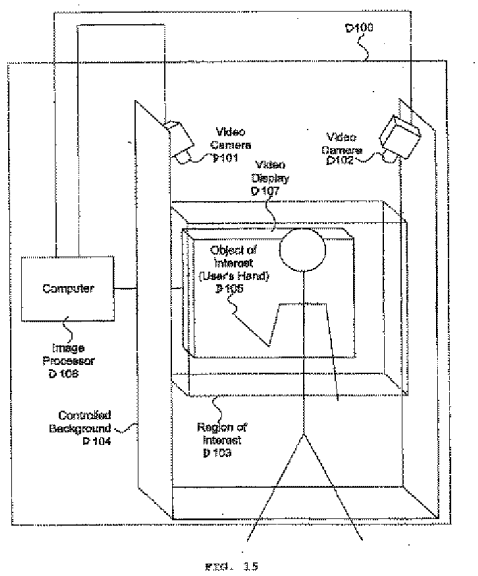

D100
Video Camera D101
Video Camera D102
Video Display D107
Object of Interest (User's Hand) D105
Computer
Image Processor D106
Controlled Background D104
Region of Interest D103

FIG. 15

【図16A】

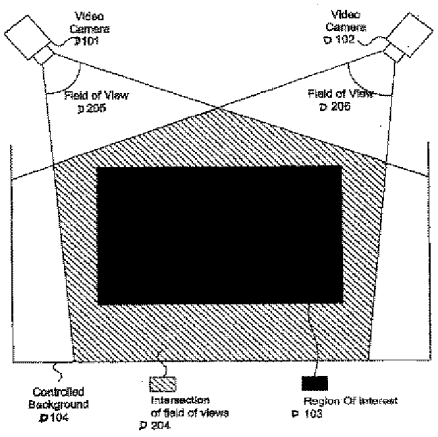

Video Camera 101
Video Camera 102
Field of View 205
Field of View 205
Controlled Background 104
Intersection of field of views 204
Region Of Interest 103

FIG. 16A

【図16B】

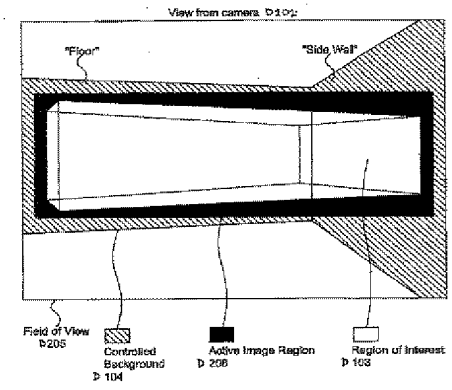

View from camera 102
"Floor"
"Side Wall"
Field of View 205
Controlled Background 104
Active Image Region 206
Region of Interest 103

FIG. 16B

【図17】

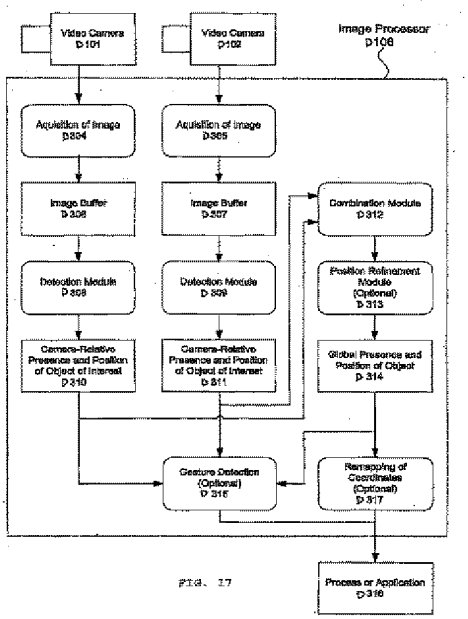

Video Camera
P 101
Video Camera
P102
Image Processor
P106
Acquisition of Image
P304
Acquisition of Image
P305
Image Buffer
P 306
Image Buffer
P 307
Combination Module
P 312
Detection Module
P 308
Detection Module
P 309
Position Refinement Module (Optional)
P 313
Camera-Relative Presence and Position of Object of Interest
P 310
Camera-Relative Presence and Position of Object of Interest
P 311
Global Presence and Position of Object
P 314
Gesture Detection (Optional)
P 316
Remapping of Coordinates (Optional)
P 317
Process or Application
P 318

FIG. 17

【図18】

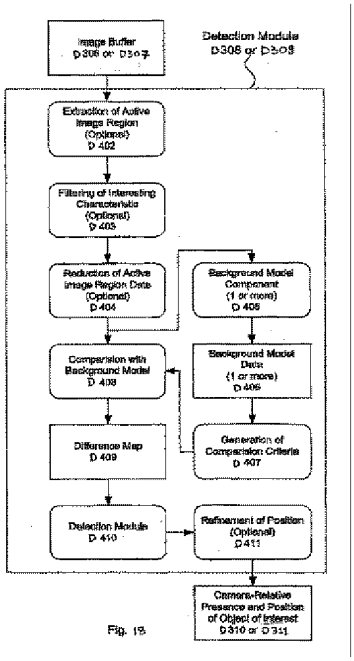

Image Buffer
D306 or D307
Detection Module
D308 or D309
Extraction of Active Image Region (Optional) D 402
Filtering of Interesting Characteristics (Optional) D 403
Reduction of Active Image Region Data (Optional) D 404
Background Model Component (1 or more) D 405
Comparision with Background Model D 408
Background Model Data (1 or more) D 406
Difference Map D 409
Generation of Comparision Criteria D 407
Detection Module D 410
Refinement of Position (Optional) D 411
Camera-Relative Presence and Position of Object of Interest D 310 or D 311

Fig. 18

【図19A】



Raw Image
Fig. 19A

Petitioner Exhibit 1002-2574

【図19B】



Filtered Image
Fig. 19B

【図19C】



Low-Value Threshold
Fig. 19c

【図19D】

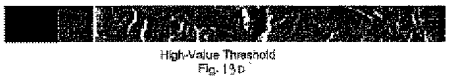
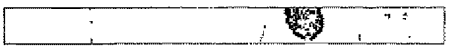


Fig. 19D

Petitioner Exhibit 1002-2577

【図19E】



Binary Difference
Fig. 19E

【図20】

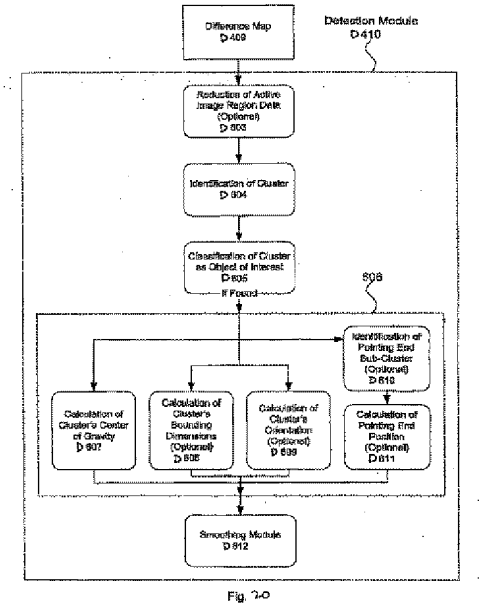
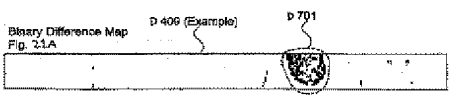
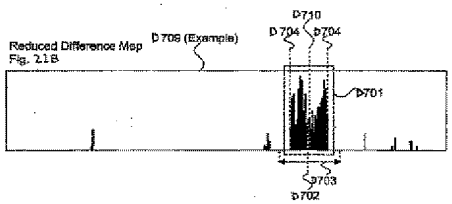

Difference Map
D 409
Detection Module
D 410
Reduction of Active Image Region Data (Optional)
D 803
Identification of Cluster
D 804
Classification of Cluster as Object of Interest
D 805
If Found
808
Identification of Pointing End Sub-Cluster (Optional)
D 810
Calculation of Cluster's Center of Gravity
D 807
Calculation of Cluster's Bounding Dimensions (Optional)
D 808
Calculation of Cluster's Orientation (Optional)
D 809
Calculation of Pointing End Position (Optional)
D 811
Smoothing Module
D 812

Fig. 20

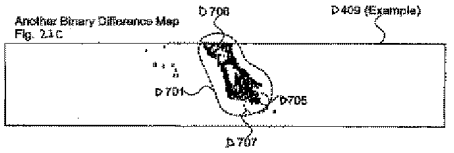
【図21A】



【図21B】


Reduced Difference Map
Fig. 21B
D709 (Example)
D710
D704
D704
D701
D703
D702

【図21C】


Another Binary Difference Map
Fig. 21C
D706
D409 (Example)
D701
D705
D707

【図22】

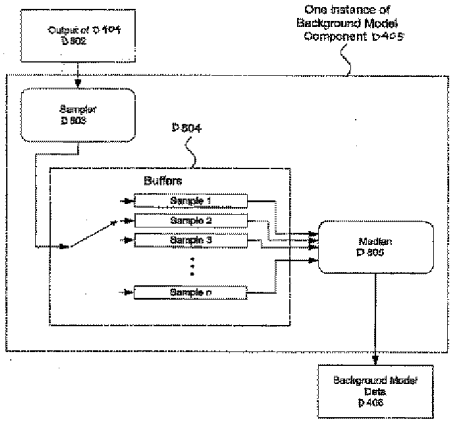

Output of D 404
D 802
One instance of
Background Model
Component D 405
Sampler
D 803
D 804
Buffers
Sample 1
Sample 2
Sample 3
Sample n
Median
D 806
Background Model
Data
D 408

Fig. 22.

【図A】

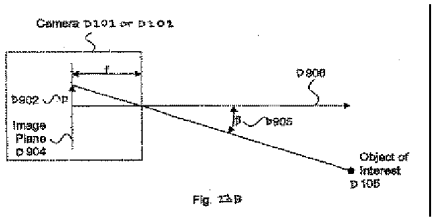

Camera D101 or D101
f
D902
P
Image
Plane
D904
β
D905
D906
Object of
Interest
D108

Fig. 9A

【図B】

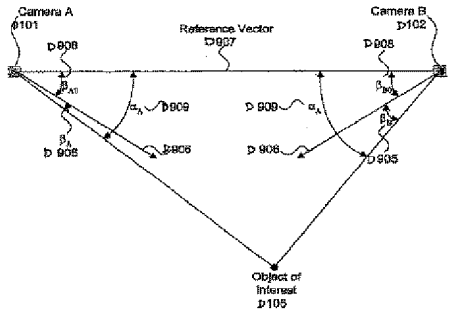


Fig. 23B

【図24】

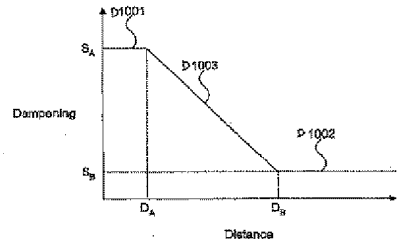


Fig. 24

【図25A】

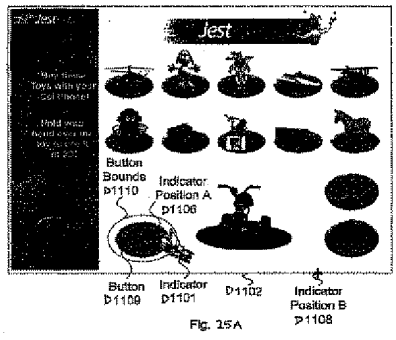
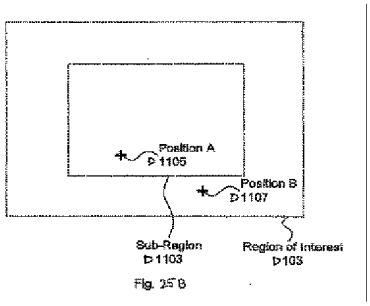

Jest
Button Bounds P1110
Indicator Position A P1106
Button P1109
Indicator P1101
P1102
Indicator Position B P1108

Fig. 25A

【図25B】


Position A
P1105
Position B
P1107
Sub-Region
P1103
Region of Interest
P103
Fig. 25B

【図26A】

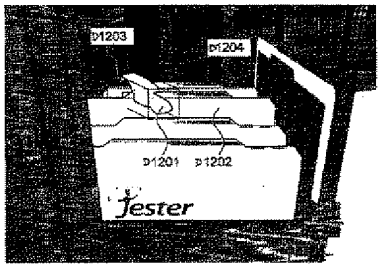


Fig. 26A

【図26B】

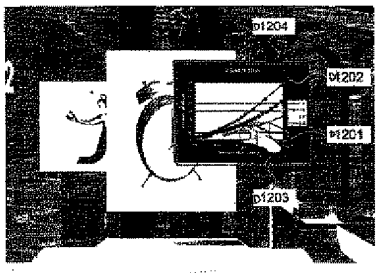


Fig. 26B

【図27A】

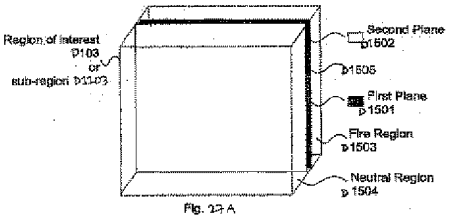

Region of Interest
1103
or
sub-region 1103
Second Plane
1502
1505
First Plane
1501
Fire Region
1503
Neutral Region
1504

Fig. 27A

【図27B】

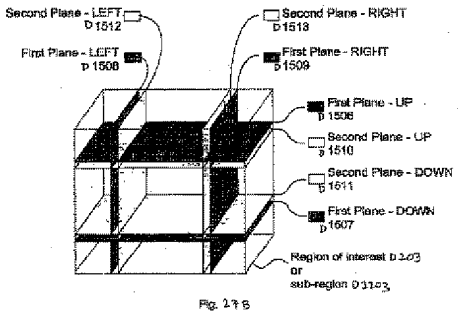
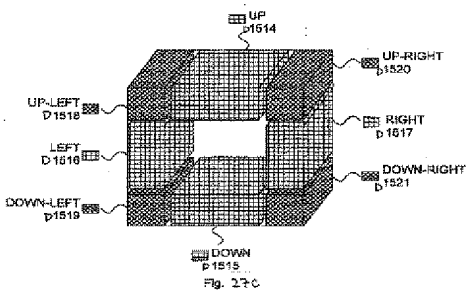

Second Plane - LEFT
1512
Second Plane - RIGHT
1513
First Plane - LEFT
1508
First Plane - RIGHT
1509
First Plane - UP
1506
Second Plane - UP
1510
Second Plane - DOWN
1511
First Plane - DOWN
1507
Region of interest 1503
or
sub-region 1503'

Fig. 27B

【図27C】


UP
p1514
UP-RIGHT
p1520
UP-LEFT
p1518
RIGHT
p1517
LEFT
p1516
DOWN-RIGHT
p1521
DOWN-LEFT
p1519
DOWN
p1515
Fig. 27C

【図27D】

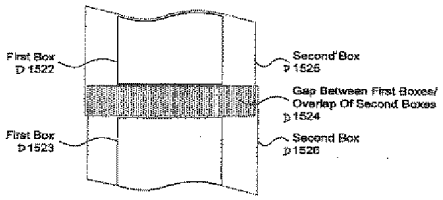

First Box
p1522
First Box
p1523
Second Box
p1525
Gap Between First Boxes/
Overlap Of Second Boxes
p1524
Second Box
p1526

Fig. 27D

【図28】

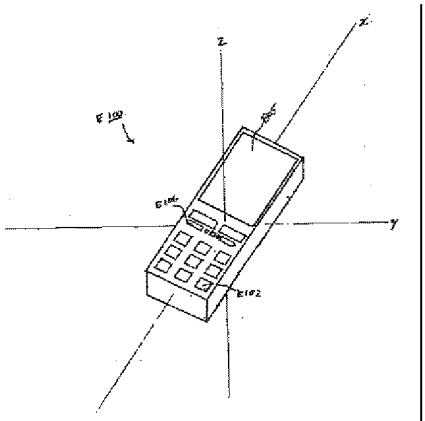


FIG. 28

Petitioner Exhibit 1002-2595

【図29】

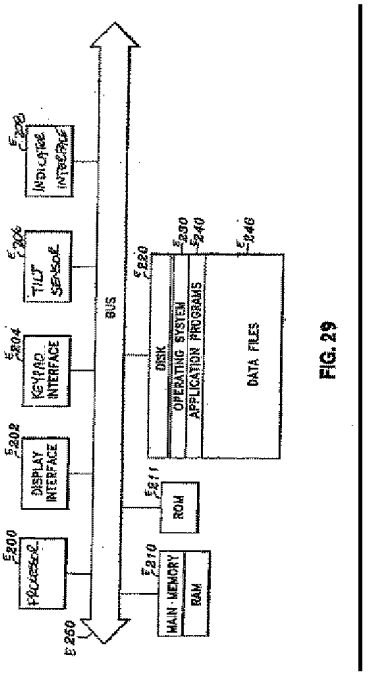
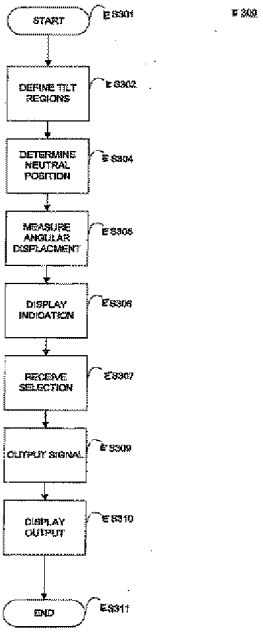

BUS
DISK
OPERATING SYSTEM
APPLICATION PROGRAMS
DATA FILES
ROM
MAIN MEMORY
RAM
DISPLAY INTERFACE
KEYPAD INTERFACE
TILT SENSOR

FIG. 29

【図30】

FIGURE 30



【図31A】

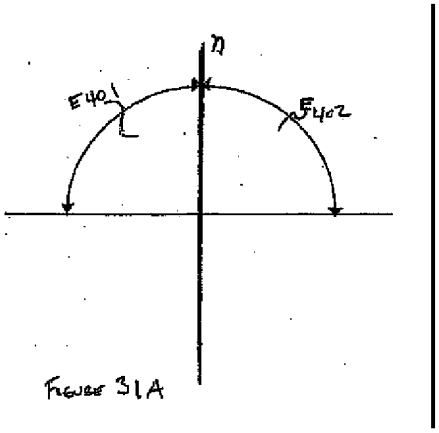


FIGURE 31A

【図31B】

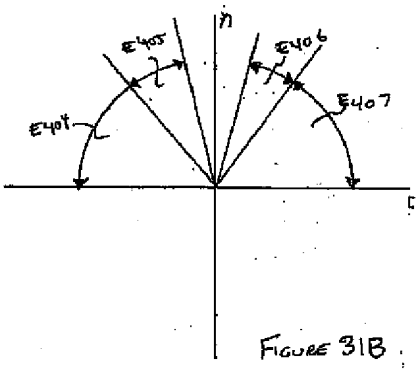
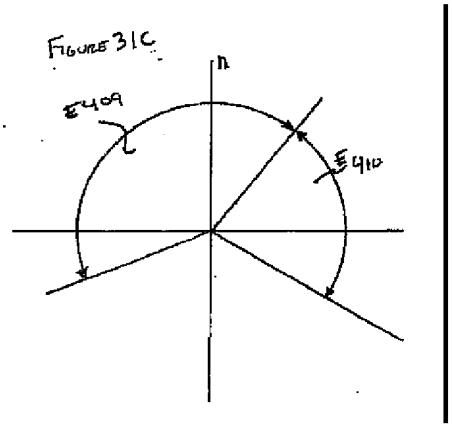
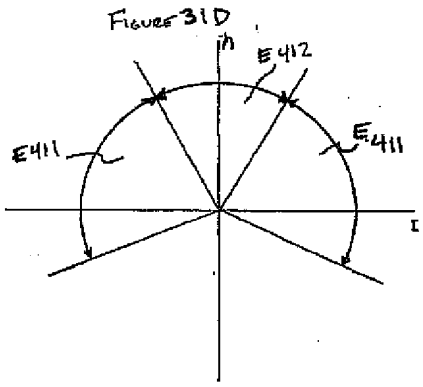


FIGURE 31B

【図31C】



【図31D】



【図32】

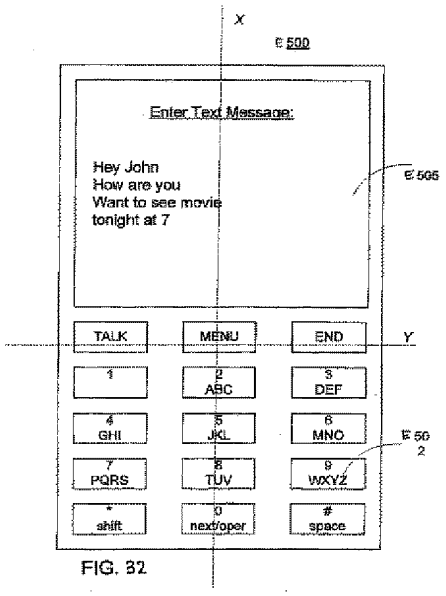

X
500
Enter Text Message:
Hey John
How are you
Want to see movie
tonight at 7
505
TALK
MENU
END
Y
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
502
* shift
0 next/oper
space

FIG. 32

【図33A】

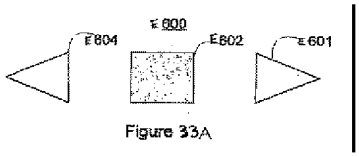


Figure 33A

【図33B】

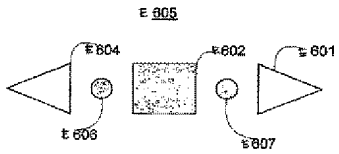


Figure 33B

【図33C】

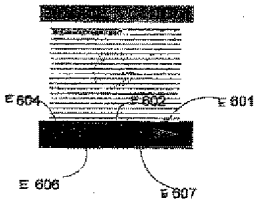


Figure 33C

【図33D】

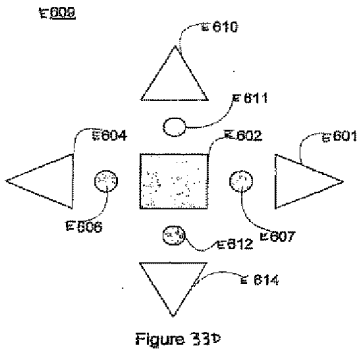


Figure 33D

【図33E】

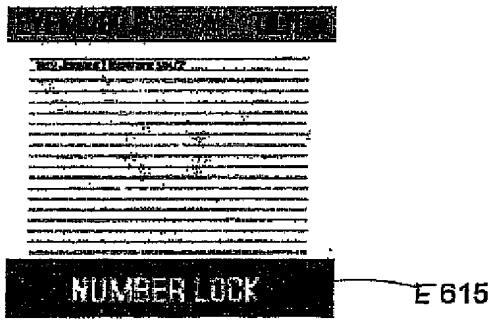


Figure 33E

【図34A】

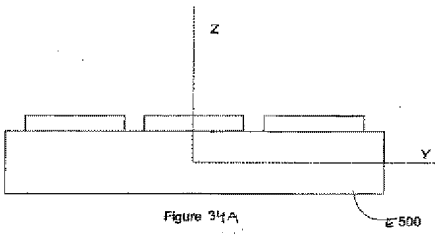


Figure 34A

【図34B】

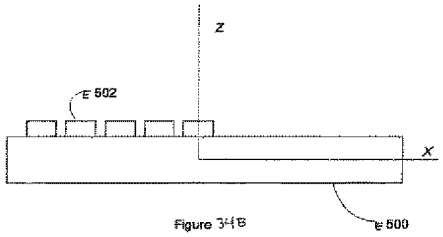


Figure 34B

【図35A】

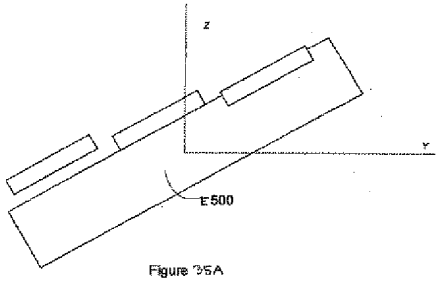


Figure 35A

【図35B】

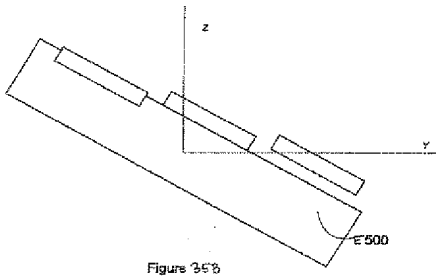


Figure 35B

【図36A】

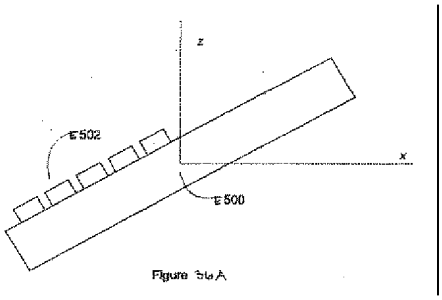


Figure 36A

【図36B】

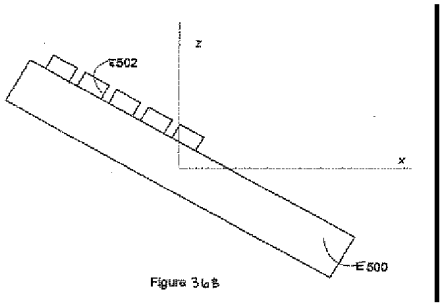


Figure 36B

【図37】

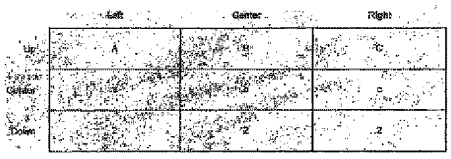


Figure 37

【図38A】

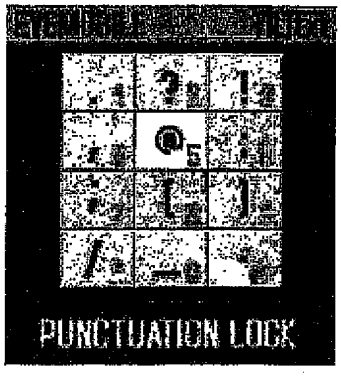


Figure. 38A

【図38B】

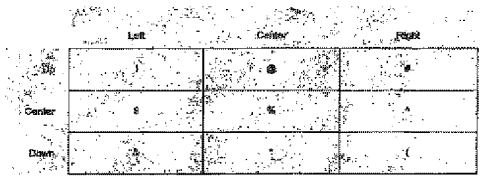
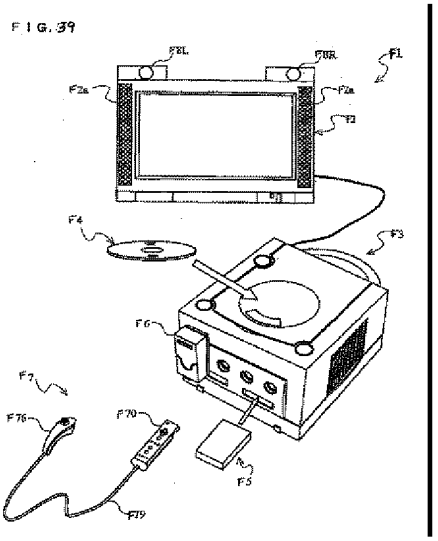
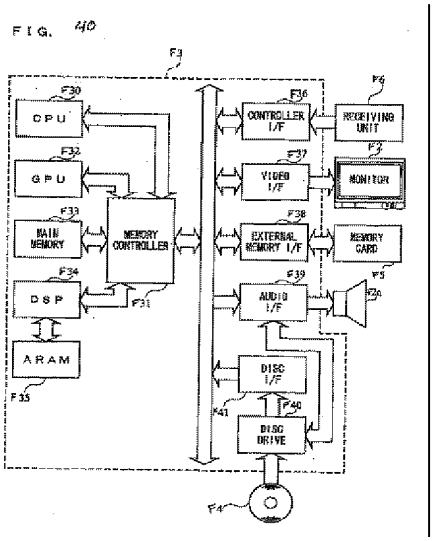


Figure 38B

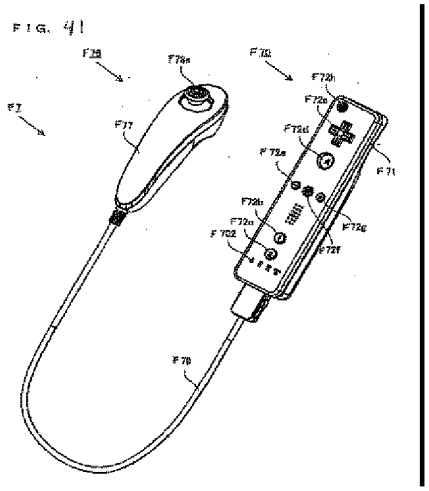
【図39】



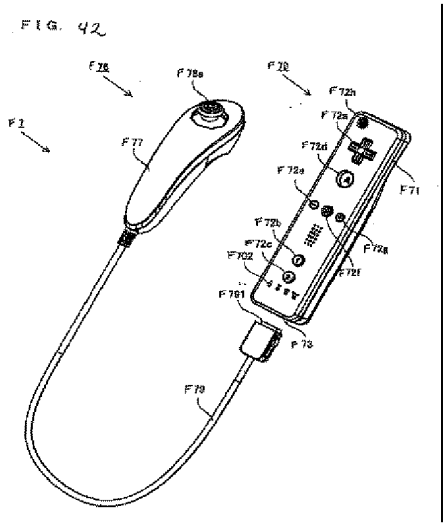
【図40】


FIG. 40
F3
F30
CPU
F32
GPU
F33
MAIN MEMORY
MEMORY CONTROLLER
F31
F34
DSP
ARAM
F35
F36
CONTROLLER I/F
F37
VIDEO I/F
F38
EXTERNAL MEMORY I/F
F39
AUDIO I/F
DISC I/F
F40
F41
DISC DRIVE
F4
F6
RECEIVING UNIT
F7
MONITOR
F5
MEMORY CARD
F7a

【図41】

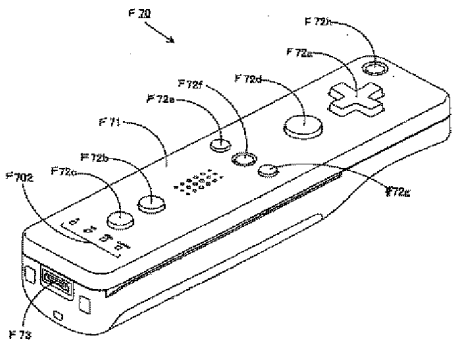


【図42】


FIG. 42
F1
F71
F72
F72a
F72b
F72c
F72d
F72e
F72f
F72g
F72h
F73
F76
F76a
F77
F78
F79
F701
F702

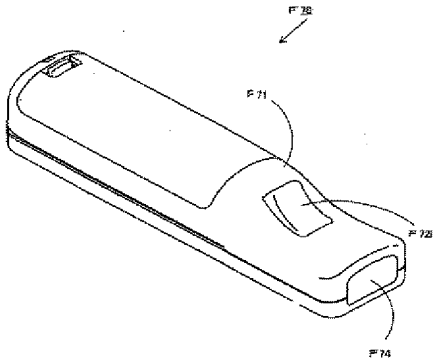
【図43】

FIG. 43



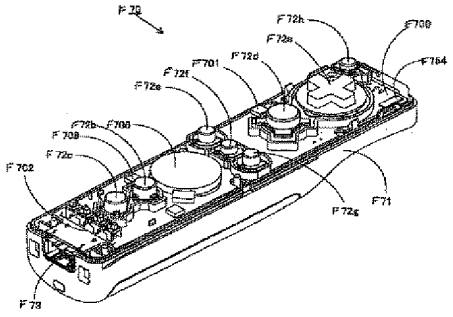
【図44】

FIG. 44



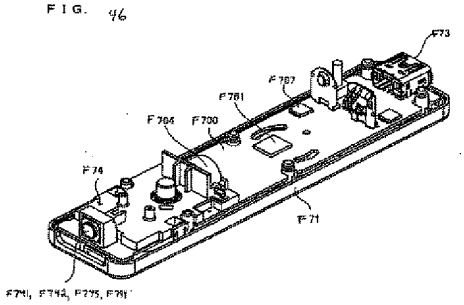
【図45】

FIG. 45


F72k
F700
F72a
F784
F701
F72d
F72f
F72e
F72b
F708
F72c
F702
F71
F72g
F73

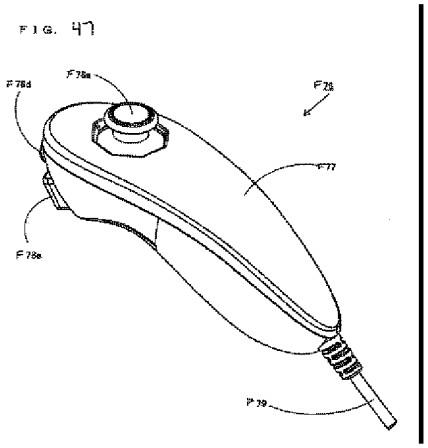
【図46】

FIG. 46

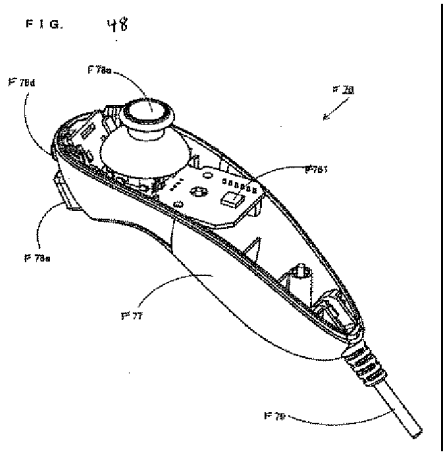


Petitioner Exhibit 1002-2624

【図47】

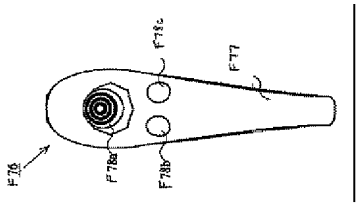


【図48】

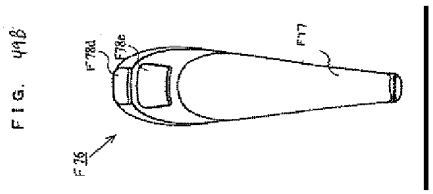


【図49A】

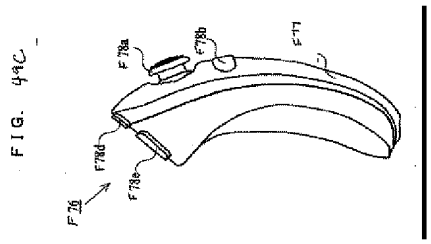
FIG. 49A



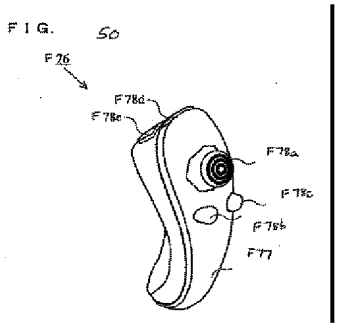
【図49B】



【図49C】

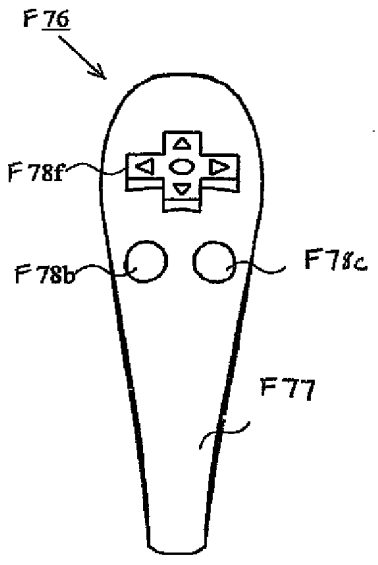


【図50】



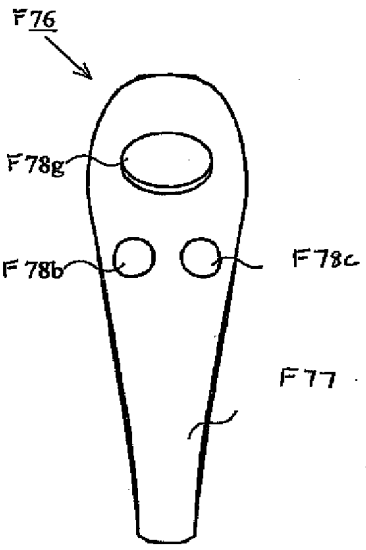
【図51】

FIG. 51



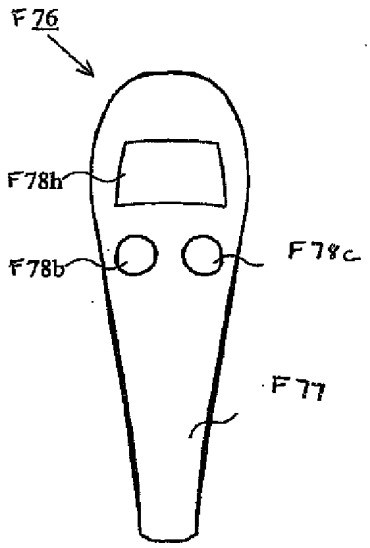
【図52】

FIG. 52



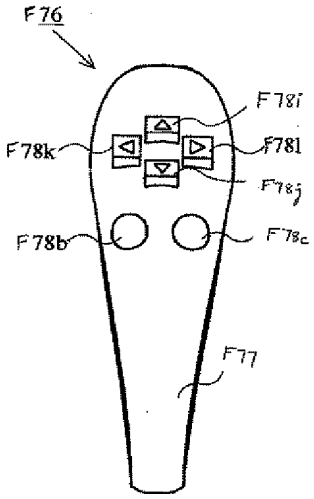
【図53】

FIG. 53



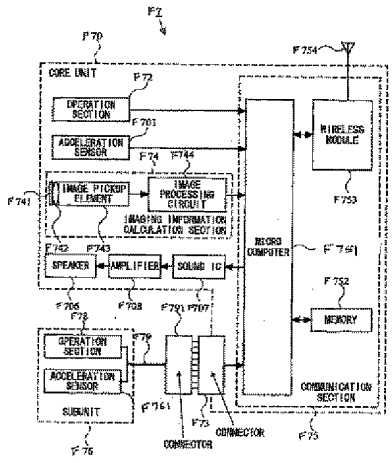
【図54】

FIG. 54



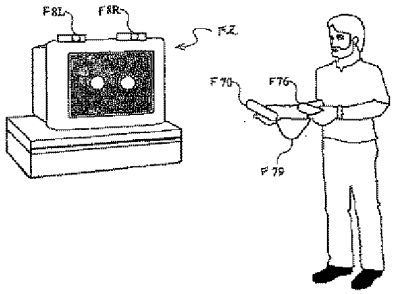
【図55】

FIG. 55


F1
F70
CORE UNIT
F72
OPERATION SECTION
F701
ACCELERATION SENSOR
F74
F744
IMAGE PICKUP ELEMENT
IMAGE PROCESSING CIRCUIT
IMAGING INFORMATION CALCULATION SECTION
F741
F742
F743
SPEAKER
AMPLIFIER
SOUND IC
F706
F708
F707
F78
OPERATION SECTION
ACCELERATION SENSOR
SUBUNIT
F76
F761
F79
F77
CONNECTOR
CONNECTOR
F75
RECORD COMPUTER
F751
WIRELESS MODULE
F753
F754
F752
MEMORY
COMMUNICATION SECTION

【図56】

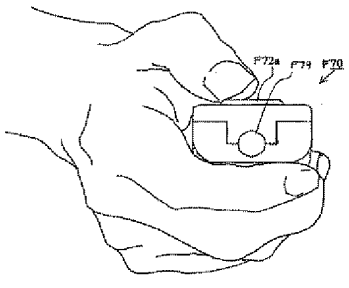
FIG. 56



Petitioner Exhibit 1002-2636

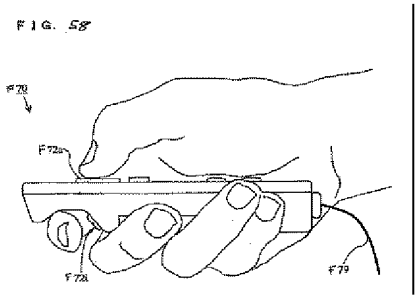
【図57】

FIG. 57



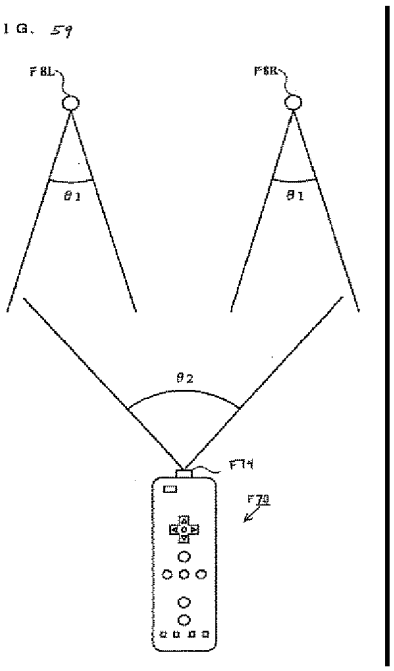
Petitioner Exhibit 1002-2637

【図58】



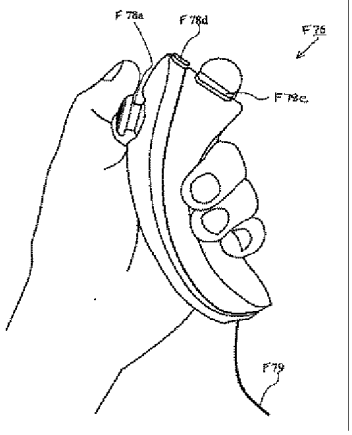
【図59】

FIG. 59



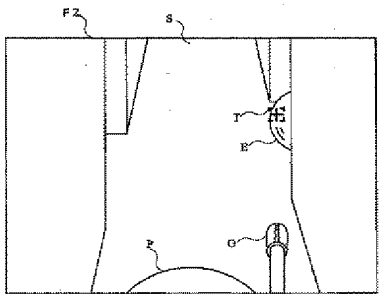
【図60】

FIG. 60



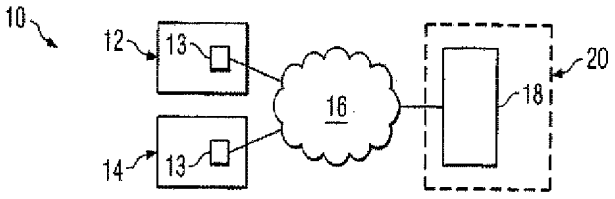
【図61】

FIG. 61

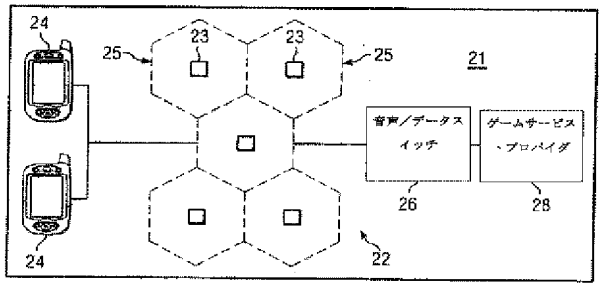


【誤訳訂正書】
【提出日】平成22年3月23日(2010.3.23)
【誤訳訂正1】
【訂正対象書類名】図面
【訂正対象項目名】全図
【訂正方法】変更
【訂正の内容】

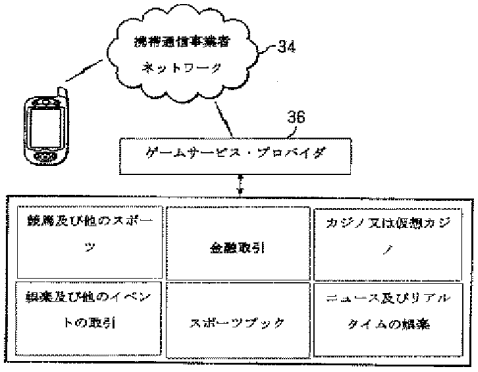
【図1】



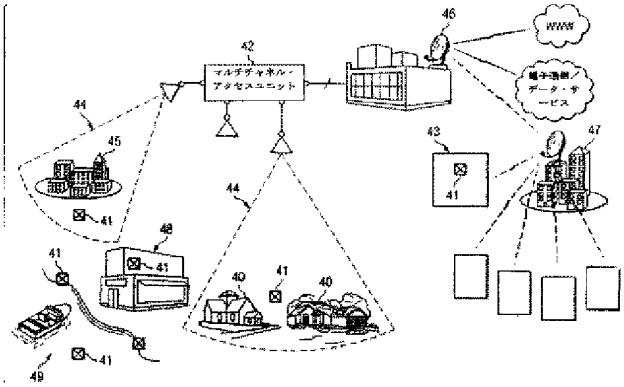
【図2】



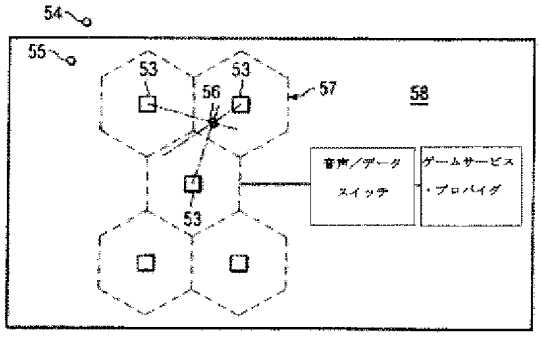
【図3】


携帯通信事業者
ネットワーク
34
36
ゲームサービス・プロバイダ
競馬及び他のスポーツ
金融取引
カジノ又は仮想カジノ
競走及び他のイベントの取引
スポーツブック
ニュース及びリアルタイムの結果

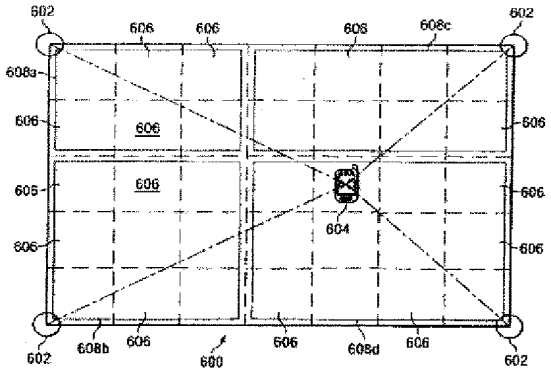
【図4】



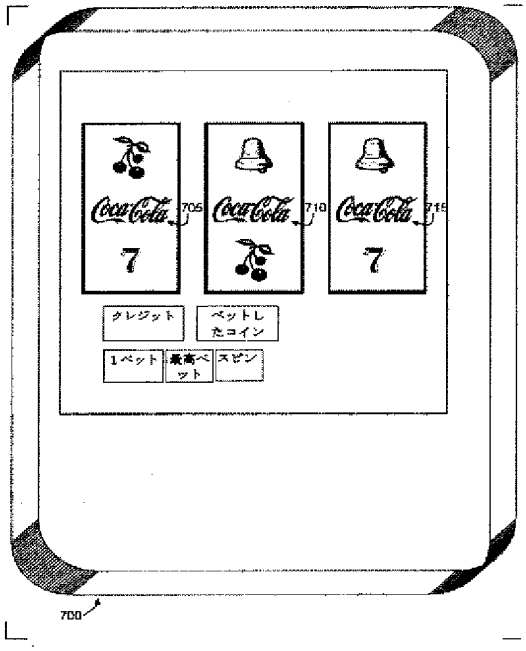
【図5】



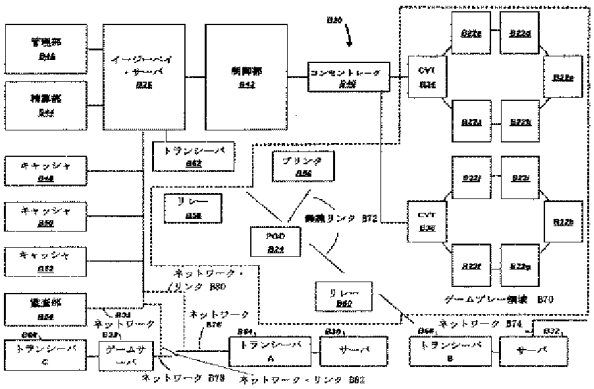
【図6】


602
606
606
606
608c
602
608a
606
606
606
606
606
604
606
606
602
608b
606
600
606
608d
606
602

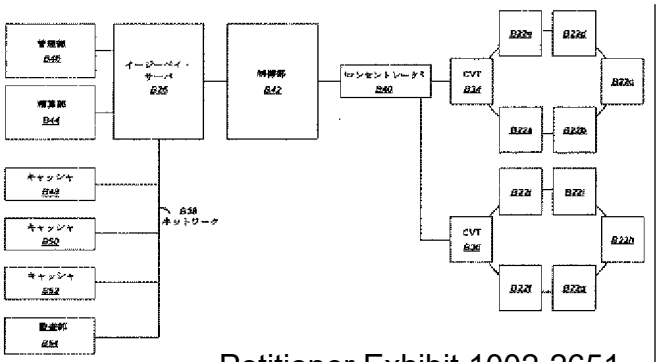
【図7】



【図8】

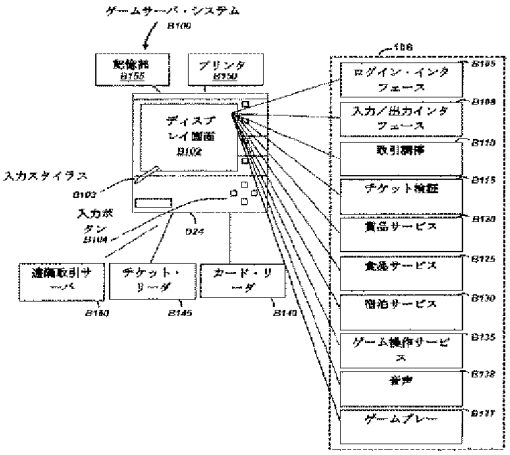

管理部
イーサーネット・サーバ
制御部
コンセントレータ
CVT
トランシーバ
プリンタ
リレー
PCID
ネットワーク・リンク
ネットワーク
トランシーバ A
サーバ
トランシーバ B
サーバ
ゲームサーバ
トランシーバ C
ゲームプレー領域

【図9】

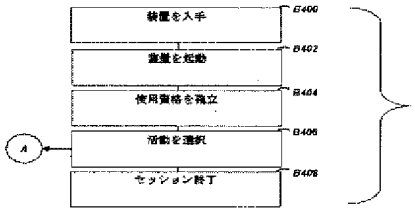


Petitioner Exhibit 1002-2651

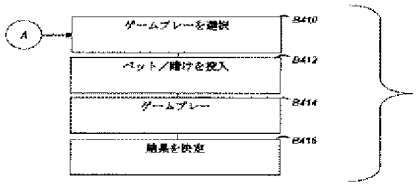
【図10】


ゲームサーバ・システム
B100
記憶装置
B155
プリンタ
B150
ディスプレイ画面
B102
入力スタイラス
B103
入力ボタン
B104
B124
通信取引サーバ
B160
チケット・リーダ
B145
カード・リーダ
B140
186
ログイン・インタフェース
B105
入力／出力インタフェース
B108
取引制御
B110
チケット検証
B115
食品サービス
B120
食品サービス
B125
宿泊サービス
B130
ゲーム操作サービス
B135
音声
B132
ゲームプレー
B137

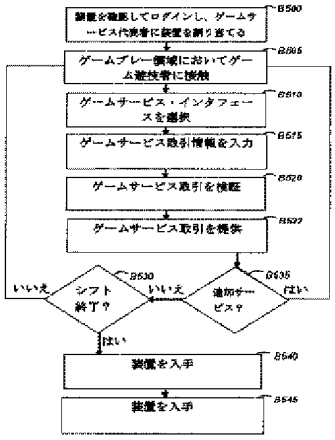
【図11a】



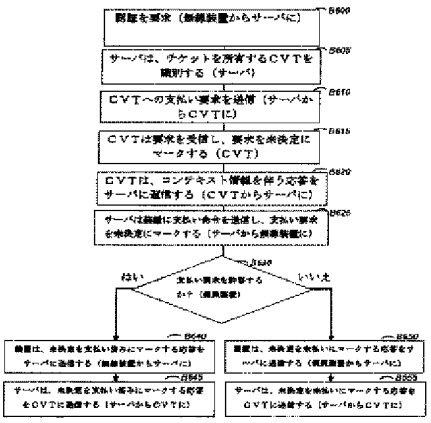
【図11b】



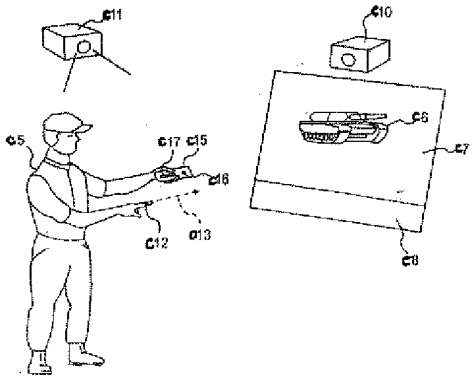
【図12】


B500
装置を確認してログインし、ゲームサービス代理者に装置を割り当てる
B505
ゲームプレー領域においてゲーム被検者に接触
B510
ゲームサービス・インタフェースを選択
B515
ゲームサービス取引情報を入力
B520
ゲームサービス取引を検証
B525
ゲームサービス取引を提供
B530
シフト終了？
いいえ
B535
追加サービス？
いいえ
はい
はい
B540
装置を入手
B545
装置を入手

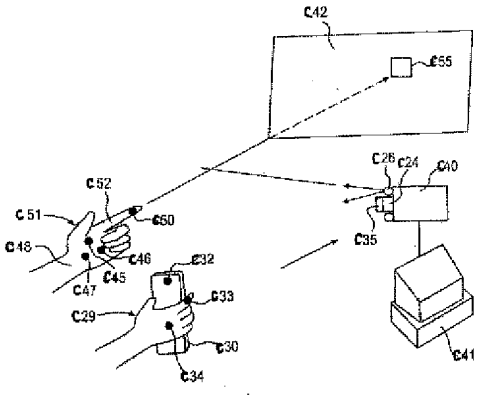
【図13】


S600
S605
S610
S615
S620
S625
S630
S635
S640
S645
S650
S655
いいえ

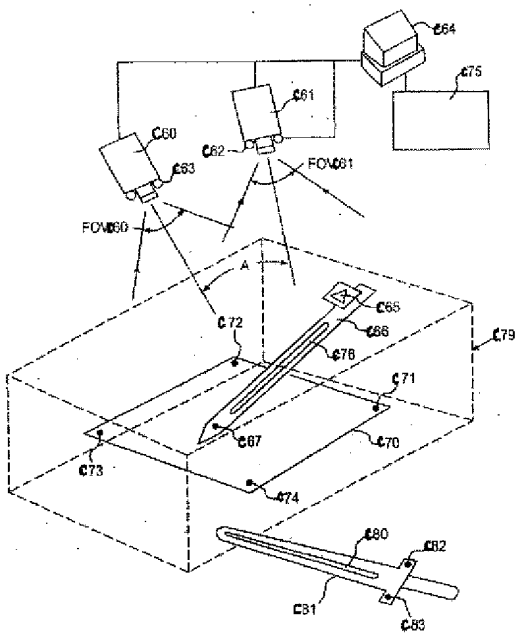
【図14A】



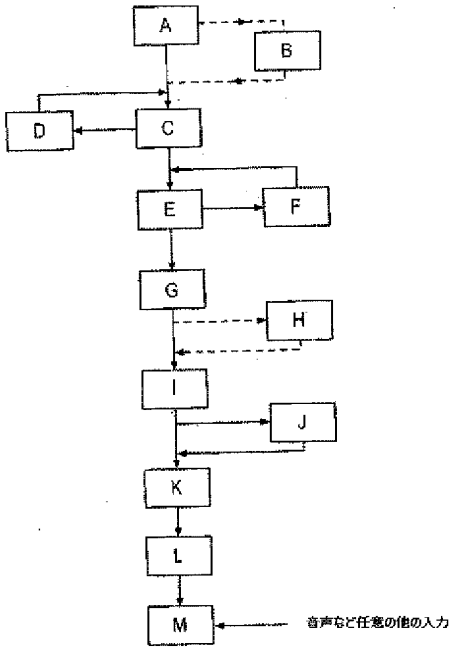
【図14B】


C42
C55
C26
C24
C40
C52
C51
C50
C48
C46
C45
C47
C32
C33
C29
C30
C34
C35
C41

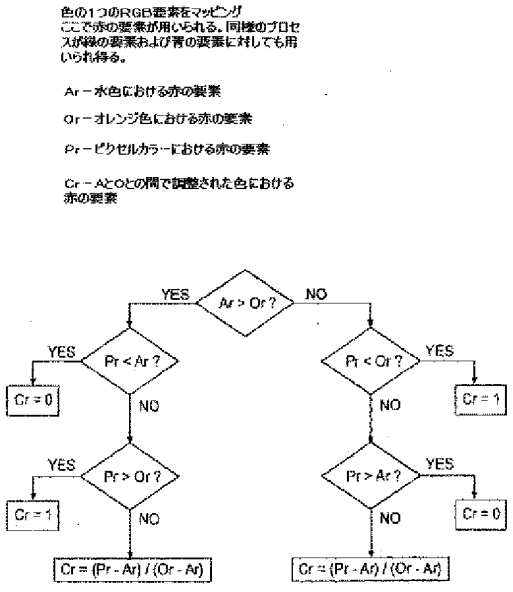
【図14C】


C64
C75
C61
C60
C62
C63
FOVC61
FOVC60
A
C65
C66
C72
C76
C79
C71
C67
C70
C73
C74
C80
C82
C81
C83

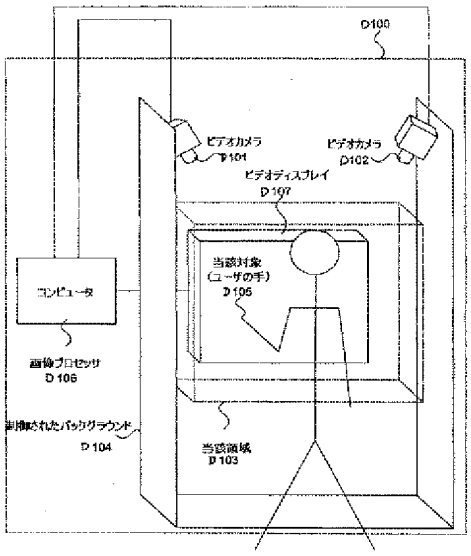
【図14D】



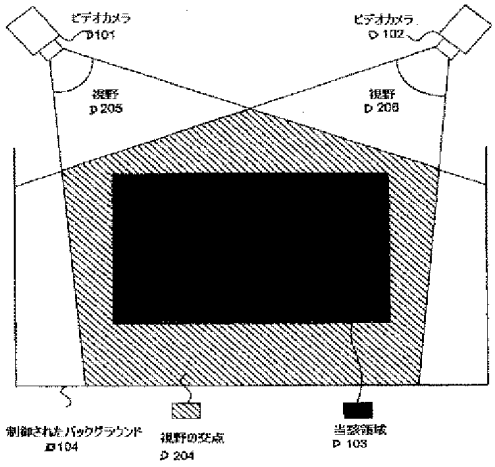
【図14E】


色の1つのRGB要素をマッピング
ここで赤の要素が用いられる。同様のプロセスが緑の要素および青の要素に対しても用いられ得る。
Ar－水色における赤の要素
Or－オレンジ色における赤の要素
Pr－ピクセルカラーにおける赤の要素
Cr－AとOとの間で調整された色における赤の要素
Ar > Or ?
YES
NO
Pr < Ar ?
Pr < Or ?
Cr = 0
Cr = 1
Pr > Or ?
Pr > Ar ?
Cr = (Pr - Ar) / (Or - Ar)
Cr = (Pr - Ar) / (Or - Ar)

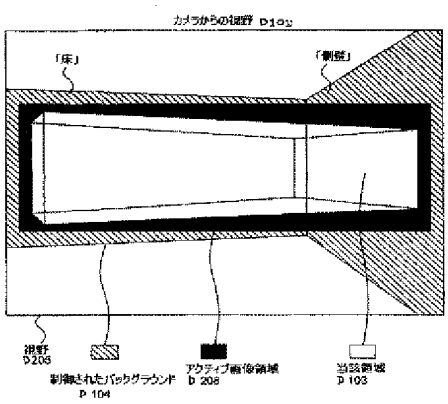
【図15】


D100
ビデオカメラ
D101
ビデオカメラ
D102
ビデオディスプレイ
D107
当該対象
（ユーザの手）
D105
コンピュータ
画像プロセッサ
D106
画像されたバックグラウンド
D104
当該領域
D103

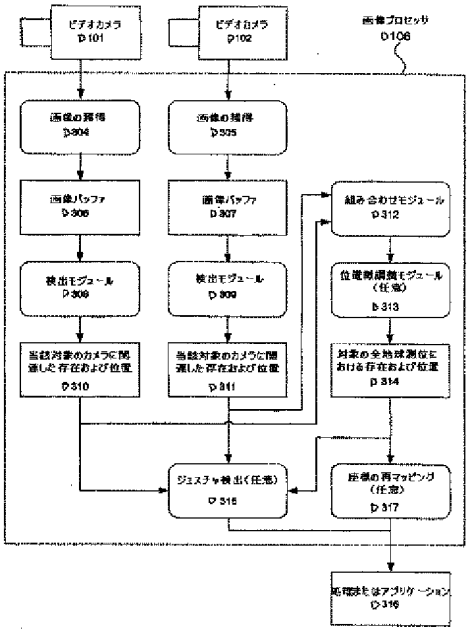
【図16A】


ビデオカメラ
P101
ビデオカメラ
P 102
視野
P 205
視野
P 206
制御されたバックグラウンド
P104
視野の交点
P 204
当該領域
P 103

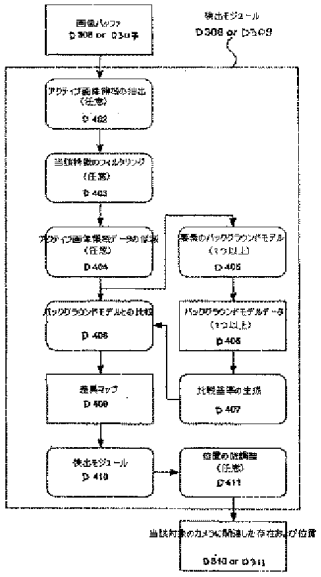
【図16B】


カメラからの視野 D100
「床」
「側壁」
視野
D200
制御されたバックグラウンド
P 104
アクティブ画像領域
D 208
当該領域
P 103

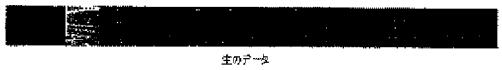
【図17】


ビデオカメラ
p101
ビデオカメラ
p102
画像プロセッサ
p106
画像の獲得
p304
画像の獲得
p305
画像バッファ
p306
画像バッファ
p307
組み合わせモジュール
p312
検出モジュール
p308
検出モジュール
p309
位置補償モジュール
（任意）
p313
当該対象のカメラに関連した存在および位置
p310
当該対象のカメラに関連した存在および位置
p311
対象の全地球測位における存在および位置
p314
ジェスチャ検出（任意）
p315
座標の再マッピング
（任意）
p317
処理またはアプリケーション
p316

【図18】


検出モジュール
D308 or D309
D402
D403
D404
D405
D406
D406
D407
D408
D410
D411
D310 or D311

【図19A】



【図19B】



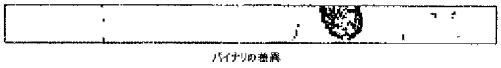
【図19C】



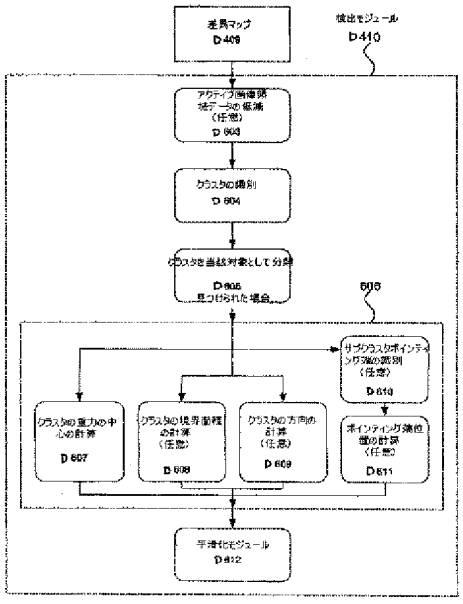
【図19D】



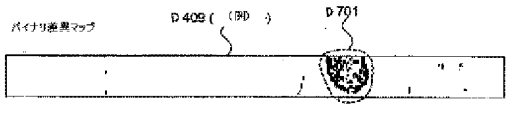
【図19E】



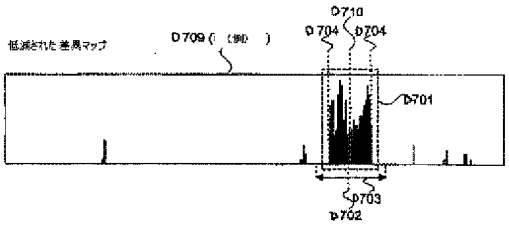
【図20】


差異マップ
D 408
検出モジュール
D 410
アクティブ画素領域データの抽出（任意）
D 602
クラスタの識別
D 604
クラスタを当該対象として分割
D 605
見つけられた場合
606
サブクラスタのポインティングデバイスの識別（任意）
D 610
クラスタの重力の中心の計算
D 607
クラスタの境界座標の計算（任意）
D 608
クラスタの方向の計算（任意）
D 609
ポインティング装置の計算（任意）
D 611
平滑化モジュール
D 612

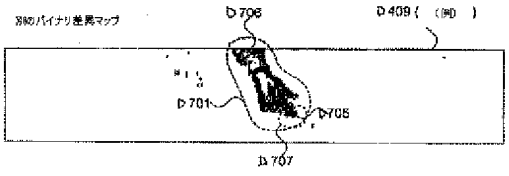
【図21A】



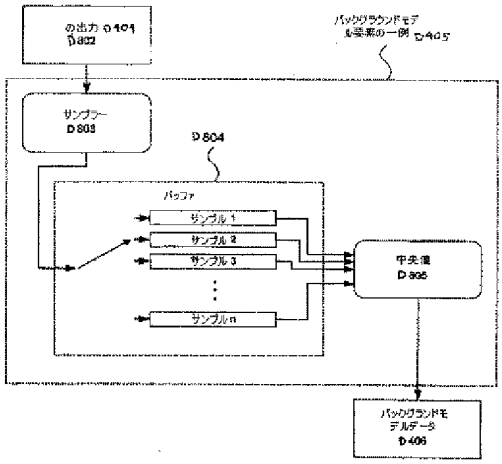
【図21B】



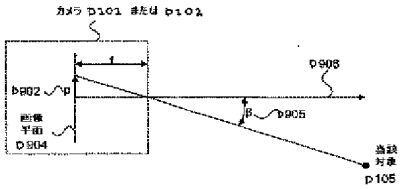
【図21C】



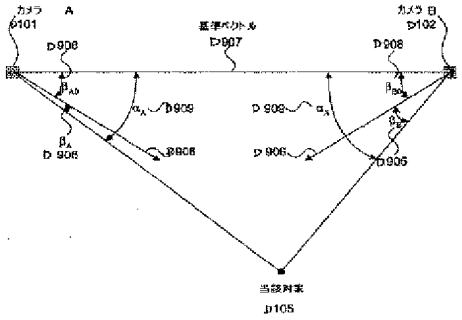
【図22】


の出力 ◎401
◎402
バックグラウンドモデル要素の一例 ◎405
サンプラー
◎803
◎804
バッファ
サンプル 1
サンプル 2
サンプル 3
サンプル n
中央値
◎805
バックグラウンドモデルデータ
◎406

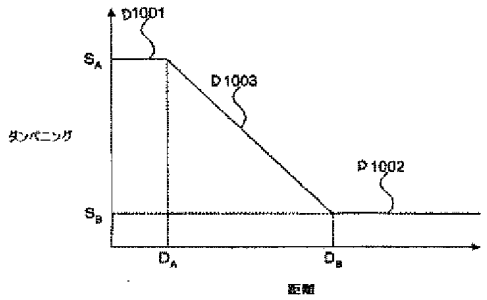
【図23A】



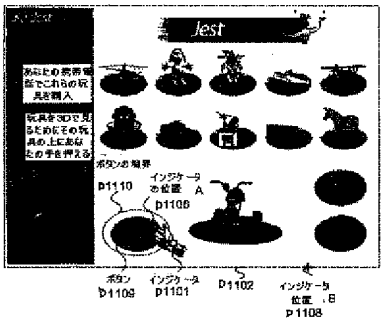
【図23B】


カメラ A
D101
D908
基準ベクトル
D907
カメラ B
D102
D908
D909
D909
D906
D906
D905
当該背景
D105

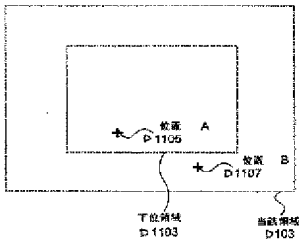
【図24】



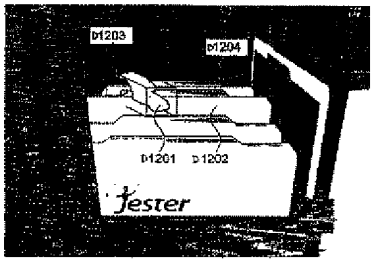
【図25A】


Jest
ボタンの背景
p1110
インジケータの位置　A
p1108
ボタン p1109
インジケータ p1101
p1102
インジケータ位置　B p1108

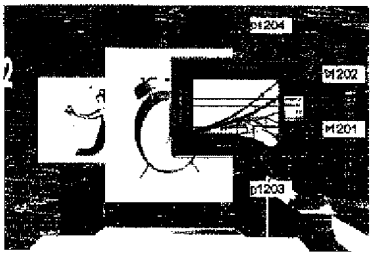
【図25B】



【図26A】

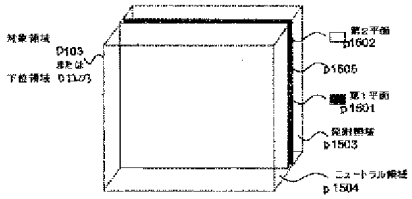


【図26B】

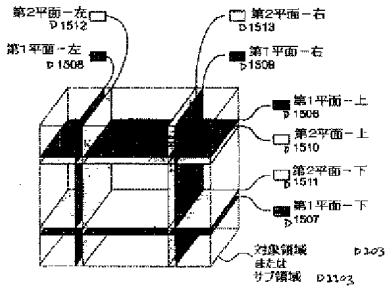


Petitioner Exhibit 1002-2683

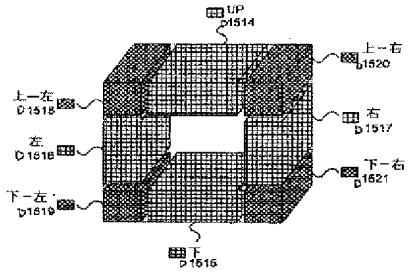
【図27A】


対象領域
D103
または
下位領域 D103
第2平面
p1502
p1505
第1平面
p1501
境界領域
p1503
ニュートラル領域
p1504

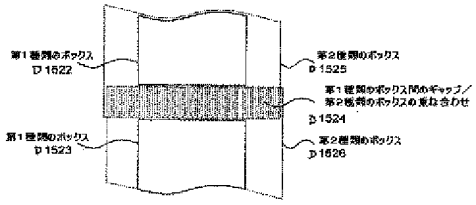
【図27B】


第2平面－左
D 1512
第2平面－右
D 1513
第1平面－左
D 1508
第1平面－右
D 1509
第1平面－上
D 1506
第2平面－上
D 1510
第2平面－下
D 1511
第1平面－下
D 1507
対象領域
または
サブ領域
D 1503
D 1103

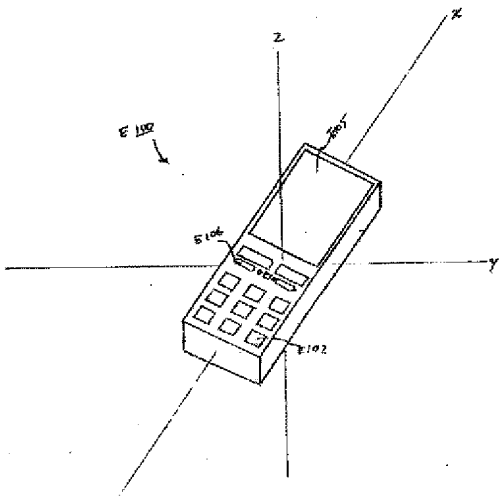
【図27C】


UP
D1514
上－右
D1520
上－左
D1518
右
D1517
左
D1516
下－右
D1521
下－左
D1519
下
D1515

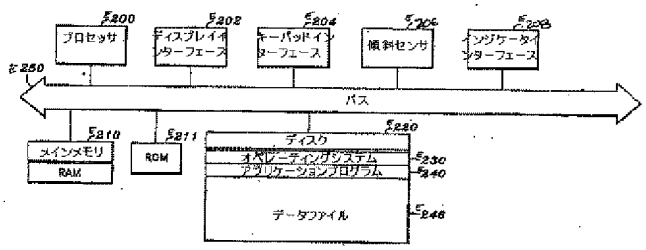
【図27D】


第1種類のボックス
1522
第2種類のボックス
1525
第1種類のボックス間のギャップ/
第2種類のボックスの重ね合わせ
1524
第1種類のボックス
1523
第2種類のボックス
1526

【図28】

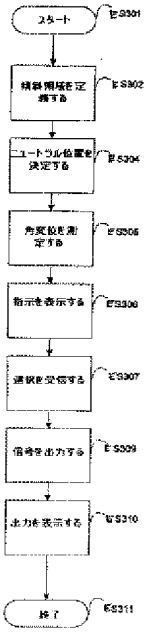


【図29】

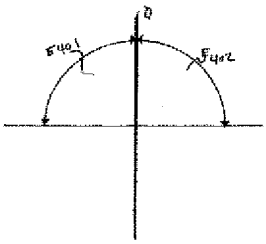


Petitioner Exhibit 1002-2689

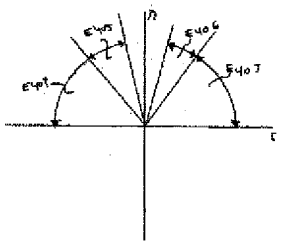
【図30】



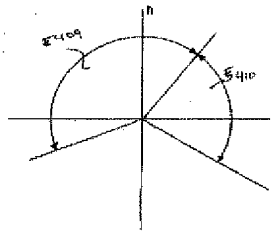
【図31A】



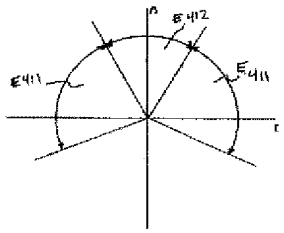
【図31B】



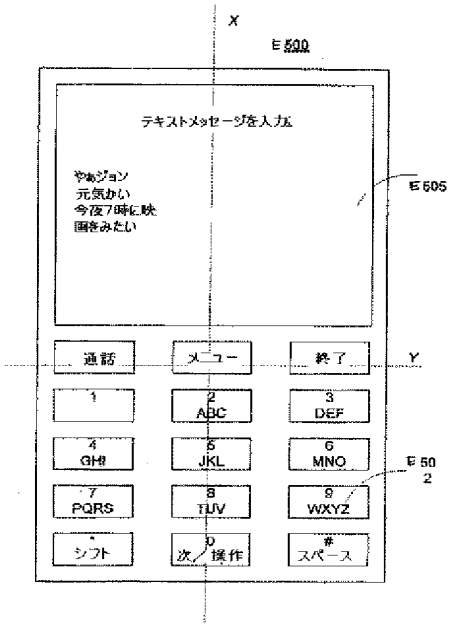
【図31C】



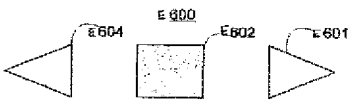
【図31D】



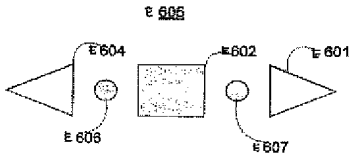
【図32】


X
E 500
テキストメッセージを入力
やぁジョン
元気かい
今夜7時に映
画をみたい
E 505
通話
メニュー
終了
Y
1
2 ABC
3 DEF
4 GHI
5 JKL
6 MNO
7 PQRS
8 TUV
9 WXYZ
E 502
* シフト
0 次/操作
スペース

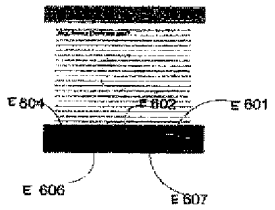
【図33A】



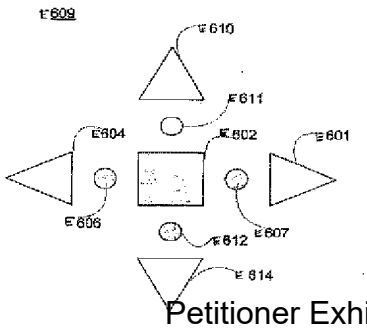
【図33B】



【図33C】



【図33D】

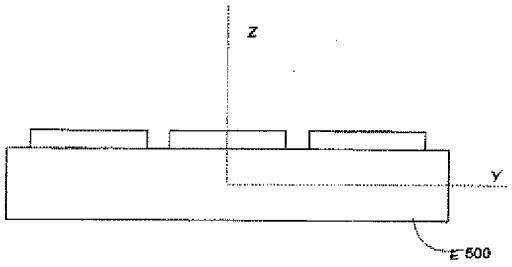


Petitioner Exhibit 1002-2699

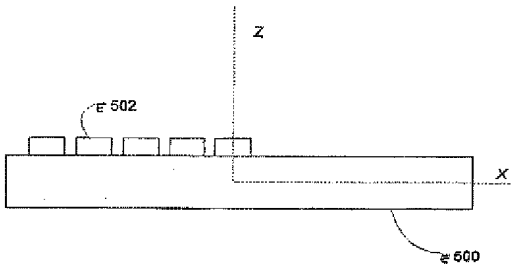
【図33E】



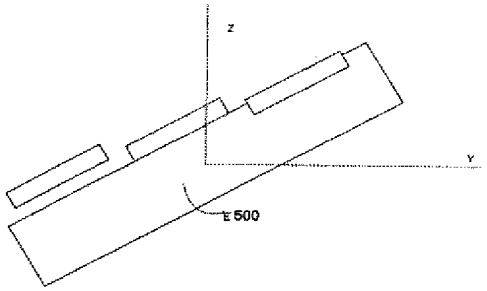
【図34A】



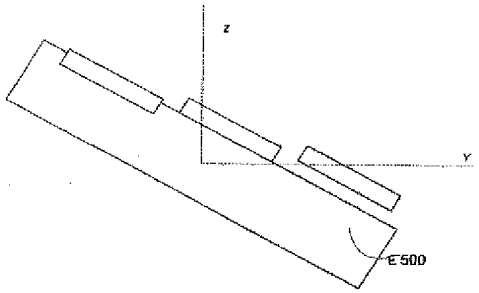
【図34B】



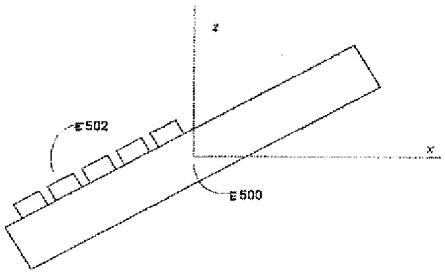
【図35A】



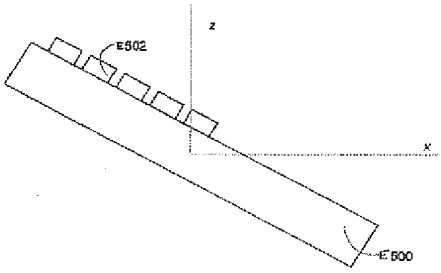
【図35B】



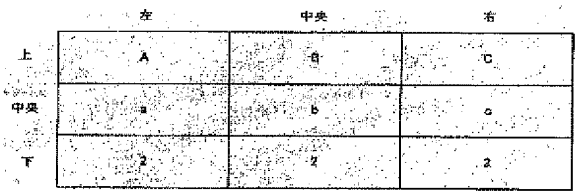
【図36A】



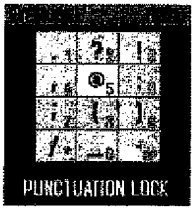
【図36B】



【図37】

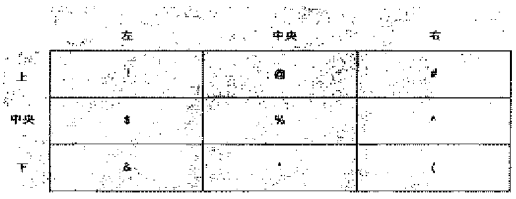


【図38A】



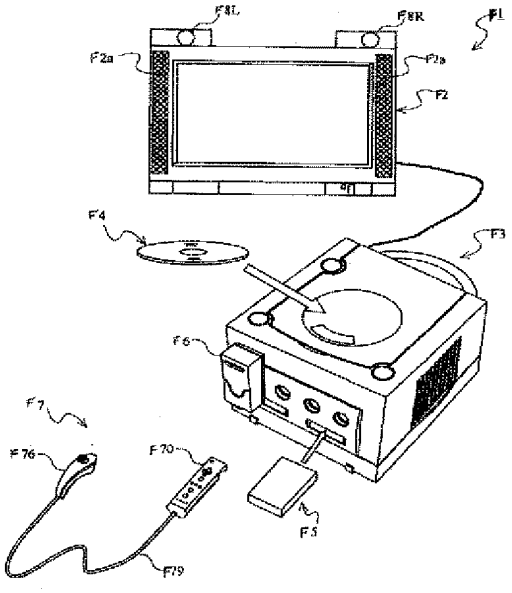
Petitioner Exhibit 1002-2708

【図38B】

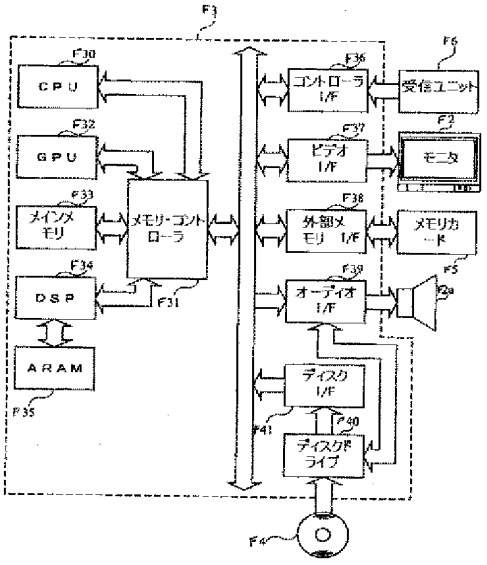


Petitioner Exhibit 1002-2709

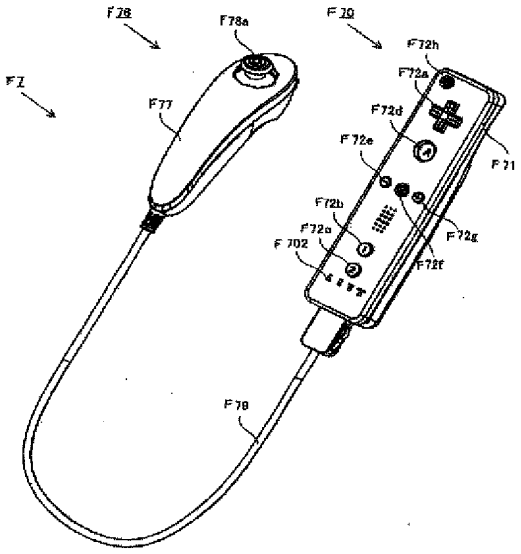
【図39】



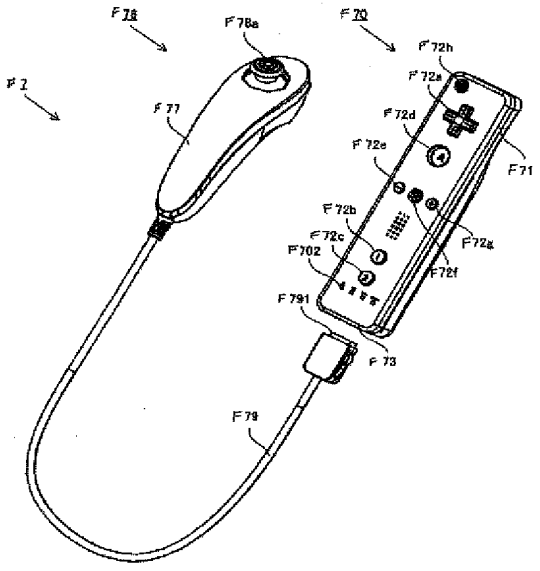
【図40】


F3
F30
CPU
F32
GPU
F33
メインメモリ
メモリ・コントローラ
F34
DSP
F31
ARAM
F35
F36
コントローラI/F
受信ユニット
F6
F37
ビデオI/F
モニタ
F2
F38
外部メモリI/F
メモリカード
F5
F39
オーディオI/F
2a
ディスクI/F
F41
F40
ディスクドライブ
F4

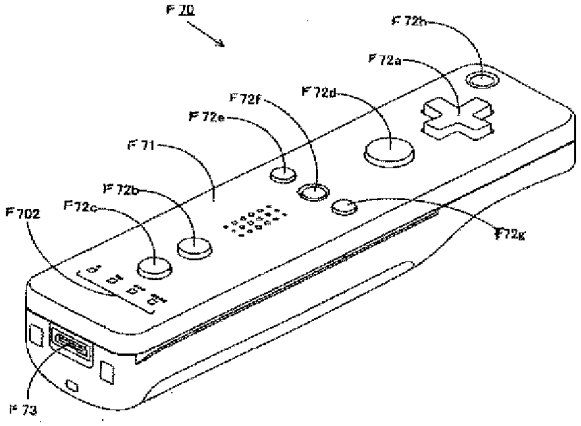
【図41】


F7
F76
F78a
F77
F70
F72h
F72a
F72d
F72e
F71
F72b
F72c
F72g
F702
F72f
F78

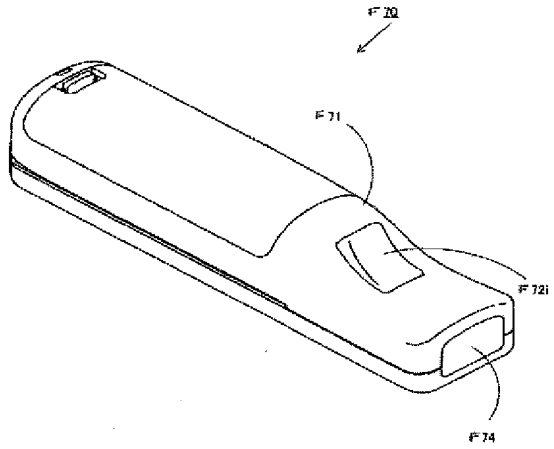
【図42】


F 78
F 78a
F 70
F 72h
F 72a
F 2
F 77
F 72d
F 72e
F 71
F 72b
F 72c
F 72g
F 702
F 72f
F 791
F 73
F 79

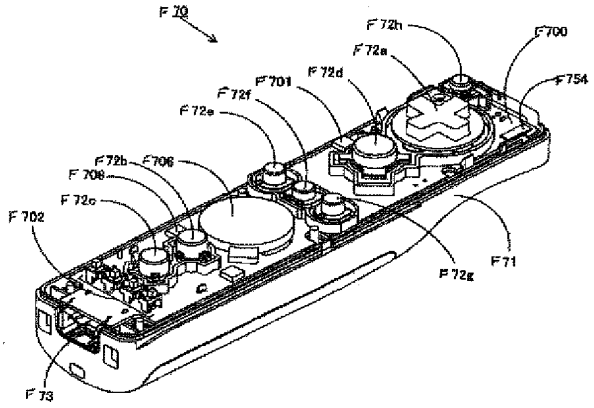
【図43】



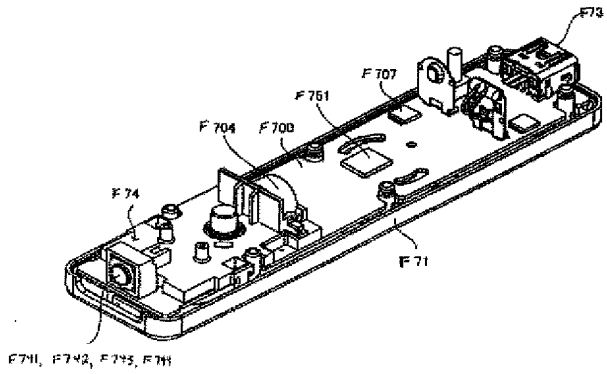
【図44】



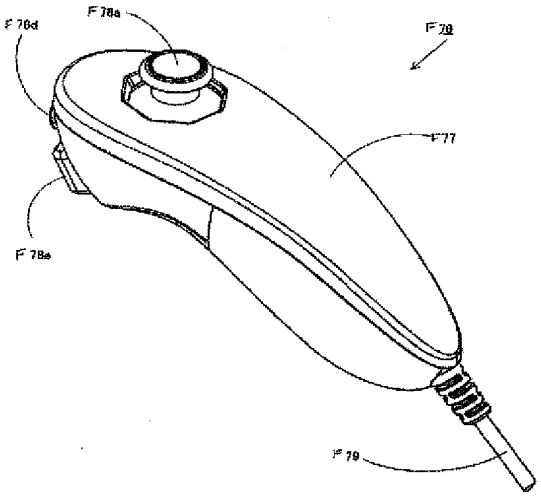
【図45】


F 70
F 72h
F700
F 72a
F 72d
F754
F 701
F 72f
F 72e
F 72b
F 706
F 708
F 72c
F 702
F 72g
F 71
F 73

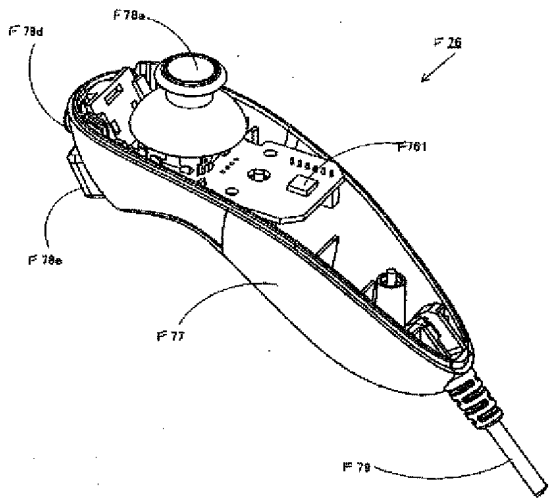
【図46】



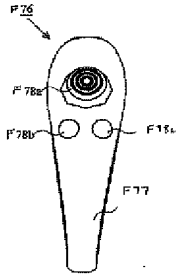
【図47】



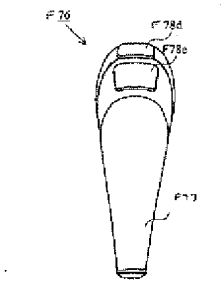
【図48】



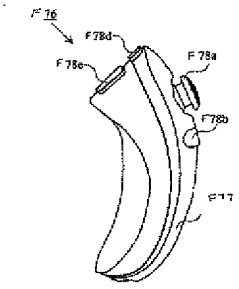
【図49A】



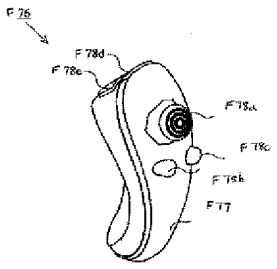
【図49B】



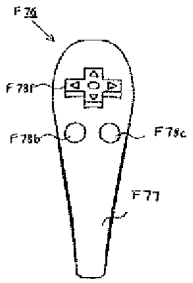
【図49C】



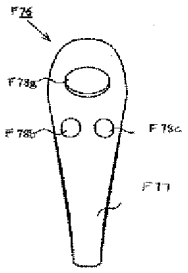
【図50】



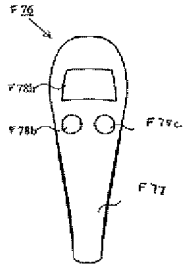
【図51】



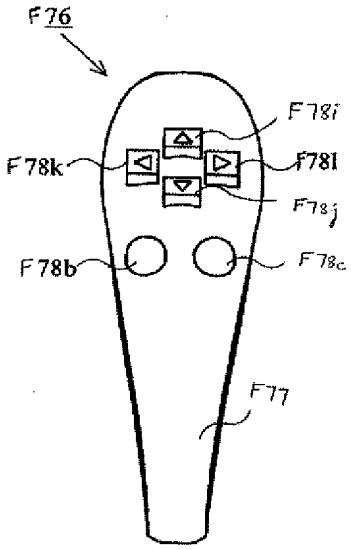
【図52】



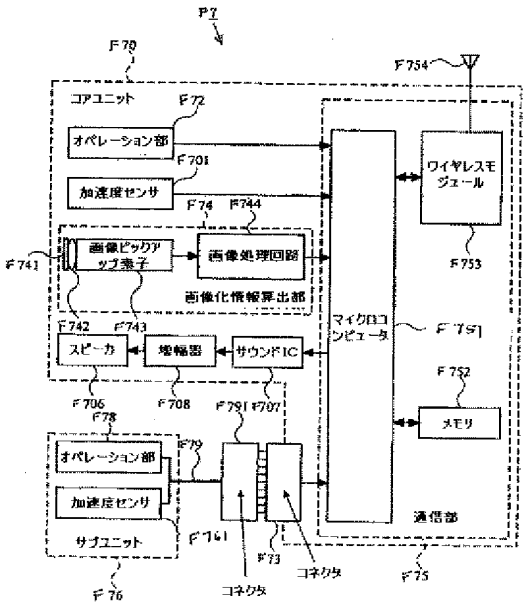
【図53】



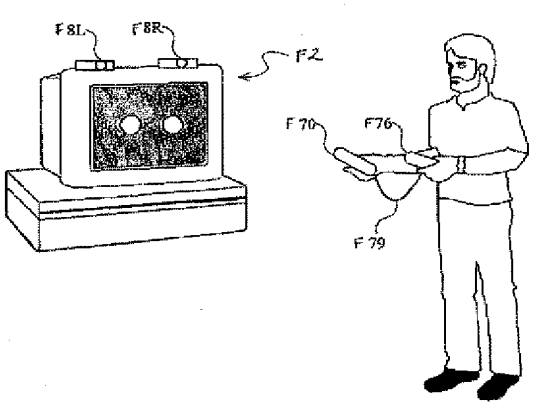
【図54】



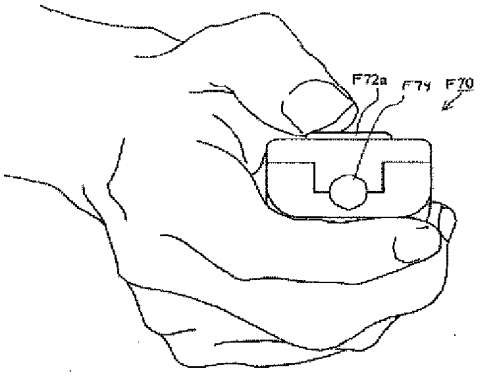
【図55】


P7
F70
F754
コアユニット
F72
オペレーション部
F701
加速度センサ
F74
F744
画像ピックアップ素子
画像処理回路
F741
画像化情報算出部
F753
ワイヤレスモジュール
マイクロコンピュータ
F751
F742
F743
スピーカ
増幅器
サウンドIC
F752
メモリ
F706
F708
F707
F78
F79
オペレーション部
加速度センサ
サブユニット
F761
F73
コネクタ
コネクタ
通信部
F75
F76

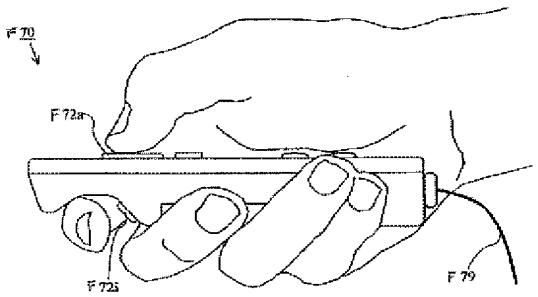
【図56】



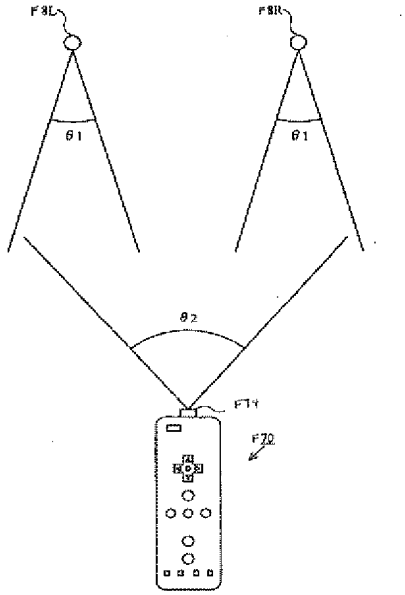
【図57】



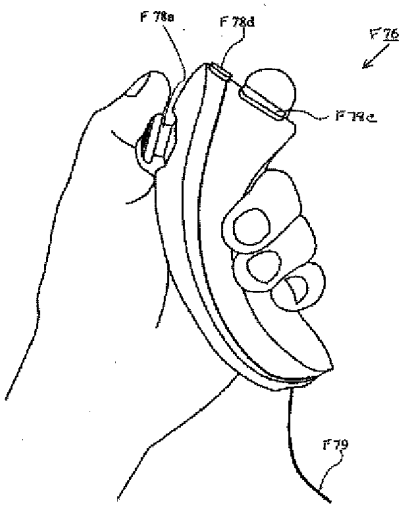
【図58】



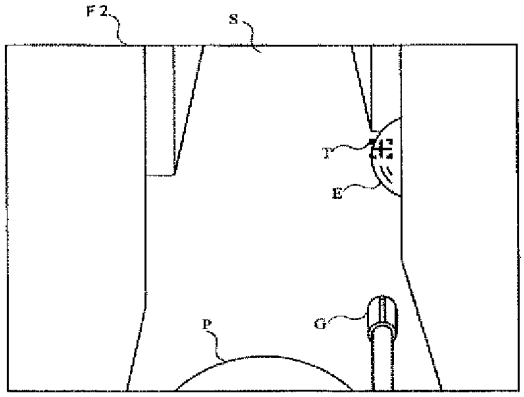
【図59】



【図60】



【図61】



【国際調査報告】

【図61】

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/065000

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A63F 9/24 (2008.04)
USPC - 463/36
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - A63F 9/24 (2008.04)
USPC - 463/36

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 2006/0019745 A1 (BENBRAHIM) 26 January 2006 (26.01.2006) entire document	12 --- 1-11, 13-20
Y	US 5,796,354 A (CARTABIANO et al) 18 August 1998 (18.08.1998) entire document	1-11, 13-20
Y	US 2003/0054868 A1 (PAULSEN et al) 20 March 2003 (20.03.2003) entire document	6-8
Y	US 2006/0287086 A1 (ZALEWSKI et al) 21 December 2006 (21.12.2006) entire document	14, 16

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 August 2008	03 SEP 2008
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2005)

(81)指定国　　AP(BW,GH,GM,KE,LS,MW,MZ,NA,SD,SL,SZ,TZ,UG,ZM,ZW),EA(AM,AZ,BY,KG,KZ,MD,RU,TJ,TM),EP(AT,BE,BG,CH,CY,CZ,DE,DK,EE,ES,FI,FR,GB,GR,HR,HU,IE,IS,IT,LT,LU,LV,MC,MT,NL,NO,PL,PT,RO,SE,SI,SK,TR),OA(BF,BJ,CF,CG,CI,CM,GA,GN,GQ,GW,ML,MR,NE,SN,TD,TG),AE,AG,AL,AM,AO,AT,AU,AZ,BA,BB,BG,BH,BR,BW,BY,BZ,CA,CH,CN,CO,CR,CU,CZ,DE,DK,DM,DO,DZ,EC,EE,EG,ES,FI,GB,GD,GE,GH,GM,GT,HN,HR,HU,ID,IL,IN,IS,JP,KE,KG,KM,KN,KP,KR,KZ,LA,LC,LK,LR,LS,LT,LU,LY,MA,MD,ME,MG,MK,MN,MW,MX,MY,MZ,NA,NG,NI,NO,NZ,OM,PG,PH,PL,PT,RO,RS,RU,SC,SD,SE,SG,SK,SL,SM,SV,SY,TJ,TM,TN,TR,TT,TZ,UA,UG,US,UZ,VC,VN,ZA,ZM,ZW

特許法第６４条第２項第４号の規定により図面の一部または全部を不掲載とする。
（特許庁注：以下のものは登録商標）
１．ＰＥＮＴＩＵＭ
２．イーサネット
３．ＧＳＭ

(72)発明者　ラトニック，ハワード，ダブリュ
アメリカ合衆国　ニューヨーク州　１００２１，ニューヨーク，イースト・７１スト・ストリート　１１
(72)発明者　オルデルッキ，ディーン，ピー
アメリカ合衆国　コネティカット州　０６８８０，ウエストポート，マリオン・ロード　８
(72)発明者　ジェルマン，ジョフリー，エム
アメリカ合衆国　ニューヨーク州　１１２１７，ブルックリン，バークレイ・プレイス　１４，アパートメント　３
Ｆターム(参考) 2C001 AA13　CA05　CA09

Espacenet

Bibliographic data: WO2016158748 (A1) — 2016-10-06

PAYMENT SYSTEM, PAYMENT DEVICE, PROGRAM, AND PAYMENT METHOD

Inventor(s): MATSUI TAKAHIRO [JP] ± (松井　孝宏)

Applicant(s): NEC CORP [JP] ± (日本電気株式会社)

Classification: - international: *G06T7/00; G07G1/00; G07G1/12*
- cooperative: G06F18/22 (EP, US); G06Q20/18 (EP, US); G06Q20/20 (EP, US); G06Q20/4014 (US); G06Q20/40145 (EP, US); G06V10/40 (EP, US); G06V10/761 (EP, US); G06V20/30 (US); G06V40/161 (EP, US); G07G1/0036 (EP, US); G07G1/12 (US); G07G1/14 (EP, US)

Application number: WO2016JP59621 20160325 Global Dossier

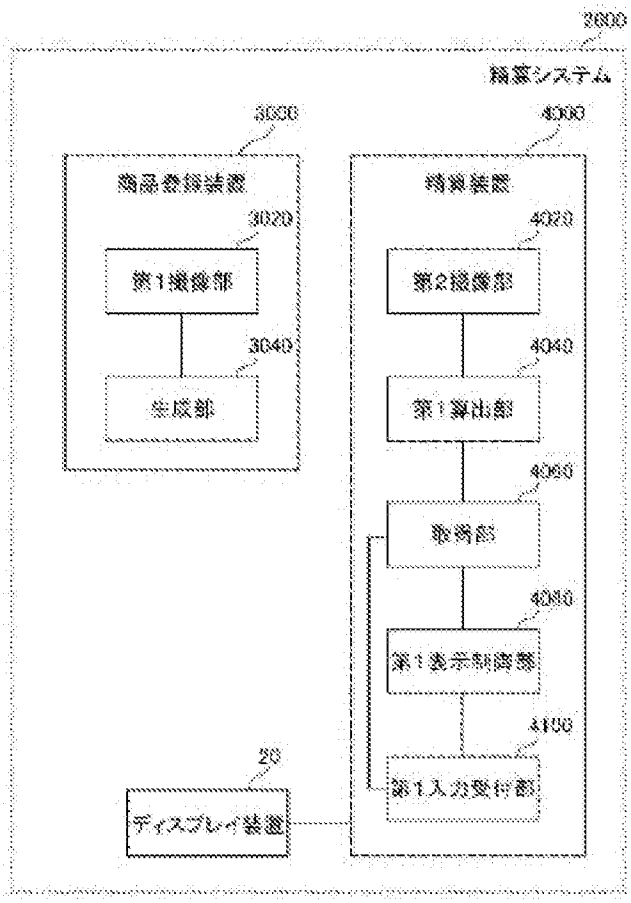
Priority number(s): JP20150072035 20150331

Also published as: JP2016192087 (A) JP6686290 (B2) US10878419 (B2) US2018096353 (A1)

Abstract of WO2016158748 (A1)

A first image capture unit (3020) generates first customer images. A generating unit (3040) generates association information which associates the first customer images with payment information. A second image capture unit (4020) generates second customer images. A first computation unit (4040) computes first degrees of similarity between the customers who appear in the first customer images and the customers who appear in the second customer images. If a first customer image is present in which the first degree of similarity is greater than or equal to a first threshold, an acquisition unit (4060) acquires the payment information which is associated with the first customer image. If no first customer image is present in which the first degree of similarity is greater than or equal to the first threshold, a first display control unit (4080) displays candidate images upon a display device (20). A first input acceptance unit (4100) accepts an input which selects among the candidate images. The acquisition unit (4060) acquires the payment information which is associated with the selected candidate image.

Petitioner Exhibit 1002-2738



20 Display device
2000 Payment system
3000 Product registration device
3020 First image capture unit
3040 Generating unit
4000 Payment device
4020 Second image capture unit
4040 First computation unit
4060 Acquisition unit
4080 First display control unit
4100 First input acceptance unit

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

DESCRIPTION WO2016158748A1

10 Settlement system, settlement device, program, and settlement method The present invention relates to a settlement system, a settlement device, a program, and a settlement method.

12 Cash register terminals in stores such as supermarkets perform (1) processing to register products to be settled (such as reading barcodes) and (2) processing to settle the registered products (such as receiving payment and returning change). Two processes are performed.

15 Then, there is an operation method in which the functions of such a cash register terminal are separated into two devices, and the processing (1) and the processing (2) are performed by different devices. For example, Patent Document 1 discloses a self-POS system in which a registration device used for processing (1) and an accounting device used for processing (2) are provided separately. The store clerk registers the product using the registration device. The registration device captures an image of the customer with the imaging unit. A store clerk who operates the registration device selects a customer image to be associated with the accounting data (data relating to the registered product) from among the customer images captured by the imaging unit. As a result, the registration device associates the customer's image with the accounting data. After that, the customer makes a payment using the accounting device. The checkout device captures an image of the customer and acquires checkout data associated with the generated customer image and the highly consistent customer image. The customer then uses the accounting device to make an accounting based on this accounting data.

29 A customer in the image generated by the registration device may not match the same customer in the image generated by the checkout device. For example, if a customer removes a mask or hat that they wore when using the registration device before using the accounting device, the customer in the image generated by the registration device and the image generated by the accounting device The matching with the customer in the image that is displayed is reduced.

35 Patent Document 1 does not mention the case where the matching between the customer appearing in the image generated by the registration device and the same customer appearing in the image generated by the checkout device is reduced.

38 The present invention has been made in view of the above problems. SUMMARY OF THE INVENTION An object of the present invention is to provide a technology that enables a customer to reliably settle the account for merchandise.

41 The settlement system of the present invention has a product registration device and a settlement device. The product registration device includes first imaging means for generating a first customer image including the customer, and generating means for generating association information in which the first customer image is associated with settlement information used for product settlement. have. The settlement device includes a second imaging means for generating a second customer image including the customer, and a candidate image as a candidate for the first customer image in which the same customer as the customer appearing in the second customer image is captured, and a first display control means for displaying on a display device viewable by a customer.

50 The settlement device of the present invention is the settlement device of the settlement system of the present invention.

52 A program of the present invention is a program that causes a computer to operate as the settlement apparatus of the present invention.

54 A settlement method of the present invention is a settlement method executed in a settlement system having a product registration device and a settlement device. The settlement method includes a first imaging step in which the product registration device generates a first customer image including the customer, and the product registration device associates settlement information used for product settlement with the first customer image. a generation step of generating associated information, a second imaging step of generating a second customer image including the customer, and a first image capturing step of generating a second customer image including the customer; and a first display control step of displaying a candidate image, which is a candidate for the customer image, on a display device that can be viewed by the customer.

64 ADVANTAGE OF THE INVENTION According to this invention, the technique which enables a customer to carry out the checkout of goods reliably is provided.

66 The above objectives, as well as other objectives, features and advantages, will become further apparent from the preferred embodiments described below and the accompanying drawings below.

69 It is a figure which illustrates arrangement|positioning of the goods registration apparatus which a settlement system has, and a settlement apparatus. 1 is a block diagram illustrating a settlement system according to Embodiment 1; FIG. 4 is a flowchart illustrating processing executed by the product registration device of the first embodiment; 4 is a flow chart illustrating the flow of processing executed by the settlement device of the first embodiment; 3 is a diagram illustrating the hardware configuration of a computer that implements the product registration device of the first embodiment; FIG. 2 is a diagram illustrating the hardware configuration of a computer that implements the settlement apparatus of Embodiment 1; FIG. It is a figure which illustrates settlement information in a table format. It is a figure which illustrates the structure of association information in a table format. FIG. 4 is a diagram illustrating a display on a display device; It is a block diagram which illustrates the

settlement device which has a judgment part. FIG. 11 is a block diagram illustrating a settlement system of Embodiment 2; FIG. FIG. 10 is a diagram illustrating association information in the second embodiment; FIG. 9 is a flowchart illustrating the flow of processing executed by the warning device of Embodiment 2; It is a figure which illustrates the operation environment of the settlement system of Embodiment 2. FIG.

85 BEST MODE FOR CARRYING OUT THE INVENTION Hereinafter, embodiments of the present invention will be described with reference to the drawings. In addition, in all the drawings, the same constituent elements are denoted by the same reference numerals, and the description thereof will be omitted as appropriate.

89 [Embodiment 1] FIG. 1 is a diagram illustrating the arrangement of the commodity registration device 3000 and the settlement device 4000 that the settlement system 2000 has. The settlement system 2000 has a commodity registration device 3000 and a settlement device 4000 . As shown in FIG. 1, the product registration device 3000 and the settlement device 4000 are provided as independent devices. In a store that uses the settlement system 2000 , commodity registration device 3000 and settlement device 4000 are used to make settlements for commodities. Here, the installed number of the product registration device 3000 and the settlement device 4000 is one or more.

97 The commodity registration device 3000 is used for processing of registering a commodity as an object of payment. A customer who wants to purchase a product goes to the product registration device 3000 with the product. A store clerk who operates the product registration device 3000 receives a product from a customer and registers the product as an object of payment. Here, various known techniques can be used for the method of registering the product as the object of payment. For example, a store clerk causes a reader of the product registration device 3000 to read a barcode or the like attached to each product. Along with product registration, the product registration device 3000 generates settlement information. The settlement information is information relating to the settlement processing of the product registered as the settlement object.

107 The settlement device 4000 is used for settlement of goods registered as settlement objects (such as receipt of payment). After completing product registration, the customer moves to any checkout device 4000 . The settlement device 4000 acquires settlement information related to the product purchased by the customer, and performs settlement processing based on the settlement information. More specifically, the settlement device 4000 presents the price to the customer, counts the price paid by the customer, refunds the customer change, issues a receipt, and the like.

114 <Configuration of product registration device 3000 and settlement device 4000> FIG. 2 is a block diagram illustrating the settlement system 2000 according to the first embodiment. In FIG. 2, each block does not represent the configuration in units of hardware, but the configuration in units of functions.

118 The product registration device 3000 has a first imaging section 3020 and a generation section 3040 . The first imaging unit 3020 generates an image including the customer. The image generated by the first imaging unit 3020 is hereinafter referred to as the first customer image. The generation unit 3040 generates association information. The

association information is information that associates the first customer image and the payment information.

124 The settlement device 4000 has a second imaging section 4020 , a first calculation section 4040 , an acquisition section 4060 , a first display control section 4080 and a first input reception section 4100 . The second imaging unit 4020 generates an image including the customer. The image generated by the second imaging unit 4020 is hereinafter referred to as a second customer image.

129 The first calculation unit 4040 calculates the customer appearing in each image (first customer image) captured by the first imaging unit 3020 and the customer appearing in the image (second customer image) captured by the second imaging unit 4020. Calculate the similarity with the customer who is Hereinafter, this degree of similarity is referred to as the first degree of similarity.

134 Acquisition unit 4060 determines whether or not there is a first customer image that satisfies the matching condition. The matching condition is that "the first similarity between the customer appearing in the first customer image and the customer appearing in the second customer image is greater than or equal to the first threshold". Then, when there is a first customer image that satisfies the matching condition, the acquisition unit 4060 acquires settlement information associated with the first customer image. As described above, the settlement information and the first customer image are associated by the association information.

142 The first display control unit 4080 displays candidate images on the display device 20 when there is no first customer image that satisfies the matching condition. The candidate image is a candidate for the first customer image in which the same customer as the customer appearing in the second customer image is shown. Here, the display device 20 on which the candidate image is displayed by the first display control unit 4080 is a display device that can be viewed by the customer using the settlement device 4000 .

148 The first input reception unit 4100 receives input for selecting a candidate image. When first input reception unit 4100 receives selection of a candidate image, acquisition unit 4060 acquires settlement information associated with the candidate image (first customer image) selected in the association information.

152 <Action/Effect> The degree of similarity between the customer shown in the first customer image and the same customer shown in the second customer image may be low. Such a situation occurs, for example, when the customer wears different items depending on whether the product registration device 3000 is used or the checkout device 4000 is used. Specifically, there may be a case where the customer removes the mask worn when using the product registration device 3000 before using the settlement device 4000 .

158 Therefore, the settlement device 4000 of the present embodiment, when there is no first customer image showing a customer who has a high degree of similarity with the customer who uses the settlement device 4000 (the first similarity is equal to or greater than the first threshold), Candidates for the first customer image showing the same customer as the customer using the settlement device 4000 are displayed, and the customer is made to select the candidate. Therefore, even if the degree of similarity between the customer shown in the

first customer image and the same customer shown in the second customer image is low, the settlement device 4000 can detect the first customer selected by the customer. The settlement process can be performed by acquiring the settlement information associated with the image. Therefore, according to the checkout system 2000 of the present embodiment, the customer can reliably checkout the product.

169 The present embodiment will be described in further detail below.

170 <Flow of Processing> FIG. 3 is a flowchart illustrating processing executed by the product registration device 3000 of the first embodiment. The first imaging unit 3020 generates a first customer image (S102). The generation unit 3040 generates association information by associating the first customer image with the settlement information (S104).

174 FIG. 4 is a flowchart illustrating the flow of processing executed by the settlement device 4000 of the first embodiment. The second imaging unit 4020 generates a second customer image (S202). The first calculator 4040 calculates the first similarity between the customer appearing in each first customer image and the customer appearing in the second customer image (S204). The acquisition unit 4060 determines whether or not there is a first customer image whose first similarity is greater than or equal to the first threshold (S206). If there is a first customer image whose first similarity is greater than or equal to the first threshold (S206: YES), the process of FIG. 4 proceeds to S208. On the other hand, when there is no first customer image whose first similarity is equal to or higher than the first threshold (S206: NO), the process of FIG. 4 proceeds to S210.

184 In S208, the acquisition unit 4060 acquires settlement information associated with the first customer image whose first similarity is greater than or equal to the first threshold.

186 In S210, the first display control unit 4080 displays the candidate images on the display device when there is no first customer image with the first similarity equal to or higher than the first threshold. The first input accepting unit 4100 accepts selection of a candidate image (S212). The obtaining unit 4060 obtains the settlement information associated with the selected candidate image (S214).

191 <Example of hardware that implements the product registration device 3000> Each functional component of the product registration device 3000 and the settlement device 4000 is implemented by hardware that implements each functional component (eg, hardwired electronic circuits, etc.) Alternatively, it may be realized by a combination of hardware and software (for example, a combination of an electronic circuit and a program for controlling it).

197 FIG. 5 is a diagram illustrating the hardware configuration of the computer 1000 that implements the product registration device 3000 of the first embodiment. This computer 1000 may be implemented using a dedicated device such as a cash register terminal, or may be implemented using a general-purpose device such as a PC (Personal Computer) or a mobile terminal.

202 Computer 1000 has bus 1020 , processor 1040 , memory 1060 , storage 1080 , input/output interface 1100 and network interface 1120 . Bus 1020 is a data transmission path for processor 1040, memory 1060, storage 1080, input/output interface 1100, and network interface 1120 to mutually transmit and receive data. However, the method of connecting

processors 1040 and the like to each other is not limited to bus connection. The processor 1040 is, for example, an arithmetic processing unit such as a CPU (Central Processing Unit) or a GPU (Graphics Processing Unit). The memory 1060 is memory such as RAM (Random Access Memory) or ROM (Read Only Memory), for example. The storage 1080 is a storage device such as a hard disk, SSD (Solid State Drive), or memory card. Also, the storage 1080 may be a memory such as RAM or ROM.

212 The input/output interface 1100 is an interface for connecting the computer 1000 and input/output devices. Input/output devices are, for example, keyboards and mice.

214 The network interface 1120 is an interface for communicably connecting the computer 1000 to an external device. The network interface 1120 may be a network interface for connecting with a wired line or a network interface for connecting with a wireless line. For example, a computer 1000 realizing a product registration device 3000 is connected to a computer 6000 realizing a settlement device 4000 via a network.

219 The storage 1080 stores program modules that implement the functions of the first imaging unit 3020 and the generating unit 3040, respectively. The processor 1040 implements the function of each corresponding functional component by executing each program module. Here, when executing each module, the processor 1040 may execute these modules after reading them onto the memory 1060 , or may execute them without reading them onto the memory 1060 .

225 The hardware configuration of computer 1000 is not limited to the configuration shown in FIG. For example, each program module may be stored in memory 1060 . In this case, the computer 1000 may not have the storage 1080 .

228 Input/output devices connected to the input/output interface 1100 include a reader 40 that recognizes products to be registered. A specific implementation method of the reader 40 differs depending on the method of recognizing the product. For example, the reader 40 reads product information symbols attached to products. The product information symbol is a symbol attached to a product, and is a symbol representing information specifying the product (ID (identifier) of product information, etc.). The symbol is a bar code, a two-dimensional code (QR code (registered trademark), etc.), a character string symbol, or the like. Note that the character string here also includes a numeric string. The product information symbol is a barcode or the like in which information specifying product information is encoded, or a character string symbol representing information specifying product information.

239 For example, if the product information symbol is a bar code, the reader 40 is a bar code reader. Further, for example, when the product information symbol is a two-dimensional code, the reader 40 is a two-dimensional code reader. Further, for example, when the product information symbol is a character string symbol, the reader 40 has an imaging device that captures an image of the character string and a processing unit that analyzes the imaged character string symbol to determine the ID of the product. Various known techniques for character string analysis can be used to analyze character string symbols. A description of these known techniques is omitted.

247 Note that when multiple types of symbols are used as product information symbols, multiple

types of readers are connected to the input/output interface 1100 . For example, when a bar code and a two-dimensional code are used as product information symbols, the input/output interface 1100 is connected to a bar code reader and a two-dimensional code reader.

251 Alternatively, the reader 40 may capture an image of a product to generate an image, and perform object recognition on the product shown in the image to recognize the product.

253 <<Hardware Configuration of First Imaging Unit 3020>> The first imaging unit 3020 has an imaging element that records the results of imaging. For example, the first imaging unit 3020 is configured using a camera having this imaging device. The first imaging unit 3020 may capture still images or may capture moving images. In the latter case, the first customer image is each frame that constitutes the moving image.

258 The first imaging unit 3020 is installed at a position where it can capture an image of a customer using the product registration device 3000 . The first imaging unit 3020 may be provided integrally with the product registration device 3000, or may be provided separately. In the latter case, for example, as shown in FIG.

262 <Example of hardware realizing settlement device 4000> FIG. 6 is a diagram illustrating the hardware configuration of a computer 6000 that implements the settlement device 4000 of the first embodiment. This computer 6000 may be implemented using a dedicated device such as a cash register terminal, or may be implemented using a general-purpose device such as a PC (Personal Computer) or a mobile terminal. Note that the configuration of the computer 6000 is the same as that of the computer 1000 .

268 The storage 6080 stores program modules for realizing the functions of the second imaging unit 4020, the first calculation unit 4040, and the acquisition unit 4060, respectively. The processor 6040 implements the function of each corresponding functional component by executing each program module. Here, when executing each module, the processor 6040 may execute these modules after reading them onto the memory 6060 or may execute them without reading them onto the memory 6060 .

274 The hardware configuration of computer 6000 is not limited to the configuration shown in FIG. For example, each program module may be stored in memory 6060 . In this case, the computer 6000 may not have the storage 6080 .

277 Input/output devices connected to input/output interface 6100 include display device 20 controlled by first display control section 4080 . The display device 20 is installed facing the customer so that the customer using the checkout device 4000 can view it. This display device may be provided integrally with the settlement device 4000, or may be provided separately.

282 Input/output devices connected to input/output interface 6100 include an input device for realizing the function of first input reception unit 4100 . For example, this input device is the touch panel 22 built into the display device 20 . Also, for example, this input device may be a keyboard, a mouse, or the like.

286 Further, input/output devices connected to the input/output interface 6100 include devices for customers to deposit money, devices for refunding change, and devices for issuing receipts (not shown).).

289 <Registration processing of product by product registration device 3000> As described above,

the product registration device 3000 generates settlement information related to products registered as settlement targets. The product registration device 3000 stores the generated settlement information in a storage unit inside or outside the product registration device 3000 .

294 A plurality of commodities can be included in the settlement objects in one settlement process. For example, the product registration device 3000 registers one or a plurality of registered products after receiving an operation instructing the start of the registration processing of the settlement object and before accepting an operation instructing the end of the registration processing of the settlement object. , is registered as a settlement object in one settlement process. Settlement information related to a certain settlement process indicates the ID of each product registered as the target of the settlement process. The settlement information may also indicate the transaction number, the price of each product, the total price, and the like.

303 FIG. 7 is a diagram illustrating settlement information in a table format. The settlement information shown in FIG. 7 is referred to as settlement information 200 . The settlement information 200 has two columns, a settlement information ID 202 and a product list 204 . The product list 204 is a list of product IDs registered as payment targets. The product ID 206 is the ID of the product registered as the payment target.

308 Since various known techniques can be used as a specific method for generating settlement information for products recognized by a reader or the like, description of this method will be omitted.

311 <Details of Processing Performed by First Imaging Unit 3020> The first imaging unit 3020 generates a first customer image (S102). There are various timings at which the first imaging unit 3020 performs imaging. For example, the first image capturing unit 3020 always repeatedly captures images while the product registration device 3000 is in operation. The frequency at which the first imaging unit 3020 performs repeated imaging is, for example, 1/30 second, which is the same as the frame rate of general moving images.

317 Further, for example, the first imaging unit 3020 may detect that the customer is near the product registration device 3000 and may perform imaging according to the detection. For example, an infrared sensor or the like for detecting a person is provided near the first imaging unit 3020 . The first imaging unit 3020 can recognize that the customer is near the first imaging unit 3020 by receiving the notification from the infrared sensor. Therefore, for example, the first imaging unit 3020 takes an image of the customer when the infrared sensor detects that the customer is in the vicinity of the first imaging unit 3020, and generates a first customer image.

325 Note that the first imaging unit 3020 may repeatedly image the customer for a predetermined period from the time the detection is performed. For example, the first imaging unit 3020 repeatedly images the customer for a predetermined period of time after the detection. Also, for example, the first image capturing unit 3020 may repeatedly capture images of the customer from the time the above detection is performed until the registration of the product purchased by the customer is completed (until the settlement information is generated). .

331 The above-mentioned “predetermined time” may be set in advance in the first imaging

section 3020 or may be stored in a storage section provided inside or outside the product registration device 3000 . In the latter case, the first imaging unit 3020 acquires and uses the predetermined time from this storage unit. Unless otherwise specified, various predetermined values (predetermined threshold value, predetermined time, etc.) used by each functional configuration unit described previously or hereinafter are also set in the functional configuration unit. , or obtained from the storage unit and used.

338 Also, the first imaging unit 3020 may be operated by a store clerk who operates the product registration device 3000 . For example, the store clerk guides the customer so that the customer's face is within the imaging range of the first imaging unit 3020 by calling out to the customer. After confirming that the customer's face is within the imaging range of the first imaging unit 3020, the store clerk causes the first imaging unit 3020 to capture the customer's image.

344 Also, the guidance may be performed by the first imaging unit 3020 . For example, the product registration device 3000 is provided with a display device that displays an image captured by the imaging element of the first imaging unit 3020 . The display device is installed facing the customer so that the customer can view it. The first imaging unit 3020 guides the customer by displaying guidance in text on the display device or providing guidance by voice so that the customer's face is captured by the first imaging unit 3020 .

350 When the first imaging unit 3020 captures the customer multiple times, multiple images of the customer are generated. Therefore, the first imaging unit 3020 treats one or more of these multiple images as the first customer image. There are various ways to determine which image to treat as the first customer image. For example, the first imaging unit 3020 sets the image in which the customer looks good as the first customer image. The "image in which the customer appears well" is an image in which the customer appears large or an image with little blurring. Known techniques can be used to calculate the size of the object (customer) appearing in the image and to calculate the amount of blurring. Therefore, descriptions of these methods are omitted.

359 Note that the first imaging unit 3020 may set one image in which the customer is best captured as the first customer image, or may set a plurality of images in which the customer's appearance is equal to or higher than a predetermined standard as the first customer images.

363 Further, the first imaging unit 3020 may use all generated images as the first customer image.

365 <Details of Processing Performed by Generation Unit 3040> The generation unit 3040 generates association information (S104). FIG. 8 is a diagram illustrating the configuration of association information in a table format. The association information shown in FIG. 8 is referred to as association information 300. As shown in FIG. The association information 300 has two columns of first customer image 302 and checkout information ID 304 . A first customer image 302 indicates an image file in which the first customer image is recorded. The settlement information ID 304 indicates the ID of settlement information. When multiple first customer images are generated for the same customer, multiple different first customer images 302 are associated with one settlement information ID 304 .

374 The generation unit 3040 associates the first customer image with the settlement information related to the product purchased by the customer shown in the customer image. Specifically, the generating unit 3040 associates the settlement information generated by the registration process with the first customer image generated during the period from the start of the product registration process to the end of the registration process. .

379 Here, when associating the first customer image with the settlement information, the generation unit 3040 may confirm with the clerk whether or not the association is correct. Specifically, the generation unit 3040 presents the first customer image to be associated with the settlement information on the display device viewed by the store clerk who operates the product registration device 3000 . The store clerk confirms whether or not the presented first customer image is an image of the customer currently using the product registration device 3000 . Then, if the presented first customer image is correct, the clerk uses the touch panel, keyboard, or the like to input that the first customer image is correct. Upon receiving the result of the input, generation section 3040 generates association information.

388 On the other hand, if the presented first customer image is not correct, the clerk performs processing for associating the correct customer image with the payment information. For example, the store clerk operates the first imaging unit 3020 to capture an image of the customer and generate the first customer image again. Then, the generation unit 3040 generates association information by associating the first customer image generated by this operation with the settlement information.

394 Generation unit 3040 stores the association information in a storage unit accessible from each settlement device 4000 . This storage unit may be inside the product registration device 3000 or may be outside. The storage unit outside the product registration device 3000 is, for example, a database server accessible from the product registration device 3000 and the settlement device 4000 .

399 <Regarding settlement processing by the settlement device 4000> The settlement device 4000 acquires settlement information and performs settlement processing based on the settlement information. A known technique can be used as a method for performing settlement processing based on information (settlement information) used by the settlement device 4000 for settlement processing of products. Details of this known technique are omitted.

405 <Details of Processing Performed by Second Imaging Unit 4020> The second imaging unit 4020 generates a second customer image (S202). The process by which the second imaging section 4020 generates the second customer image is the same as the process by which the first imaging section 3020 generates the first customer image.

409 <Details of Processing Performed by First Calculation Unit 4040> The first calculation unit 4040 calculates the customer in the first customer image captured by the first imaging unit 3020 and the second customer image captured by the second imaging unit 4020. A first degree of similarity is calculated with respect to the customer appearing in the customer image (S204). The first customer image for which the first calculation unit 4040 calculates the degree of similarity is the first customer image associated with the payment information in any of the association information. Hereinafter, the similarity calculation is also referred to

as "matching between the first customer image and the second customer image".

417 There are various methods for the first calculation unit 4040 to calculate the first similarity. For example, the first calculation unit 4040 calculates feature amounts of customers in the first customer image and the second customer image, respectively. The first calculator 4040 then calculates the similarity of these customer feature amounts as the first similarity. Here, various known methods used for object matching can be used for the method of extracting the feature amount of the object from the image and the method of calculating the similarity of the feature amount. Also, the method of calculating the first similarity is not limited to the method using the feature amount. Various known methods for calculating the similarity of objects in an image can be used to calculate the first similarity.

426 <<Method for determining first similarity calculation target>> The first calculation unit 4040 may calculate the first similarity for all the first customer images associated with the payment information, or The first similarity may be calculated only for the first customer image. In the latter case, there are various methods for determining the first customer image for which the first similarity is to be calculated. The method will be described below.

431 For example, the first calculation unit 4040 determines the first customer image to be calculated for the first similarity by using the imaging time points of the first customer image and the second customer image. Normally, it takes a short time from when the commodity registration device 3000 registers an item to be settled to when the settlement device 4000 performs the settlement process. For example, this time is within 5 minutes. Therefore, the first calculation unit 4040 selects only the first customer images captured within a predetermined period of time before the generation of the second customer image to be calculated for the first similarity as the calculation target for the first similarity. and For example, this predetermined time is 5 minutes.

440 Further, for example, the first calculation unit 4040 may determine the first customer image to be calculated for the first similarity based on the arrangement of the product registration device 3000 and the settlement device 4000 . For example, as shown in FIG. 1, in a store where the checkout system 2000 is installed, a plurality of product registration devices 3000 and checkout devices 4000 are installed. After completing product registration in the product registration device 3000, the customer appropriately selects the settlement device 4000 to be used. In such an operation environment of the settlement system 2000, it is considered that customers often select the settlement device 4000 that is close to the commodity registration device 3000 used.

449 Therefore, the settlement system 2000 stores in advance information that associates the product registration device 3000 with the settlement device 4000 close to the product registration device 3000 in a storage device accessible from the settlement device 4000 . Then, the first calculator 4040 calculates the first similarity only for the first customer image generated by the product registration device 3000 associated with the settlement device 4000 having the first calculator 4040 .

455 For example, in the case of the example of FIG. Information associated with the settlement device 4000-4 is stored in advance. Then, the first calculator 4040 uses this information to determine the first customer image to be calculated for the first degree of similarity. For

example, in this example, the first calculation unit 4040 included in the settlement devices 4000-1 and 4000-2 selects only the first customer image generated by the product registration device 3000-1 as the first similarity calculation target. and On the other hand, the first calculation units 4040 included in the settlement devices 4000-3 and 4000-4 use only the first customer image generated by the product registration device 3000-2 as the object of calculation of the first similarity.

464 <<Method for Determining Area in which Customer is Captured>> The first calculation unit 4040 extracts an area representing the customer using the product registration device 3000 from the first customer image. Similarly, the first calculator 4040 extracts a region representing the customer using the settlement device 4000 from the second customer image. A variety of existing object recognition techniques can be used as a method of extracting a person appearing in an image in this way. Details of this existing technique are omitted.

471 Here, a plurality of customers may be present at the store. In this case, the imaging range of the first imaging unit 3020 may include customers other than the customer using the product registration device 3000 . As a result, multiple customers may appear in the first customer image.

475 Therefore, the first calculation unit 4040 identifies the customer who used the product registration device 3000 from among the customers appearing in the first customer image, and calculates the first similarity for this customer. The "customer using the product registration device 3000" here means a customer who purchases the product indicated by the settlement information associated with the first customer image.

480 There are various methods of specifying a customer using the product registration device 3000 . For example, the first calculation unit 4040 determines that the customer appearing in the largest image among the customers appearing in the first customer image is the customer who used the product registration device 3000 . Further, for example, the first calculation unit 4040 determines that the customer who appears closest to the center of the first customer image among the customers appearing in the first customer image is the customer using the product registration device 3000. do. Here, a known technique can be used as a method for comparing the sizes of the customers appearing in the images and comparing the positions of the customers appearing in the images. Therefore, descriptions of these methods are omitted.

490 Note that the first customer image may be generated by the first imaging unit 3020 as an image showing only the customer who uses the product registration device 3000 . In this case, the first imaging unit 3020 identifies the customer who used the product registration device 3000 by the same method as the first calculation unit 4040, for example. Then, the first imaging unit 3020 generates a first customer image using only the area representing the customer who used the product registration device 3000 in the image recorded in the imaging device.

497 Further, for example, when the first customer image is generated, the store clerk operating the product registration device 3000 may specify the area in which the customer is shown. In this case, the first imaging unit 3020 displays the entire image recorded by the imaging

device on the display device viewed by the store clerk who operates the product registration device 3000 . Then, the store clerk performs an input designating an area in which the customer using the product registration device 3000 is shown in the image displayed on the display device. For example, if the display device has a touch panel, the store clerk designates the area where the customer is shown by enclosing the area where the customer is shown by tracing the area with a finger. Then, the first imaging unit 3020 generates an image representing the area specified by the store clerk as the first customer image. Note that when the customer is imaged multiple times, for example, the first imaging unit 3020 displays the image with the least blur among the images recorded in the imaging element on the display device.

510 Similarly, a plurality of customers may appear in the second customer image as well. In this case, for example, the first calculation unit 4040 extracts customers using the settlement device 4000 by performing the same processing as that for the first customer image. Also, the second customer image may be generated by the second imaging unit 4020 as an image of the customer using the settlement device 4000 extracted. The generation method is the same as the method by which the first imaging unit 3020 generates the first customer image showing only the customer who used the product registration device 3000 . In addition, the settlement device 4000 uses the same method as the product registration device 3000 to allow the store clerk to designate a customer. may be allowed to

519 <Details of the processing performed by the acquisition unit 4060> If there is a first customer image that satisfies the matching condition (the first similarity is equal to or greater than the first threshold) (S206: YES), the acquisition unit 4060 determines that the first customer is present (S206: YES). Accounting information associated with the image is obtained (S208). Specifically, the obtaining unit 4060 determines a first customer image whose first similarity is equal to or greater than a first threshold, from among the first customer images for which the first similarity has been calculated. Then, using the association information, the acquisition unit 4060 acquires the settlement information associated with the determined first customer image. Specifically, the acquisition unit 4060 accesses the storage unit in which the generation unit 3040 stores the association information, and acquires the settlement information indicated by the association information indicating the determined customer image.

531 Note that there may be a plurality of first customer images whose first similarity is equal to or higher than the first threshold. For example, in this case, the acquisition unit 4060 acquires settlement information associated with the first customer image having the highest first similarity. Further, in this case, the settlement device 4000 may display the first customer images whose first similarity is equal to or higher than the first threshold on the display device 20 and allow the customer to select one of them. Acquisition unit 4060 acquires settlement information associated with the first customer image selected by the customer. By these methods, even if there are a plurality of first customer images that satisfy the matching condition, it is possible to uniquely determine and acquire the settlement information related to the product purchased by the customer using the settlement device 4000 .

541 Here, the method of displaying the first customer image whose first similarity is equal to or

higher than the first threshold on the display device 20 and the method of accepting the selection of the displayed first customer image are performed by the first display control unit 4080 as a candidate. The process of displaying an image on the display device 20 and the method of receiving selection of the displayed candidate image by the first input receiving unit 4100 are the same. A detailed description of the process by which the first display control unit 4080 displays the candidate images on the display device 20 and the method by which the first input reception unit 4100 receives selection of the displayed candidate images will be described later.

550 <Details of processing performed by the first display control unit 4080> The first display control unit 4080 sets the first similarity with the customer (customer using the settlement device 4000) shown in the second customer image to the If there is no first customer image in which the customer with the number equal to or greater than 1 threshold is present, the display device is controlled (S210). Specifically, the first display control unit 4080 selects candidates (candidate images) for the first customer image in which the same customer as the customer appearing in the second customer image is displayed among the first customer images on the display device. 20.

558 FIG. 9 is a diagram illustrating a display on the display device 20. As shown in FIG. In FIG. 9A , the first display control unit 4080 displays one candidate image 50 on the touch panel 22 of the display device 20 . On the other hand, in FIG. 9B , the first display control unit 4080 displays three candidate images 50 on the touch panel 22 of the display device 20 . Note that when there are many customers imaged by the first imaging unit 3020 , the first display control unit 4080 displays the button 70 on the touch panel 22 . When the customer presses the button 70 , the first display control section 4080 displays the candidate image 50 not currently displayed on the touch panel 22 .

566 <<Method for Determining Candidate Image>> As described above, the candidate image is a candidate for the first customer image in which the same customer as the customer shown in the second customer image is shown. To display the candidate images, the first display control unit 4080 determines which first customer image is the candidate image. There are various methods for this method. The method will be specifically exemplified below.

571 For example, the first display control unit 4080 determines candidate images using a predetermined second threshold that is smaller than the first threshold. Specifically, when it is necessary to display the candidate image (when there is no first customer image that satisfies the matching condition), the first display control unit 4080 first similarity with the customer appearing in the second customer image. A first customer image having a degree greater than or equal to the second threshold is set as a candidate image. Since the second threshold is smaller than the first threshold, according to this method, the first customer image whose first similarity is greater than or equal to the second threshold and less than the first threshold is determined as the candidate image.

580 Also, for example, the first display control unit 4080 determines candidate images using a second similarity calculated by a method different from that for the first similarity. Specifically, when it is necessary to display the candidate images (when there is no first customer image that satisfies the matching condition), the first calculation unit 4040 uses a

method different from the method of calculating the first similarity. Then, a second similarity between the second customer image and the first customer image is calculated. Then, the first display control unit 4080 sets each first customer image having the calculated second similarity equal to or higher than the first threshold as a candidate image.

588 Here, when the second similarity is greater than or equal to the first threshold, the second similarity is a value greater than the first similarity. This is because the first similarity is smaller than the first threshold when the second similarity is calculated. Therefore, as the algorithm for calculating the second degree of similarity, it is preferable to use an algorithm for calculating a higher degree of similarity than the algorithm for calculating the first degree of similarity. Here, there are various algorithms for calculating the degree of similarity between objects in an image, and the magnitude of the degree of similarity calculated differs from one to another. Therefore, for example, an algorithm for calculating the first similarity and an algorithm for calculating the second similarity are appropriately adopted from these known algorithms so that the second similarity is greater than the first similarity.

598 Note that the first display control unit 4080 may display all of the candidate images determined by the methods described above, or may display only some of them. In the latter case, for example, the first display control unit 4080 uses the association between the product registration device 3000 and the settlement device 4000 described above. Specifically, the first display control unit 4080 displays only the candidate images generated by the settlement information associated with the settlement device 4000 having the first display control unit 4080 among the candidate images.

605 Further, the first display control unit 4080 may determine the display order of the candidate images using the association between the product registration device 3000 and the settlement device 4000 described above. Specifically, the first display control unit 4080 selects the candidate images generated by the product registration device 3000 associated with the settlement device 4000 having the first display control unit 4080 as the settlement device 4000 associated with the settlement device 4000. The candidate image generated by the product registration device 3000 that does not exist is displayed before the candidate image.

613 <Details of Processing Performed by First Input Reception Unit 4100> The first input reception unit 4100 receives input for selecting one of the displayed candidate images (S212). As a method for accepting selection of candidate images, various known techniques for accepting selection of images, buttons, etc. displayed on the display can be used. When the display device has a touch panel and the first input reception unit 4100 displays candidate images on the touch panel, for example, the first input reception unit 4100 detects that the candidate image displayed on the touch panel has been pressed. , the selection of the candidate image is accepted. In the case of FIG. 9, the customer selects the candidate image 50 by pressing one of the candidate images 50 . Further, for example, the first input receiving unit 4100 may receive selection of a candidate image using an input device such as a keyboard.

624 When the first input reception unit 4100 receives the selection of the candidate image, the acquisition unit 4060 uses the association information to acquire the settlement information

associated with the selected candidate image (first customer image) (S214). The method of obtaining the settlement information associated with the first customer image is as described above.

629 <About other functions> The settlement device 4000 may further have a determination unit 4120 . FIG. 10 is a block diagram illustrating the settlement device 4000 having the determination unit 4120. As shown in FIG. When the first input receiving unit 4100 does not receive the selection operation of the candidate image (when the customer does not select the candidate image), the determination unit 4120 determines whether the customer who is the same as the customer shown in the second customer image is shown. It is determined that there is no first customer image that is For example, in the example of FIG. 9, the determination unit 4120 determines that the first input reception unit 4100 receives the selection of the candidate image when the customer presses the button 60 or does not press the candidate image 50 or each button for a predetermined time. determined that it was not. Further, even when there is no candidate image displayed by the first display control unit 4080, the determination unit 4120 determines that there is no first customer image showing the same customer as the customer shown in the second customer image. . Here, the case where there is no candidate image displayed by the first display control unit 4080 means, for example, when there is no first customer image whose second similarity is equal to or higher than the first threshold in the above-described method of determining the candidate image. Alternatively, there is no first customer image whose first similarity is equal to or higher than the second threshold.

647 When the determining unit 4120 determines that "there is no first customer image in which the same customer as the second customer image is shown", the settlement device 4000 performs various processes. For example, the first display control unit 4080 displays a message or the like to the effect that there is no settlement information corresponding to the customer on the display device. Further, for example, the settlement device 4000 may redo the second customer image and the like. That is, the settlement device 4000 executes the process of FIG. 4 again. As a result, similarity calculation and the like are performed using the second customer image generated by newly imaging the customer. By doing so, the customer will be able to checkout more reliably.

656 [Embodiment 2] FIG. 11 is a block diagram illustrating a settlement system 2000 of Embodiment 2. As shown in FIG. In FIG. 11, each block does not represent the configuration in units of hardware, but the configuration in units of functions.

659 The settlement system 2000 of the second embodiment has a function of issuing a warning when a customer who is about to leave the area where the settlement device 4000 is installed has not completed the settlement process. Therefore, the settlement system 2000 of the second embodiment is configured as follows.

663 The related information generated by the generation unit 3040 of the second embodiment further indicates a completion flag. The completion flag indicates whether the settlement using the settlement information indicated by the relevant information has been completed. That is, the generation unit 3040 of the second embodiment generates related information that associates the first customer image, the payment information, and the completion flag.

Hereinafter, it is assumed that the value of the completion flag indicating that the payment has been completed is "payment completed", and the value of the completion flag indicating that the payment has not been completed is "not yet completed". FIG. 12 is a diagram illustrating association information 300 according to the second embodiment. The association information 300 further has a completion flag 306 in addition to the first customer image 302 and settlement information ID 304 .

674 The settlement system 2000 of Embodiment 2 further has a warning device 5000 . The warning device 5000 has a third imaging section 5020 , a warning section 5040 , a second calculation section 5060 , a second display control section 5080 and a second input reception section 5100 . The third imaging unit 5020 performs imaging to generate an image including the customer at the exit (hereinafter also simply referred to as “exit”) of the area where the settlement device 4000 is installed. The image generated by the third imaging unit 5020 is hereinafter referred to as the third customer image.

681 The warning unit 5040 performs warning processing when a warning condition is satisfied. The warning condition is that "the completion flag associated with the first customer image in which the same customer as the customer in the third customer image is shown indicates that the payment has not been completed". The warning unit 5040 determines whether or not the warning condition is satisfied based on the result of processing by the second calculation unit 5060, the second display control unit 5080, and the second input reception unit 5100.

688 The second calculator 5060 calculates the third similarity between the customer appearing in the third customer image and the customer appearing in each first customer image. When there is a first customer image showing a customer whose third similarity is equal to or higher than a predetermined third threshold, the warning unit 5040 sets the first customer image to the same customer as the customer shown in the third customer image. is taken as the first customer image. Therefore, the warning unit 5040 determines that the warning condition is satisfied when the completion flag associated with the first customer image indicates that payment has not been completed. The value of the third threshold may be the same as the value of the first threshold or the value of the second threshold, or may be a value different therefrom.

698 The second display control unit 5080 displays the second candidate image on the display device 110 that can be viewed by the store clerk when there is no first customer image showing a customer whose third similarity is equal to or higher than the third threshold. The second candidate image is a candidate for the first customer image in which the same customer as the customer appearing in the third customer image is shown.

703 A second input accepting unit 5100 accepts an input for selecting a second candidate image. Warning unit 5040 sets the second candidate image selected via second input reception unit 5100 as the first customer image in which the same customer as the customer appearing in the third customer image is shown. Therefore, the warning unit 5040 determines that the warning condition is satisfied when the completion flag associated with the first customer image indicates that payment has not been completed.

709 <Flow of Processing> FIG. 13 is a flowchart illustrating the flow of processing executed by the

warning device 5000 of the second embodiment. The third imaging unit 5020 images the customer at the exit and generates a third customer image (S302). The second calculator 5060 calculates the third similarity for each first customer image (S304). The warning unit 5040 determines whether or not there is a first customer image showing a customer whose third similarity is equal to or higher than the third threshold (S306). If there is a first customer image showing a customer whose third similarity is equal to or higher than the third threshold (S306: YES), the process of FIG. 13 proceeds to S308. On the other hand, when there is no first customer image showing a customer whose third similarity is equal to or higher than the third threshold (S306: NO), the process of FIG. 13 proceeds to S312.

719 In S308, the warning unit 5040 determines whether "whether the completion flag associated with the first customer image showing the customer whose third similarity is equal to or higher than the third threshold indicates that payment has not been completed (warning condition is satisfied)" . If this warning condition is satisfied (S308: YES), the warning unit 5040 performs warning processing (S310). If this warning condition is not satisfied (S308: NO), the process of FIG. 13 ends.

725 In S<b>312 , the second display control unit 5080 displays the second candidate image on the display device 110 . The second input accepting unit 5100 accepts an input for selecting a second candidate image (S314).

728 The warning unit 5040 determines "whether or not the completion flag associated with the selected second candidate image indicates that the payment has not been completed (whether or not the warning condition is satisfied)" (S316). If this warning condition is satisfied (S316: YES), the process of FIG. 13 proceeds to S310. On the other hand, if this warning condition is not satisfied (S316: NO), the process of FIG. 13 ends.

733 <Hardware configuration example> For example, the warning device 5000 is implemented by a computer having the same hardware configuration as the computer that implements the product registration device 3000 and the settlement device 4000 . The input/output interface of this computer is connected to hardware (such as a camera) that constitutes the third imaging unit 5020 . The third imaging unit 5020 is provided near the exit. For example, the third imaging unit 5020 is provided on the ceiling near this exit. Also, for example, if there is a gate through which customers pass through this exit, the third imaging unit 5020 may be provided at this gate. However, the third imaging unit 5020 only needs to be able to capture an image of the customer at the exit, and its installation location is not limited to the above example. As for other points, the third imaging unit 5020 is implemented in the same manner as the first imaging unit 3020 and the second imaging unit 4020 .

744 A display device 110 is connected to the input/output interface of the computer that implements the warning device 5000 . A display device 110 is provided near the exit. In addition, the display device 110 is installed so that it can be viewed by the store clerk.

747 An input device for realizing the second input reception unit 5100 is connected to the input/output interface of the computer that realizes the warning device 5000 . For example, this input device is a touch panel built into the display device 110 . Also, for example, this input device may be a keyboard, a mouse, or the like.

751 The computer storage that implements the warning device 5000 has program modules that

implement the third imaging unit 5020 , the warning unit 5040 , the second calculation unit 5060 , the second display control unit 5080 , and the second input reception unit 5100 . The processor of the computer that implements the warning device 5000 implements the functions of these functional components by executing this program module.

756 <Details of processing performed by the second calculation unit 5060> The second calculation unit 5060 calculates the third similarity between the customer shown in each first customer image and the customer shown in the third customer image (S304). The algorithm used for calculating the third degree of similarity may be the same as or different from the algorithm for calculating the first degree of similarity or the second degree of similarity.

762 The first customer image for which the third degree of similarity is to be calculated is the first customer image associated with the payment information in any of the related information. The second calculation unit 5060 acquires each first customer image by the same method as the method by which the first calculation unit 4040 acquires each first customer image associated with the settlement information in the related information.

767 <Details of processing performed by the second display control unit 5080> If there is no first customer image whose third similarity is equal to or higher than the third threshold (S306: NO), the second display control unit 5080 5080 displays the second candidate image (the first customer image representing the customer candidate appearing in the third customer image) on the display device 110 that can be viewed by the store clerk (S312). Here, the method for determining which first customer image is to be the second candidate image is the same as the method for determining candidate images in the first embodiment. This method will be specifically described below.

775 For example, the second calculation unit 5060 calculates the fourth similarity between the customer appearing in the first customer image and the customer appearing in the third customer image using a method different from the method for calculating the third similarity. do. Then, the second display control unit 5080 displays the first customer image whose fourth similarity is equal to or higher than the third threshold as the second candidate image.

780 Here, for the same reason that it is preferable that the algorithm for calculating the second similarity calculates a higher degree of similarity than the algorithm for calculating the first similarity, the algorithm for calculating the fourth similarity is the third similarity. It is preferable to calculate a degree of similarity that is greater than the algorithm that calculates the degree. For example, the second calculation unit 5060 uses the same algorithm as the algorithm for calculating the first similarity as the algorithm for calculating the third similarity, and calculates the second similarity as the algorithm for calculating the fourth similarity. Use the same algorithm as the algorithm.

788 Further, for example, the second display control unit 5080 may display the first customer image whose third similarity is equal to or higher than the fourth threshold as the second candidate image. The fourth threshold is a value smaller than the third threshold.

791 <Details of Processing Performed by Second Input Receiving Unit 5100> The second input receiving unit 5100 receives processing for selecting a second candidate image (S314). The selection of the second candidate image is made by the store clerk. The method by which

second input reception unit 5100 receives the selection of the second candidate image is the same as the method by which first input reception unit 4100 receives the selection of the candidate image.

797 <Details of processing performed by the warning unit 5040> The warning unit 5040 performs warning processing when the warning conditions are satisfied (S310). As described above, the warning condition is that "the completion flag associated with the first customer image showing the same customer as the third customer image indicates that payment has not been completed." Here, the warning unit 5040 categorizes 1) the first customer image whose third similarity is equal to or higher than the third threshold or 2) the second candidate image selected by the customer as “a customer appearing in the third customer image”. "first customer image in which the same customer as the customer is shown". 1) and 2) are as described above.

806 The warning unit 5040 accesses the storage unit in which the related information is stored, and acquires the completion flag associated with "the first customer image showing the same customer as the customer shown in the third customer image". do. Then, warning unit 5040 determines whether or not the value of the completion flag indicates that payment has not been completed.

811 <<Details of warning processing>> There are various types of warning processing performed by the warning unit 5040. For example, the warning unit 5040 outputs an alarm sound at a place where the customer captured by the first imaging unit 3020, the store clerk, or the security guard can hear. For example, this place is near the exit, near the product registration device 3000, or a security room. In this case, a speaker or the like for outputting the alarm sound is installed at the place where the alarm sound is output.

817 Also, for example, the warning unit 5040 displays a warning message to the effect that the payment has not been completed in a place where the customer captured by the third imaging unit 5020, the store clerk, or the security guard can be seen. Specifically, the warning unit 5040 displays a warning message on the display device 110 provided at the exit, the display device 20 provided in each product registration device 3000, or the display device provided in the guard room. indicate.

823 Moreover, when a gate is installed at the exit, the warning unit 5040 may perform processing for closing the gate when the warning condition is satisfied. By doing so, the customer is prevented from exiting the exit, and thus it is possible to prevent the customer who has not made the payment from leaving by mistake.

827 Moreover, when a membership system is introduced in the store that operates the settlement system 2000, the warning unit 5040 may issue a warning using member information. Specifically, it is assumed that the member’s image (face photo, etc.) and the member’s contact information (e-mail address, etc.) are registered in advance as member information. If the warning condition is satisfied, the warning unit 5040 accesses a database or the like in which member information is stored, and searches for images of members in which the same customer as the third customer image is shown. Then, when there is such an image, the warning unit 5040 sends a warning message to the contact of the customer indicated by the member information indicated by the image. For example, the warning unit 5040 sends an e-

mail containing a warning message to the customer's e-mail address. By using the member information, it is possible to send a warning message directly to the customer. Therefore, even if the customer mistakenly forgets to pay the bill and leaves the exit, the customer can be warned so that other people do not know about it. Therefore, the customer's privacy can be protected.

841 <Specific example> The operation of the settlement system 2000 of the second embodiment will be specifically illustrated. FIG. 14 is a diagram illustrating an operational environment of the settlement system 2000 of the second embodiment. In FIG. 14, the settlement device 4000 is installed in the area 80 . Exit 90 is the exit of area 80 . Gate 100 is the gate through which customers exit exit 90 . In FIG. 14, the third imaging section 5020 is provided in this gate 100 .

847 Normally, after using the commodity registration device 3000, the customer uses the settlement device 4000 to make a settlement. The settlement device 4000 changes the value of the completion flag associated with the first customer image selected by the customer via the input reception unit 4100 to "completion of settlement" when the settlement of the customer is completed.

852 When the customer passes through the gate 100, the third imaging unit 5020 images the customer and generates a third customer image. Then, the warning unit 5040 determines whether or not the completion flag associated with the first customer image showing the same customer as the customer shown in the third customer image indicates "incomplete payment". As described above, if the customer has completed payment, the completion flag indicates "payment completed". Therefore, the warning unit 5040 does not perform warning processing.

859 On the other hand, if the customer has not completed the payment, the completion flag associated with the first customer image showing the same customer as the customer shown in the third customer image indicates "incomplete payment". In this case, the warning unit 5040 performs warning processing. For example, the warning unit 5040 closes the gate 100 and displays a warning message on the display device provided at the gate 100 .

864 <Action/Effect> The settlement system 2000 of the present embodiment can be used when the completion flag associated with the "first customer image showing the same customer as the customer depicted in the third customer image" indicates that settlement has not been completed. , perform warning processing. This means that the customer will be warned if they attempt to (or exit) the exit before checking out for their purchases. Therefore, according to the checkout system 2000 of the present embodiment, it is possible to prevent the customer from forgetting to pay the checkout and go home, thereby preventing troubles between the customer and the store. .

872 In addition, when there is no first customer image whose third similarity is equal to or higher than the third threshold, the warning device 5000 displays the second candidate image and prompts the salesclerk browsing the display device 110 to select the second candidate image. . For example, what the customer is wearing may be different depending on when the product registration device 3000 is used and when the customer leaves the exit. Specifically, it is conceivable that the customer removes the mask worn when using the product

registration device 3000 before leaving the exit. In such a case, although there is actually a first customer image showing the same customer as the customer shown in the third customer image, the third similarity between them will be low. Therefore, even if a customer who has not completed payment exits the exit, no warning will be issued.

882 According to the warning device 5000 of this embodiment, the second candidate image is displayed when there is no first customer image whose third similarity is equal to or higher than the third threshold. It is possible to visually determine whether or not there is a second candidate image in which the same customer is shown. Then, when there is a second candidate image in which the same customer as the customer who is about to leave the exit is present in the clerk's eyes, the clerk selects the second candidate image, and the warning device 5000 It is determined whether or not payment based on the payment information associated with the second candidate image has been completed. Then, the warning device 5000 performs warning processing when the settlement is not completed. Therefore, the warning device 5000 of the present embodiment can more reliably prevent the customer from forgetting to pay the bill and going home by using the judgment by the person.

893 Although the embodiments of the present invention have been described above with reference to the drawings, these are examples of the present invention, and combinations of the above embodiments or various configurations other than those described above can also be adopted.

897 Examples of reference forms are added below. 1. A checkout system having a product registration device and a checkout device, wherein the product registration device includes first imaging means for generating a first customer image including the customer, and checkout for the first customer image used for product checkout and generating means for generating association information that associates information, and the settlement device includes: second imaging means for generating a second customer image including a customer; a first display control means for displaying a candidate image, which is a candidate for the first customer image in which the customer is shown, on a display device that can be viewed by the customer. 2. a first calculating means for calculating a first degree of similarity between the customer appearing in the second customer image and the customer appearing in each of the first customer images; acquisition means for acquiring the settlement information associated with the first customer image when there is a first customer image showing a customer whose degree of similarity is equal to or higher than a first threshold; Display control means displays the candidate image when there is no first customer image showing a customer whose first similarity to the customer shown in the second customer image is equal to or greater than a first threshold; . payment system described in . 3. 2. The settlement device has input reception means for receiving a selection operation on the candidate image, and the acquisition means acquires the settlement information associated with the selected candidate image; payment system described in . 4.The settlement device has determination means for determining that there is no first customer image in which the same customer as the customer in the second customer image is present when the candidate image is not selected.3. payment system described in . 5. The first calculation means calculates the first similarity when there is no first customer image showing a customer

whose first similarity to the customer shown in the second customer image is equal to or greater than a first threshold. Using a method different from the method, the second similarity between the customer appearing in the second customer image and the customer appearing in each of the first customer images is calculated, and the first display control means performs the 1. displaying, as the candidate image, a first customer image showing a customer whose second similarity to the customer shown in the second customer image is equal to or greater than the first threshold; to 4. The settlement system according to any one of the preceding claims. 6. If there is no first customer image showing a customer whose first similarity to the customer shown in the second customer image is equal to or greater than a first threshold, the first display control means displays 2. Displaying as the candidate image a first customer image in which a customer whose first similarity with the customer in the image is equal to or greater than a second threshold smaller than the first threshold is displayed;

933 to 4. The settlement system according to any one of the preceding claims. 7. The settlement system has a plurality of the commodity registration devices and a plurality of settlement devices, and the first display control means is generated by the commodity registration device associated with the settlement device having the first display control means 1. displaying the obtained first customer image as the candidate image; to 4. The settlement system according to any one of the preceding claims. 8. The generating means generates the association information further indicating the imaging time point of the first customer image, and the first calculating means calculates the difference between the imaging time point and the current time for the first customer image within a predetermined time. 2. Calculate similarity. to 6. The settlement system according to any one of the preceding claims. 9. The generating means further associates, in the association information, a completion flag indicating whether the settlement using the settlement information indicated by the association information has been completed, and the settlement system is equipped with the settlement device a third imaging means for generating a third customer image including the customer at the exit of the area; and the completion flag associated with the first customer image in which the same customer as the customer appearing in the third customer image is captured indicates that settlement using the settlement information has not been completed, warning means for performing warning processing;1. to 8. The settlement system according to any one of the preceding claims. 10. The warning device has a second calculation means for calculating a third degree of similarity between the customer appearing in the third customer image and the customer appearing in each of the first customer images; When there is a first customer image showing a customer whose third similarity is equal to or higher than the third threshold, the first customer image is transferred to the first customer image showing the same customer as the customer shown in the third customer image. If there is no first customer image showing a customer whose third similarity is equal to or higher than the third threshold, the warning device will second display control means for displaying a second candidate image, which is a candidate for the first customer image, on the display device provided at the exit; and second input reception means for receiving an input for selecting the second candidate image and, if there is no first customer image

showing a customer whose third similarity is equal to or higher than the third threshold, the warning means has the second 9. The candidate image is the first customer image in which the same customer as the customer in the third customer image is shown;

965 payment system described in . 11. If there is no first customer image showing a customer whose third similarity is equal to or higher than the third threshold, the second calculation means uses a method different from the method for calculating the third similarity , calculating a fourth degree of similarity between the customer appearing in the third customer image and the customer appearing in each of the first customer images; 10. displaying the first customer image in which the customer whose number is equal to or higher than the threshold is shown as the second candidate image; payment system described in . 12. 10. The second display control means displays, as the second candidate image, a first customer image showing a customer whose third similarity is smaller than the third threshold and equal to or greater than a fourth threshold; The information processing system according to . １３． １． 12. A settlement device included in any one of the information processing systems. １４． コンピュータを１３． A program that operates as the settlement device described in . 15. A settlement method executed in a settlement system having a commodity registration device and a settlement device, wherein the commodity registration device generates a first customer image including the customer in a first imaging step; A generation step of generating association information in which settlement information used for settlement of goods is associated with one customer image; a second imaging step of the settlement device generating a second customer image including the customer; and a first display control step of displaying a candidate image, which is a candidate for the first customer image in which the same customer as the customer in the second customer image is shown, on a display device that can be viewed by the customer. . 16. a first calculation step in which the settlement device calculates a first degree of similarity between the customer depicted in the second customer image and the customer depicted in each of the first customer images; Acquisition for acquiring the settlement information associated with the first customer image when there is a first customer image showing a customer whose first similarity to the customer shown in the customer image is equal to or higher than a first threshold and the first display control step is performed when there is no first customer image showing a customer whose first similarity to the customer shown in the second customer image is equal to or higher than the first threshold 15. displaying said candidate image; Settlement method described in . 17. 16. The settlement device has an input reception step of receiving a selection operation on the candidate image, and the acquisition step acquires the settlement information associated with the selected candidate image;

998 Settlement method described in . 18. 17. The settlement device has a determination step of determining that there is no first customer image in which the same customer as the customer appearing in the second customer image is present when the candidate image is not selected; Settlement method described in . 19. The first calculating step calculates a first similarity when there is no first customer image showing a customer whose first similarity to the customer shown in the second customer image is equal to or greater than a first

threshold. calculating a second similarity between the customer appearing in the second customer image and the customer appearing in each of the first customer images using a method different from the method, and the first display control step includes: 16. Display as the candidate image a first customer image in which a customer whose second similarity to the customer in the second customer image is equal to or greater than the first threshold is displayed; to 18. The settlement method described in any one. 20. In the first display control step, when there is no first customer image showing a customer whose first similarity to the customer shown in the second customer image is equal to or higher than a first threshold, 15. Displaying as the candidate image a first customer image in which a customer whose first similarity with the captured customer is equal to or greater than a second threshold smaller than the first threshold is displayed; to 18. The settlement method described in any one. 21. The settlement method includes a plurality of the product registration devices and a plurality of the settlement devices, and the first display control step is performed by the product registration device associated with the settlement device that executes the first display control step 15. displaying the generated first customer image as the candidate image; to 18. The settlement method described in any one. 22. The generating step generates the association information that further indicates the imaging time point of the first customer image, and the first calculating step is performed on the first customer image in which the difference between the imaging time point and the current time is within a predetermined time. Calculate similarity16. 20. The settlement method described in any one. 23. The generating step further associates, in the association information, a completion flag indicating whether or not the settlement using the settlement information indicated by the association information has been completed, the settlement system further has a warning device, and the The settlement system comprises a third imaging step in which the warning device generates a third customer image including a customer at the exit of the area where the settlement device is installed; a warning step of performing a warning process when the completion flag associated with the first customer image in which the same customer as the customer who is present indicates that the settlement using the settlement information has not been completed; , 15.

1033 22. The settlement method described in any one. 24. The warning device has a second calculation step of calculating a third degree of similarity between the customer appearing in the third customer image and the customer appearing in each of the first customer images, and the warning step comprises the When there is a first customer image showing a customer whose third similarity is equal to or higher than the third threshold, the first customer image is transferred to the first customer image showing the same customer as the customer shown in the third customer image. If there is no first customer image in which the customer whose third similarity is equal to or higher than the third threshold is present, the customer image is the same as the customer in the third customer image. a second display control step of displaying a second candidate image, which is a candidate for the first customer image, on the display device provided at the exit; and the warning device receives an input for selecting the second candidate image and a second input receiving step, wherein if there is no first customer image showing a customer whose third similarity

is equal to or higher than the third threshold, the warning step is performed through the second input receiving step 23. The selected second candidate image is the first customer image showing the same customer as the customer shown in the third customer image; Settlement method described in . 25. In the second calculation step, if there is no first customer image showing a customer whose third similarity is equal to or higher than the third threshold, a method different from the method for calculating the third similarity is used, Calculate a fourth degree of similarity between the customer appearing in the third customer image and the customer appearing in each of the first customer images; 24. displaying the first customer image in which the above customer is shown as the second candidate image; Settlement method described in . 26. 24. The second display control step displays, as the second candidate image, a first customer image including a customer whose third similarity is smaller than the third threshold and equal to or greater than a fourth threshold; Settlement method described in .

1059 This application claims priority based on Japanese Patent Application No. 2015-072035 filed on March 31, 2015, and the entire disclosure thereof is incorporated herein.

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

CLAIMS WO2016158748A1

1.

13 A checkout system having a product registration device and a checkout device, wherein the product registration device includes first imaging means for generating a first customer image including the customer, and checkout for the first customer image used for product checkout and generating means for generating association information that associates information, and the settlement device includes: second imaging means for generating a second customer image including a customer; a first display control means for displaying a candidate image, which is a candidate for the first customer image in which the customer is shown, on a display device that can be viewed by the customer.

2.

24 a first calculating means for calculating a first degree of similarity between the customer appearing in the second customer image and the customer appearing in each of the first customer images; acquisition means for acquiring the settlement information associated with the first customer image when there is a first customer image showing a customer whose degree of similarity is equal to or higher than a first threshold; The display control means displays the candidate image when there is no first customer image showing a customer whose first similarity to the customer shown in the second customer image is equal to or higher than a first threshold. Item 1. The settlement system according to Item 1.

3.

35 3. The settlement according to claim 2, wherein the settlement device has input reception means for receiving a selection operation on the candidate image, and the acquisition means acquires the settlement information associated with the selected candidate image. system.

4.

41 4. The settlement device has determination means for determining that there is no first customer image in which the same customer as the customer appearing in the second customer image is present when the candidate image is not selected. Payment system as described.

5.

48 The first calculation means calculates the first similarity when there is no first customer image showing a customer whose first similarity to the customer shown in the second customer image is equal to or greater than a first threshold. Using a method different from the method, the second similarity between the customer appearing in the second customer image and the customer appearing in each of the first customer images is calculated, and the first display control means performs the 5. Any one of claims 2 to 4, wherein a first customer image showing a customer whose second similarity to the customer shown in the second customer image is equal to or higher than the first threshold is displayed as the candidate image. payment system described in .

6.

60 If there is no first customer image showing a customer whose first similarity to the customer shown in the second customer image is equal to or greater than a first threshold, the first display control means displays 5. A first customer image in which a customer whose first similarity to the customer in the image is a second threshold value smaller than the first threshold value is displayed as the candidate image. payment system as set forth in paragraph.

7.

68 The settlement system has a plurality of the commodity registration devices and a plurality of settlement devices, and the first display control means is generated by the commodity registration device associated with the settlement device having the first display control means 5. The settlement system according to any one of claims 1 to 4, wherein said first customer image thus obtained is displayed as said candidate image.

8.

76 The generating means generates the association information further indicating the imaging time point of the first customer image, and the first calculating means calculates the difference between the imaging time point and the current time for the first customer image within a predetermined time. 7. The settlement system according to any one of claims 2 to 6, wherein

the degree of similarity is calculated.

9.

84 The generating means further associates, in the association information, a completion flag indicating whether the settlement using the settlement information indicated by the association information has been completed, and the settlement system is equipped with the settlement device a third imaging means for generating a third customer image including the customer at the exit of the area; and the completion flag associated with the first customer image in which the same customer as the customer appearing in the third customer image is captured 9. The settlement system according to any one of claims 1 to 8, further comprising: a warning means for performing a warning process when indicates that the settlement using the settlement information has not been completed.

10.

96 The warning device has a second calculation means for calculating a third degree of similarity between the customer appearing in the third customer image and the customer appearing in each of the first customer images; When there is a first customer image showing a customer whose third similarity is equal to or higher than the third threshold, the first customer image is transferred to the first customer image showing the same customer as the customer shown in the third customer image. If there is no first customer image showing a customer whose third similarity is equal to or higher than the third threshold, the warning device will second display control means for displaying a second candidate image, which is a candidate for the first customer image, on the display device provided at the exit; and second input reception means for receiving an input for selecting the second candidate image and, if there is no first customer image showing a customer whose third similarity is equal to or higher than the third threshold, the warning means has the second 10. The settlement system according to claim 9, wherein the candidate image is the first customer image showing the same customer as the customer shown in the third customer image.

11.

113 The second calculation means uses a method different from the method for calculating the third similarity when there is no first customer image showing a customer whose third similarity is equal to or higher than the third threshold, A fourth degree of similarity between the customer appearing in the third customer image and the customer appearing in each of the first customer images is calculated, and the second display control means sets the fourth similarity to the third threshold value 11. The settlement system according to claim 10, wherein the first customer image including the above customer is displayed as the second candidate image.

12.

124 11. The second candidate image according to claim 10, wherein said second display control means displays, as said second candidate image, a first customer image including a customer whose third similarity is smaller than said third threshold and equal to or greater than a fourth threshold. information processing system.

13.

131 A settlement device included in the information processing system according to any one of claims 1 to 12.

14.

136 A program for operating a computer as the settlement apparatus according to claim 13.

15.

140 A settlement method executed in a settlement system having a commodity registration device and a settlement device, wherein the commodity registration device generates a first customer image including the customer in a first imaging step; A generation step of generating association information in which settlement information used for settlement of goods is associated with one customer image; a second imaging step of the settlement device generating a second customer image including the customer; and a first display control step of displaying a candidate image, which is a candidate for the first customer image in which the same customer as the customer in the second customer image is shown, on a display device that can be viewed by the customer. .

(12) 特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関
国際事務局

(43) 国際公開日
2016 年 10 月 6 日(06.10.2016)

WIPO | PCT

(10) 国際公開番号
WO 2016/158748 A1

(51) 国際特許分類:
G07G 1/00 (2006.01) *G07G 1/12* (2006.01)
G06T 7/00 (2006.01)

(21) 国際出願番号: PCT/JP2016/059621

(22) 国際出願日: 2016 年 3 月 25 日(25.03.2016)

(25) 国際出願の言語: 日本語

(26) 国際公開の言語: 日本語

(30) 優先権データ:
特願 2015-072035 2015 年 3 月 31 日(31.03.2015) JP

(71) 出願人: 日本電気株式会社(NEC CORPORATION) [JP/JP]; 〒1088001 東京都港区芝五丁目７番１号 Tokyo (JP).

(72) 発明者: 松井　孝宏(MATSUI Takahiro); 〒1088001 東京都港区芝五丁目７番１号　日本電気株式会社内 Tokyo (JP).

(74) 代理人: 速水　進治(HAYAMI Shinji); 〒1410031 東京都品川区西五反田７丁目９番２号　五反田ＴＧビル９階 Tokyo (JP).

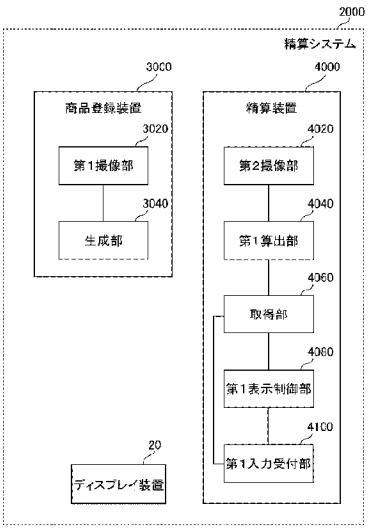
(81) 指定国 (表示のない限り、全ての種類の国内保護が可能): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY, KG, KZ, RU, TJ, TM), ヨーロッパ (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC,

[続葉有]

(54) **Title**: PAYMENT SYSTEM, PAYMENT DEVICE, PROGRAM, AND PAYMENT METHOD

(54) 発明の名称 : 精算システム、精算装置、プログラム、及び精算方法



20 Display device
2000 Payment system
3000 Product registration device
3020 First image capture unit
3040 Generating unit
4000 Payment device
4020 Second image capture unit
4040 First computation unit
4060 Acquisition unit
4080 First display control unit
4100 First input acceptance unit

(57) **Abstract**: A first image capture unit (3020) generates first customer images. A generating unit (3040) generates association information which associates the first customer images with payment information. A second image capture unit (4020) generates second customer images. A first computation unit (4040) computes first degrees of similarity between the customers who appear in the first customer images and the customers who appear in the second customer images. If a first customer image is present in which the first degree of similarity is greater than or equal to a first threshold, an acquisition unit (4060) acquires the payment information which is associated with the first customer image. If no first customer image is present in which the first degree of similarity is greater than or equal to the first threshold, a first display control unit (4080) displays candidate images upon a display device (20). A first input acceptance unit (4100) accepts an input which selects among the candidate images. The acquisition unit (4060) acquires the payment information which is associated with the selected candidate image.

(57) 要約:　第１撮像部（３０２０）は、第１顧客画像を生成する。生成部（３０４０）は、第１顧客画像と精算情報を関連付けた関連付け情報を生成する。第２撮像部（４０２０）は第２顧客画像を生成する。第１算出部（４０４０）は、第１顧客画像に写っている顧客と第２顧客画像に写っている顧客との第１類似度を算出する。取得部（４０６０）は、第１類似度が第１閾値以上である第１顧客画像がある場合、その第１顧客画像と関連付けられている精算情報を取得する。第１表示制御部（４０８０）は、第１類似度が第１閾値以上である第１顧客画像がない場合、候補画像をディスプレイ装置（２０）に表示する。第１入力受付部（４１００）は、候補画像を選択する入力を受け付ける。取得部（４０６０）は、選択された候補画像と関連付けられている精算情報を取得する。

WO 2016/158748 A1

Petitioner Exhibit 1002-2770

MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

添付公開書類:

— 国際調査報告（条約第 21 条(3)）

明　細　書

発明の名称 ：

精算システム、精算装置、プログラム、及び精算方法

技術分野

[0001] 本発明は、精算システム、精算装置、プログラム、及び精算方法に関する。

背景技術

[0002] スーパーマーケット等の店舗におけるレジ端末では、（１）精算対象の商品を登録する処理（バーコードの読み取りなど）及び（２）登録された商品の精算を行う処理（代金の受け取りやおつりの返却など）という２つの処理が行われる。

[0003] そして、このようなレジ端末の機能を２つの装置に分離し、（１）の処理と（２）の処理とを異なる装置で行うという運用方法がある。例えば特許文献１は、（１）の処理に用いられる登録装置と、（２）の処理に用いられる会計装置とが分離して設けられているセルフ POS システムを開示している。店員は、登録装置を用いて商品の登録を行う。登録装置は、撮像部で顧客を撮像する。登録装置を操作する店員は、撮像部によって撮像された顧客の画像の中から、会計データ（登録された商品に関するデータ）に関連付ける顧客の画像を選択する。その結果、登録装置は、顧客の画像と会計データとを関連付ける。その後、顧客は、会計装置を利用して会計を行う。会計装置は、顧客を撮像し、生成された顧客の画像と一致性の高い顧客の画像に関連付けられている会計データを取得する。そして、顧客は、会計装置を用いて、この会計データに基づく会計を行う。

先行技術文献

特許文献

[0004] 特許文献1：特開２０１２－２４８１６２号公報

発明の概要

発明が解決しようとする課題

[0005] 登録装置で生成される画像に写っている顧客と会計装置で生成される画像に写っている同じ顧客との一致性が低くなることがある。例えば顧客が、登録装置を利用した時に身につけていたマスクや帽子などを、会計装置を利用する前に外した場合、登録装置で生成される画像に写っている顧客と、会計装置で生成される画像に写っているその顧客との一致性が小さくなってしまう。

[0006] 特許文献１は、このように登録装置で生成される画像に写っている顧客と会計装置で生成される画像に写っている同じ顧客との一致性が小さくなってしまう場合について言及していない。

[0007] 本発明は、上記の課題に鑑みてなされたものである。本発明の目的は、顧客が確実に商品の精算を行えるようにする技術を提供することである。

課題を解決するための手段

[0008] 本発明の精算システムは、商品登録装置及び精算装置を有する。

前記商品登録装置は、顧客を含む第１顧客画像を生成する第１撮像手段と、前記第１顧客画像に対して商品の精算に用いる精算情報を関連付けた関連付け情報を生成する生成手段と、を有する。

前記精算装置は、顧客を含む第２顧客画像を生成する第２撮像手段と、前記第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である候補画像を、顧客が閲覧できるディスプレイ装置に表示する第１表示制御手段と、を有する。

[0009] 本発明の精算装置は、本発明の精算システムが有する精算装置である。

[0010] 本発明のプログラムは、コンピュータを本発明の精算装置として動作させるプログラムである。

[0011] 本発明の精算方法は、商品登録装置及び精算装置を有する精算システムにおいて実行される精算方法である。当該精算方法は、前記商品登録装置が、顧客を含む第１顧客画像を生成する第１撮像ステップと、前記商品登録装置が、前記第１顧客画像に対して商品の精算に用いる精算情報を関連付けた関

連付け情報を生成する生成ステップと、前記精算装置が、顧客を含む第２顧客画像を生成する第２撮像ステップと、前記第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である候補画像を、顧客が閲覧できるディスプレイ装置に表示する第１表示制御ステップと、を有する。

発明の効果

[0012] 本発明によれば、顧客が確実に商品の精算を行えるようにする技術が提供される。

図面の簡単な説明

[0013] 上述した目的、およびその他の目的、特徴および利点は、以下に述べる好適な実施の形態、およびそれに付随する以下の図面によってさらに明らかになる。

[0014] [図1]精算システムが有する商品登録装置と精算装置の配置を例示する図である。

[図2]実施形態１に係る精算システムを例示するブロック図である。

[図3]実施形態１の商品登録装置によって実行される処理を例示するフローチャートである。

[図4]実施形態１の精算装置によって実行される処理の流れを例示するフローチャートである。

[図5]実施形態１の商品登録装置を実現する計算機のハードウエア構成を例示する図である。

[図6]実施形態１の精算装置を実現する計算機のハードウエア構成を例示する図である。

[図7]精算情報をテーブル形式で例示する図である。

[図8]関連付け情報の構成をテーブル形式で例示する図である。

[図9]ディスプレイ装置における表示を例示する図である。

[図10]判定部を有する精算装置を例示するブロック図である。

[図11]実施形態２の精算システムを例示するブロック図である。

[図12]実施形態２における関連付け情報を例示する図である。

[図13]実施形態２の警告装置によって実行される処理の流れを例示するフローチャートである。

[図14]実施形態２の精算システムの運用環境を例示する図である。

発明を実施するための形態

[0015] 以下、本発明の実施の形態について、図面を用いて説明する。尚、すべての図面において、同様な構成要素には同様の符号を付し、適宜説明を省略する。

[0016] ［実施形態１］

図１は、精算システム２０００が有する商品登録装置３０００と精算装置４０００の配置を例示する図である。精算システム２０００は、商品登録装置３０００及び精算装置４０００を有する。図１に示すように、商品登録装置３０００と精算装置４０００は、独立した装置として設けられている。精算システム２０００を利用する店舗では、商品登録装置３０００及び精算装置４０００を用いて商品の精算が行われる。ここで、商品登録装置３０００及び精算装置４０００の設置数はそれぞれ１以上である。

[0017] 商品登録装置３０００は、商品を精算対象として登録する処理に用いられる。商品を購入したい顧客は、その商品を持って商品登録装置３０００のところへ行く。商品登録装置３０００を操作する店員は、顧客から商品を受け取り、その商品を精算対象として登録する。ここで、商品を精算対象として登録する方法には既知の様々な技術を利用できる。例えば店員は、各商品に付されているバーコード等を、商品登録装置３０００が有するリーダに読み取らせる。商品の登録に伴い、商品登録装置３０００は精算情報を生成する。精算情報は、精算対象として登録された商品の精算処理に関する情報である。

[0018] 精算装置４０００は、精算対象として登録された商品の精算（代金の受け取りなど）に用いられる。商品の登録が終わった後、顧客は、任意の精算装置４０００のところへ移動する。精算装置４０００は、その顧客が購入する商品に関する精算情報を取得し、その精算情報に基づいて精算処理を行う。

具体的には、精算装置４０００は、顧客に対する代金の提示、顧客によって投入された代金の数え上げ、顧客に対するおつりの払い戻し、レシートの発行などを行う。

[0019] ＜商品登録装置３０００及び精算装置４０００の構成＞

図２は、実施形態１に係る精算システム２０００を例示するブロック図である。図２において、各ブロックは、ハードウエア単位の構成ではなく、機能単位の構成を表している。

[0020] 商品登録装置３０００は、第１撮像部３０２０及び生成部３０４０を有する。第１撮像部３０２０は、顧客を含む画像を生成する。以下、第１撮像部３０２０によって生成される画像を第１顧客画像と表記する。生成部３０４０は関連付け情報を生成する。関連付け情報は、第１顧客画像と精算情報を関連付けた情報である。

[0021] 精算装置４０００は、第２撮像部４０２０、第１算出部４０４０、取得部４０６０、第１表示制御部４０８０、及び第１入力受付部４１００を有する。第２撮像部４０２０は、顧客を含む画像を生成する。以下、第２撮像部４０２０によって生成される画像を、第２顧客画像と表記する。

[0022] 第１算出部４０４０は、第１撮像部３０２０によって撮像された各画像（第１顧客画像）に写っている顧客と、第２撮像部４０２０によって撮像された画像（第２顧客画像）に写っている顧客との類似度を算出する。以下、この類似度を第１類似度と表記する。

[0023] 取得部４０６０は、第１顧客画像の中にマッチング条件を満たすものがあるか否かを判定する。マッチング条件は、「その第１顧客画像に写っている顧客と第２顧客画像に写っている顧客との第１類似度が、第１閾値以上である」という条件である。そして、取得部４０６０は、マッチング条件を満たす第１顧客画像がある場合、その第１顧客画像と関連付けられている精算情報を取得する。前述したように、精算情報と第１顧客画像は、関連付け情報によって関連付けられている。

[0024] 第１表示制御部４０８０は、マッチング条件を満たす第１顧客画像がない

場合、候補画像をディスプレイ装置２０に表示する。候補画像は、第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である。ここで、第１表示制御部４０８０が候補画像の表示先とするディスプレイ装置２０は、精算装置４０００を利用する顧客によって閲覧できるディスプレイ装置である。

[0025] 第１入力受付部４１００は、候補画像を選択する入力を受け付ける。第１入力受付部４１００が候補画像の選択を受け付けた場合、取得部４０６０は、関連付け情報において選択された候補画像（第１顧客画像）と関連付けられている精算情報を取得する。

[0026] ＜作用・効果＞

第１顧客画像に写っている顧客と第２顧客画像に写っている同じ顧客との類似度が低くなることがある。このような状況は、例えば、商品登録装置３０００を利用する時と精算装置４０００を利用する時で、顧客が身につけているものが変わる場合などに起こる。具体的には、顧客が、商品登録装置３０００を利用した時に装着していたマスクを、精算装置４０００を利用する前に外すケースなどが考えられる。

[0027] そこで本実施形態の精算装置４０００は、その精算装置４０００を利用する顧客との類似度が高い（第１類似度が第１閾値以上である）顧客が写っている第１顧客画像がない場合、その精算装置４０００を利用する顧客と同じ顧客が写っている第１顧客画像の候補を表示し、顧客にその候補を選択させる。よって、第１顧客画像に写っている顧客と第２顧客画像に写っている同じ顧客との類似度が低くなってしまう場合であっても、精算装置４０００は、顧客によって選択された第１顧客画像に関連付けられている精算情報を取得することで精算処理を行うことができる。よって、本実施形態の精算システム２０００によれば、顧客は確実に商品の精算を行うことができる。

[0028] 以下、本実施形態についてさらに詳細を述べる。

[0029] ＜処理の流れ＞

図３は、実施形態１の商品登録装置３０００によって実行される処理を例

示するフローチャートである。第１撮像部３０２０は第１顧客画像を生成する（Ｓ１０２）。生成部３０４０は、第１顧客画像と精算情報とを関連付けて関連付け情報を生成する（Ｓ１０４）。

[0030] 図４は、実施形態１の精算装置４０００によって実行される処理の流れを例示するフローチャートである。第２撮像部４０２０は第２顧客画像を生成する（Ｓ２０２）。第１算出部４０４０は、各第１顧客画像に写っている顧客について、第２顧客画像に写っている顧客との第１類似度を算出する（Ｓ２０４）。取得部４０６０は、第１類似度が第１閾値以上である第１顧客画像があるか否かを判定する（Ｓ２０６）。第１類似度が第１閾値以上である第１顧客画像がある場合（Ｓ２０６：ＹＥＳ）、図４の処理はＳ２０８に進む。一方、第１類似度が第１閾値以上である第１顧客画像がない場合（Ｓ２０６：ＮＯ）、図４の処理はＳ２１０に進む。

[0031] Ｓ２０８において、取得部４０６０は、第１類似度が第１閾値以上である第１顧客画像と関連付けられている精算情報を取得する。

[0032] Ｓ２１０において、第１表示制御部４０８０は、第１類似度が第１閾値以上である第１顧客画像がない場合、候補画像をディスプレイ装置に表示する。第１入力受付部４１００は、候補画像の選択を受け付ける（Ｓ２１２）。取得部４０６０は、選択された候補画像と関連付けられている精算情報を取得する（Ｓ２１４）。

[0033] ＜商品登録装置３０００を実現するハードウエアの例＞

商品登録装置３０００や精算装置４０００の各機能構成部は、各機能構成部を実現するハードウエア（例：ハードワイヤードされた電子回路など）で実現されてもよいし、ハードウエアとソフトウエアとの組み合わせ（例：電子回路とそれを制御するプログラムの組み合わせなど）で実現されてもよい。

[0034] 図５は、実施形態１の商品登録装置３０００を実現する計算機１０００のハードウエア構成を例示する図である。この計算機１０００は、レジ端末等の専用装置を用いて実装されてもよいし、PC（Personal Computer）や携帯端

末などの汎用装置を用いて実装されてもよい。

[0035] 計算機１０００は、バス１０２０、プロセッサ１０４０、メモリ１０６０、ストレージ１０８０、入出力インタフェース１１００、及びネットワークインタフェース１１２０を有する。バス１０２０は、プロセッサ１０４０、メモリ１０６０、ストレージ１０８０、入出力インタフェース１１００、及びネットワークインタフェース１１２０が、相互にデータを送受信するためのデータ伝送路である。ただし、プロセッサ１０４０などを互いに接続する方法は、バス接続に限定されない。プロセッサ１０４０は、例えば CPU (Central Processing Unit) や GPU (Graphics Processing Unit) などの演算処理装置である。メモリ１０６０は、例えば RAM (Random Access Memory) や ROM (Read Only Memory) などのメモリである。ストレージ１０８０は、例えばハードディスク、SSD (Solid State Drive)、又はメモリカードなどの記憶装置である。また、ストレージ１０８０は、RAM や ROM 等のメモリであってもよい。

[0036] 入出力インタフェース１１００は、計算機１０００と入出力デバイスとを接続するためのインタフェースである。入出力デバイスは、例えばキーボードやマウスなどである。

[0037] ネットワークインタフェース１１２０は、計算機１０００を外部の装置と通信可能に接続するためのインタフェースである。ネットワークインタフェース１１２０は、有線回線と接続するためのネットワークインタフェースでもよいし、無線回線と接続するためのネットワークインタフェースでもよい。例えば商品登録装置３０００を実現する計算機１０００は、ネットワークを介して、精算装置４０００を実現する計算機６０００と接続されている。

[0038] ストレージ１０８０は、第１撮像部３０２０及び生成部３０４０の機能をそれぞれ実現するプログラムモジュールを記憶している。プロセッサ１０４０は、これら各プログラムモジュールを実行することで、対応する各機能構成部の機能を実現する。ここでプロセッサ１０４０は、上記各モジュールを実行する際、これらのモジュールをメモリ１０６０上に読み出してから実行

してもよいし、メモリ１０６０上に読み出さずに実行してもよい。

[0039] 計算機１０００のハードウエア構成は図５に示した構成に限定されない。例えば、各プログラムモジュールはメモリ１０６０に格納されてもよい。この場合、計算機１０００は、ストレージ１０８０を備えていなくてもよい。

[0040] 入出力インタフェース１１００に接続される入出力デバイスは、登録する商品を認識するリーダ４０を含む。リーダ４０の具体的な実装方法は、商品を認識する方法によって異なる。例えばリーダ４０は、商品に付されている商品情報シンボルを読み取る。商品情報シンボルは、商品に付されているシンボルであり、商品を特定する情報（商品情報のＩＤ（Identifier）など）を表すシンボルである。シンボルは、バーコード、２次元コード（ＱＲコード（登録商標）など）、又は文字列シンボルなどである。なお、ここでいう文字列には、数値列も含まれる。商品情報シンボルは、商品情報を特定する情報が符号化されたバーコード等、又は商品情報を特定する情報を表す文字列シンボルなどである。

[0041] 例えば商品情報シンボルがバーコードである場合、リーダ４０はバーコードリーダをある。また例えば、商品情報シンボルが２次元コードである場合、リーダ４０は、２次元コードリーダである。また例えば、商品情報シンボルが文字列シンボルである場合、リーダ４０は、この文字列を撮像する撮像素子と、撮像された文字列シンボルを解析して商品のＩＤなどを割り出す処理部とを有する。なお、文字列シンボルの解析には、文字列解析に関する様々な既知の技術を用いることができる。これら既知の技術に関する説明は省略する。

[0042] なお、商品情報シンボルとして複数の種類のシンボルが用いられる場合、入出力インタフェース１１００には、複数種類のリーダが接続される。例えば、商品情報シンボルとしてバーコード及び２次元コードが用いられる場合、この入出力インタフェース１１００には、バーコードリーダ及び２次元コードリーダが接続される。

[0043] また、リーダ４０は、商品を撮像して画像を生成し、その画像に写ってい

る商品に対してオブジェクト認識を行うことで、その商品を認識してもよい。

[0044] ＜＜第１撮像部３０２０のハードウエア構成＞＞

第１撮像部３０２０は、撮像した結果を記録する撮像素子を有する。例えば第１撮像部３０２０は、この撮像素子を有するカメラを用いて構成される。第１撮像部３０２０は、静止画像を撮像してもよいし、動画を撮像してもよい。後者の場合、第１顧客画像は動画を構成する各フレームである。

[0045] 第１撮像部３０２０は、商品登録装置３０００を利用する顧客を撮像できる位置に設置される。第１撮像部３０２０は、商品登録装置３０００と一体に設けられていてもよいし、別体に設けられていてもよい。後者の場合、例えば図５に示すように、入出力インタフェース１１００に対して、第１撮像部３０２０を実現するカメラ３０が接続される。

[0046] ＜精算装置４０００を実現するハードウエアの例＞

図６は、実施形態１の精算装置４０００を実現する計算機６０００のハードウエア構成を例示する図である。この計算機６０００は、レジ端末等の専用装置を用いて実装されてもよいし、PC（Personal Computer）や携帯端末などの汎用装置を用いて実装されてもよい。なお、計算機６０００の構成は、計算機１０００の構成と同様である。

[0047] ストレージ６０８０は、第２撮像部４０２０、第１算出部４０４０、及び取得部４０６０の機能をそれぞれ実現するためのプログラムモジュールを記憶している。プロセッサ６０４０は、これら各プログラムモジュールを実行することで、対応する各機能構成部の機能を実現する。ここでプロセッサ６０４０は、上記各モジュールを実行する際、これらのモジュールをメモリ６０６０上に読み出してから実行してもよいし、メモリ６０６０上に読み出さずに実行してもよい。

[0048] 計算機６０００のハードウエア構成は図６に示した構成に限定されない。例えば、各プログラムモジュールはメモリ６０６０に格納されてもよい。この場合、計算機６０００は、ストレージ６０８０を備えていなくてもよい。

[0049] 入出力インタフェース６１００に対して接続される入出力デバイスは、第１表示制御部４０８０によって制御されるディスプレイ装置２０を含む。ディスプレイ装置２０は、精算装置４０００を利用する顧客が閲覧できるように、顧客の方に向けて設置される。このディスプレイ装置は、精算装置４０００と一体に設けられていてもよいし、別体に設けられていてもよい。

[0050] また、入出力インタフェース６１００に対して接続される入出力デバイスは、第１入力受付部４１００の機能を実現するための入力デバイスを含む。例えばこの入力デバイスは、ディスプレイ装置２０に内蔵されるタッチパネル２２である。また例えば、この入力デバイスは、キーボードやマウスなどであってもよい。

[0051] さらに、入出力インタフェース６１００に対して接続される入出力デバイスは、顧客が代金を投入するためのデバイス、おつりを返金するためのデバイス、及びレシートを発行するためのデバイスなどを含む（図示せず）。

[0052] ＜商品登録装置３０００による商品の登録処理＞

前述したように商品登録装置３０００は、精算対象として登録される商品に関する精算情報を生成する。商品登録装置３０００は、生成した精算情報を、商品登録装置３０００の内部又は外部の記憶部に記憶する。

[0053] １つの精算処理における精算対象には、複数の商品が含まれうる。例えば商品登録装置３０００は、精算対象の登録処理の開始を指示する操作を受け付けた後、精算対象の登録処理の終了を指示する操作を受け付けるまでの間に登録された１つ又は複数の商品を、１つの精算処理における精算対象として登録する。ある精算処理に関する精算情報は、その精算処理の対象として登録された各商品のＩＤなどを示す。また精算情報は、取引番号、各商品の金額、及び合計金額などをさらに示してもよい。

[0054] 図７は、精算情報をテーブル形式で例示する図である。図７に示す精算情報を、精算情報２００と表記する。精算情報２００は、精算情報ＩＤ２０２及び商品リスト２０４という２つの列を有する。商品リスト２０４は、精算対象として登録された商品ＩＤのリストである。商品ＩＤ２０６は、精算対

象として登録された商品のＩＤである。

[0055] なお、リーダ等で認識した商品について精算情報を生成する具体的な方法には様々な既知の技術を利用できるため、この方法に関する説明は省略する。

[0056] ＜第１撮像部３０２０が行う処理の詳細＞

第１撮像部３０２０は第１顧客画像を生成する（Ｓ１０２）。第１撮像部３０２０が撮像を行うタイミングは様々である。例えば第１撮像部３０２０は、商品登録装置３０００が稼働している間、常に繰り返し撮像を行う。第１撮像部３０２０が繰り返し撮像を行う頻度は、例えば一般的な動画のフレームレートと同じ 1/30 秒である。

[0057] また例えば第１撮像部３０２０は、顧客が商品登録装置３０００の付近にいることを検出し、その検出に応じて撮像を行ってもよい。例えば第１撮像部３０２０の付近に、人の検出を行う赤外線センサなどを設ける。第１撮像部３０２０は、この赤外線センサからの通知を受けることで、第１撮像部３０２０の付近に顧客がいることを把握することができる。そこで例えば、第１撮像部３０２０は、この赤外線センサによって第１撮像部３０２０の付近に顧客がいることが検出された時に顧客の撮像を行い、第１顧客画像を生成する。

[0058] なお、第１撮像部３０２０は、上記検出が行われた時から所定の期間、顧客を繰り返し撮像してもよい。例えば第１撮像部３０２０は、上記検出が行われた時から所定時間、顧客を繰り返し撮像する。また例えば、第１撮像部３０２０は、上記検出が行われた時から、その顧客が購入する商品の登録が終わるまで（精算情報が生成されるまで）の間、顧客を繰り返し撮像してもよい。

[0059] 上述の「所定時間」は、予め第１撮像部３０２０に設定されていてもよいし、商品登録装置３０００の内部又は外部に設けられた記憶部に記憶されてもよい。後者の場合、第１撮像部３０２０は、この記憶部から上記所定時間を取得して利用する。なお、特に説明しない限り、以前に説明した又は以降

で説明する各機能構成部が利用する各種所定の値（所定の閾値や所定の時間など）も同様に、その機能構成部に設定されるか、又は記憶部から取得して利用される。

[0060] また、第１撮像部３０２０は、商品登録装置３０００を操作する店員によって操作されてもよい。例えば店員は、顧客に声をかけるなどの方法で、第１撮像部３０２０の撮像範囲に顧客の顔が入るように顧客を誘導する。そして、店員は、第１撮像部３０２０の撮像範囲に顧客の顔が入っていることを確認して、第１撮像部３０２０に、顧客画像の撮像を行わせる。

[0061] また、上記誘導は、第１撮像部３０２０によって行われてもよい。例えば商品登録装置３０００に、第１撮像部３０２０の撮像素子に写っている画像を表示するディスプレイ装置を設ける。このディスプレイ装置は、顧客が閲覧できるように、顧客の方を向けて設置される。第１撮像部３０２０は、このディスプレイ装置に文字で案内を表示したり、音声で案内を行ったりすることで顧客を誘導し、顧客の顔が第１撮像部３０２０によって撮像されるようにする。

[0062] 第１撮像部３０２０が顧客を複数回撮像した場合、顧客が写った画像が複数生成される。そこで、第１撮像部３０２０は、これら複数の画像のうち、いずれか１つ以上を第１顧客画像として扱う。どの画像を第１顧客画像として扱うかを決定する方法は様々である。例えば第１撮像部３０２０は、顧客の写りがよい画像を第１顧客画像とする。「顧客の写りがよい画像」は、顧客が大きく写っている画像や、ブレが小さい画像である。ここで、画像に写っているオブジェクト（顧客）の大きさを算出したり、ブレの大きさを算出したりする方法には、既知の技術を利用できる。そのため、これらの方法に関する説明は省略する。

[0063] なお、第１撮像部３０２０は、顧客の写りが最もよい１つの画像を第１顧客画像としてもよいし、顧客の写りが所定の基準以上である複数の画像を第１顧客画像としてもよい。

[0064] また、第１撮像部３０２０は、生成した全ての画像を第１顧客画像として

もよい。

[0065] ＜生成部３０４０が行う処理の詳細＞

生成部３０４０は関連付け情報を生成する（Ｓ１０４）。図８は、関連付け情報の構成をテーブル形式で例示する図である。図８に示す関連付け情報を、関連付け情報３００と表記する。関連付け情報３００は、第１顧客画像３０２及び精算情報ＩＤ３０４という２つの列を有する。第１顧客画像３０２は、第１顧客画像が記録された画像ファイルを示す。精算情報ＩＤ３０４は、精算情報のＩＤを示す。なお、同じ顧客に対して複数の第１顧客画像が生成された場合、１つの精算情報ＩＤ３０４に対して異なる複数の第１顧客画像３０２が関連付けられる。

[0066] 生成部３０４０は、第１顧客画像に対して、その顧客画像に写っている顧客が購入した商品に関する精算情報を関連付ける。具体的には、生成部３０４０は、商品の登録処理を始めた時からその登録処理を終えるまでの間に生成された第１顧客画像に対して、その登録処理によって生成された精算情報を関連付ける。

[0067] ここで、生成部３０４０は、精算情報に第１顧客画像を関連付ける際、その関連付けが正しいか否かを店員に確認してもよい。具体的には、生成部３０４０は、商品登録装置３０００を操作する店員が閲覧するディスプレイ装置上に、精算情報に関連付けようとしている第１顧客画像を提示する。店員は、提示された第１顧客画像が、現在商品登録装置３０００を利用している顧客を撮像したものであるか否かを確認する。そして、店員は、提示された第１顧客画像が正しければ、タッチパネルやキーボードなどを用いて、第１顧客画像が正しい旨の入力を行う。その入力の結果を受け、生成部３０４０は、関連付け情報を生成する。

[0068] 一方、店員は、提示された第１顧客画像が正しくなければ、正しい顧客画像を精算情報に関連付けるための処理を行う。例えば店員は、第１撮像部３０２０を操作することで顧客を撮像して、再度第１顧客画像を生成する。そして、生成部３０４０は、この操作で生成された第１顧客画像と精算情報を

関連付けて、関連付け情報を生成する。

[0069] 生成部３０４０は、関連付け情報を、各精算装置４０００からアクセス可能な記憶部に記憶する。この記憶部は、商品登録装置３０００の内部にあってもよいし、外部にあってもよい。商品登録装置３０００の外部にある記憶部は、例えば商品登録装置３０００及び精算装置４０００からアクセス可能なデータベースサーバなどである。

[0070] ＜精算装置４０００による精算処理について＞

精算装置４０００は精算情報を取得し、その精算情報に基づいて精算処理を行う。精算装置４０００が商品の精算処理に用いる情報（精算情報）に基づいて精算処理を行う方法には、既知の手法が利用できる。この既知の手法についての詳細は省略する。

[0071] ＜第２撮像部４０２０が行う処理の詳細＞

第２撮像部４０２０は、第２顧客画像を生成する（Ｓ２０２）。第２撮像部４０２０が第２顧客画像を生成する処理は、第１撮像部３０２０が第１顧客画像を生成する処理と同様である。

[0072] ＜第１算出部４０４０が行う処理の詳細＞

第１算出部４０４０は、第１撮像部３０２０によって撮像された第１顧客画像に写っている顧客と、第２撮像部４０２０によって撮像された第２顧客画像に写っている顧客とについて、第１類似度を算出する（Ｓ２０４）。第１算出部４０４０が類似度の算出対象とする第１顧客画像は、いずれかの関連付け情報において精算情報と関連付けられている第１顧客画像である。以下、この類似度の算出を、「第１顧客画像と第２顧客画像のマッチング」とも表記する。

[0073] 第１算出部４０４０が第１類似度を算出する方法は様々である。例えば第１算出部４０４０は、第１顧客画像と第２顧客画像それぞれについて、写っている顧客の特徴量を算出する。そして第１算出部４０４０は、これら顧客の特徴量の類似度を、第１類似度として算出する。ここで、画像からオブジェクトの特徴量を抽出する方法、及び特徴量の類似度を算出する方法には、

オブジェクトのマッチングに用いられる様々な既知の手法を利用できる。また、第１類似度を算出する方法は、特徴量を用いる方法に限定されない。第１類似度の算出には、画像に写っているオブジェクトの類似度を算出する既知の様々な方法が利用できる。

[0074] ＜＜第１類似度の算出対象の決定方法＞＞

第１算出部４０４０は、精算情報と関連付けられている全ての第１顧客画像について第１類似度を算出してもよいし、一部の第１顧客画像のみについて第１類似度を算出してもよい。後者の場合に、第１類似度の算出の対象とする第１顧客画像を決定する方法は様々である。以下、その方法について説明する。

[0075] 例えば第１算出部４０４０は、第１顧客画像と第２顧客画像それぞれの撮像時点を用いて、第１類似度の算出対象とする第１顧客画像を決定する。通常、商品登録装置３０００で精算対象の登録が行われてから精算装置４０００で精算処理が行われるまでの時間は短い。例えばこの時間は５分以内などである。そこで第１算出部４０４０は、第１類似度の算出対象の第２顧客画像が生成された時点から所定時間前までの間に撮像された第１顧客画像のみを、第１類似度の算出対象とする。例えばこの所定時間は５分である。

[0076] また例えば、第１算出部４０４０は、商品登録装置３０００と精算装置４０００の配置に基づいて、第１類似度の算出対象とする第１顧客画像を決定してもよい。例えば図１に示したように、精算システム２０００が導入される店舗では、商品登録装置３０００及び精算装置４０００が複数設置されている。顧客は、商品登録装置３０００において商品の登録が終わったら、利用する精算装置４０００を適宜選択する。このような精算システム２０００の運用環境において、顧客は、利用した商品登録装置３０００に近い精算装置４０００を選択することが多いと考えられる。

[0077] そこで、精算システム２０００は、精算装置４０００からアクセス可能な記憶装置に、商品登録装置３０００と、その商品登録装置３０００に近い精算装置４０００とを関連付けた情報を予め記憶しておく。そして、第１算出

部４０４０は、その第１算出部４０４０を有する精算装置４０００と関連付けられている商品登録装置３０００において生成された第１顧客画像のみを、第１類似度の算出対象とする。

[0078] 例えば図１の例の場合、精算システム２０００は、商品登録装置３０００－１を精算装置４０００－１及び精算装置４０００－２と関連付けた情報、及び商品登録装置３０００－２を精算装置４０００－３及び精算装置４０００－４と関連付けた情報を予め記憶しておく。そして、第１算出部４０４０は、この情報を用いて、第１類似度の算出対象とする第１顧客画像を決定する。例えばこの例の場合、精算装置４０００－１及び精算装置４０００－２が有する第１算出部４０４０は、商品登録装置３０００－１において生成された第１顧客画像のみを、第１類似度の算出対象とする。一方、精算装置４０００－３及び精算装置４０００－４が有する第１算出部４０４０は、商品登録装置３０００－２において生成された第１顧客画像のみを、第１類似度の算出対象とする。

[0079] ＜＜顧客が写っている領域を割り出す方法＞＞

第１算出部４０４０は、第１顧客画像から、商品登録装置３０００を利用した顧客を表す領域を抽出する。同様に、第１算出部４０４０は、第２顧客画像から、精算装置４０００を利用している顧客を表す領域を抽出する。このように画像に写っている人を抽出する方法には、既存の様々なオブジェクト認識の手法を利用することができる。この既存の手法についての詳細は省略する。

[0080] ここで、複数の顧客が店舗にいる場合がある。この場合、第１撮像部３０２０の撮像範囲に、商品登録装置３０００を利用する顧客以外の顧客が入っていることがある。その結果、第１顧客画像に複数の顧客が写りうる。

[0081] そこで、第１算出部４０４０は、第１顧客画像に写っている顧客の中から、商品登録装置３０００を利用した顧客を特定し、この顧客について第１類似度を算出する。ここでいう「商品登録装置３０００を利用した顧客」とは、第１顧客画像に関連付けられている精算情報によって示されている商品を

購入する顧客を意味する。

[0082] 商品登録装置３０００を利用した顧客を特定する方法は様々である。例えば第１算出部４０４０は、第１顧客画像に写っている顧客のうち、最も大きく写っている顧客が、商品登録装置３０００を利用した顧客とする。また例えば、第１算出部４０４０は、第１顧客画像に写っている顧客の内、第１顧客画像の中心に最も近い位置に写っている顧客を、商品登録装置３０００を利用している顧客とする。ここで、画像に写っている顧客の大きさを比較したり、画像に写っている顧客の位置を比較したりする方法には、既知の技術を利用できる。そのため、これらの方法に関する説明は省略する。

[0083] なお、第１顧客画像は、第１撮像部３０２０により、商品登録装置３０００を利用した顧客のみを示す画像として生成されてもよい。この場合、第１撮像部３０２０は、例えば第１算出部４０４０と同様の方法で、商品登録装置３０００を利用した顧客を特定する。そして、第１撮像部３０２０は、撮像素子に記録された画像のうち、商品登録装置３０００を利用した顧客を表す領域のみを用いて、第１顧客画像を生成する。

[0084] また例えば、第１顧客画像が生成される際、商品登録装置３０００を操作する店員が、顧客が写っている領域を指定してもよい。この場合、第１撮像部３０２０は、商品登録装置３０００を操作する店員が閲覧するディスプレイ装置上に、撮像素子に記録された画像全体を表示する。そして、店員は、ディスプレイ装置に表示された画像に対して、商品登録装置３０００を利用している顧客が写っている領域を指定する入力を行う。例えばディスプレイ装置がタッチパネルを有する場合、店員は、この顧客が写っている領域を指でなぞって囲むことで、この顧客が写っている領域を指定する。そして、第１撮像部３０２０は、店員によって指定された領域を表す画像を、第１顧客画像として生成する。なお、顧客が複数回撮像された場合、例えば第１撮像部３０２０は、撮像素子に記録された画像の内、最もブレが少ない画像を、上記ディスプレイ装置に表示する。

[0085] なお、同様にして、第２顧客画像にも複数の顧客が写る場合がある。この

場合、例えば第１算出部４０４０は、第１顧客画像に対する処理と同様の処理により、精算装置４０００を利用している顧客を抽出する。また、第２顧客画像は、第２撮像部４０２０により、精算装置４０００を利用した顧客を抽出した画像として生成されてもよい。その生成方法は、第１撮像部３０２０が商品登録装置３０００を利用した顧客のみを示す第１顧客画像を生成する方法と同様の方法である。また、精算装置４０００は、商品登録装置３０００が店員に顧客を指定させる方法と同様の方法で、精算装置４０００を利用している顧客に対し、精算装置４０００を利用している顧客を指定する入力をさせてもよい。

[0086] ＜取得部４０６０によって行われる処理の詳細＞

取得部４０６０は、マッチング条件を満たす（第１類似度が第１閾値以上である）第１顧客画像がある場合（Ｓ２０６：ＹＥＳ）、その第１顧客画像と関連付けられている精算情報を取得する（Ｓ２０８）。具体的には、取得部４０６０は、第１類似度が算出された第１顧客画像の中から、第１類似度が第１閾値以上である第１顧客画像を決定する。そして、取得部４０６０は、関連付け情報を用いて、上記決定された第１顧客画像に関連付けられている精算情報を取得する。具体的には、取得部４０６０は、生成部３０４０が関連付け情報を記憶した記憶部にアクセスし、上記決定された顧客画像が示されている関連付け情報が示す精算情報を取得する。

[0087] なお、第１類似度が第１閾値以上である第１顧客画像が、複数ある場合が考えられる。例えばこの場合、取得部４０６０は、第１類似度が最も高い第１顧客画像と関連付けられている精算情報を取得する。またこの場合、精算装置４０００は、第１類似度が第１閾値以上である第１顧客画像をディスプレイ装置２０に表示し、その内の１つを顧客に選択させてもよい。そして、取得部４０６０は、顧客によって選択された第１顧客画像と関連付けられている精算情報を取得する。これらの方法により、マッチング条件を満たす第１顧客画像が複数あった場合でも、精算装置４０００を利用している顧客が購入する商品に関する精算情報を一意に決定して取得することができる。

[0088] ここで、第１類似度が第１閾値以上である第１顧客画像をディスプレイ装置２０に表示する方法、及び表示された第１顧客画像の選択を受け付ける方法は、第１表示制御部４０８０が候補画像をディスプレイ装置２０に表示する処理、及び第１入力受付部４１００が表示された候補画像の選択を受け付ける方法と同様である。第１表示制御部４０８０が候補画像をディスプレイ装置２０に表示する処理、及び第１入力受付部４１００が表示された候補画像の選択を受け付ける方法についての詳細な説明は後述する。

[0089] ＜第１表示制御部４０８０によって行われる処理の詳細＞

第１表示制御部４０８０は、第２顧客画像に写っている顧客（精算装置４０００を利用している顧客）との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合に、ディスプレイ装置の制御を行う（Ｓ２１０）。具体的には、第１表示制御部４０８０は、第１顧客画像のうち、第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補（候補画像）を、ディスプレイ装置２０に表示する。

[0090] 図９は、ディスプレイ装置２０における表示を例示する図である。図９（ａ）において、第１表示制御部４０８０は、ディスプレイ装置２０のタッチパネル２２に１つの候補画像５０を表示している。一方、図９（ｂ）において、第１表示制御部４０８０は、ディスプレイ装置２０のタッチパネル２２に３つの候補画像５０を表示している。なお、第１撮像部３０２０によって撮像された顧客が多い場合、第１表示制御部４０８０は、タッチパネル２２にボタン７０を表示する。顧客がボタン７０を押すと、第１表示制御部４０８０は、現在タッチパネル２２に表示していない候補画像５０を表示する。

[0091] ＜＜候補画像を決定する方法＞＞

前述したように、候補画像は、第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である。候補画像を表示するために、第１表示制御部４０８０は、どの第１顧客画像を候補画像にするかを決定する。この方法には、様々な方法がある。以下、その方法を具体的に例示する。

[0092] 例えば第１表示制御部４０８０は、第１閾値よりも小さい所定の第２閾値

を用いて、候補画像を決定する。具体的には、第１表示制御部４０８０は、候補画像を表示する必要がある場合（マッチング条件を満たす第１顧客画像がない場合）、第２顧客画像に写っている顧客との第１類似度が第２閾値以上である第１顧客画像を、候補画像とする。第２閾値は第１閾値よりも小さいため、この方法によれば、第１類似度が第２閾値以上第１閾値未満である第１顧客画像が、候補画像として決定される。

[0093] また例えば第１表示制御部４０８０は、第１類似度とは異なる方法で算出される第２類似度を用いて、候補画像を決定する。具体的には、候補画像を表示する必要がある場合（マッチング条件を満たす第１顧客画像がない場合）、第１算出部４０４０が、第１類似度を算出する方法とは別の方法を用いて、第２顧客画像と第１顧客画像との第２類似度を算出する。そして、第１表示制御部４０８０は、算出された第２類似度が第１閾値以上である各第１顧客画像を、候補画像とする。

[0094] ここで、第２類似度が第１閾値以上となる場合、第２類似度は第１類似度より大きい値である。なぜなら、第２類似度が算出される場合、第１類似度は第１閾値より小さいためである。そこで、第２類似度を算出するアルゴリズムには、第１類似度を算出するアルゴリズムよりも大きい類似度を算出するアルゴリズムを利用することが好ましい。ここで、画像に写っているオブジェクトの類似度を算出するアルゴリズムには種々のアルゴリズムがあり、算出される類似度の大きさもそれぞれ異なる。そこで例えば、第２類似度が第１類似度よりも大きくなるように、これら既知のアルゴリズムの中から、第１類似度の算出するアルゴリズムと第２類似度を算出するアルゴリズムを適宜採用する。

[0095] なお、第１表示制御部４０８０は、前述の各方法で決定された候補画像の全てを表示してもよいし、一部のみを表示してもよい。後者の場合、例えば第１表示制御部４０８０は、前述した商品登録装置３０００と精算装置４０００との関連付けを利用する。具体的には、第１表示制御部４０８０は、候補画像のうち、その第１表示制御部４０８０を有する精算装置４０００と関

連付けられている精算情報によって生成された候補画像のみを表示する。

[0096] また、第１表示制御部４０８０は、前述した商品登録装置３０００と精算装置４０００との関連付けを利用して、候補画像の表示順を決定してもよい。具体的には、第１表示制御部４０８０は、その第１表示制御部４０８０を有する精算装置４０００と関連付けられている商品登録装置３０００によって生成された候補画像を、その精算装置４０００と関連付けられていない商品登録装置３０００によって生成された候補画像より前に表示する。

[0097] ＜第１入力受付部４１００によって行われる処理の詳細＞

第１入力受付部４１００は、表示した候補画像の内の１つを選択する入力を受け付ける（Ｓ２１２）。候補画像の選択を受け付ける方法には、ディスプレイ上に表示された画像やボタンなどの選択を受け付ける既知の様々な技術を利用できる。ディスプレイ装置がタッチパネルを有し、第１入力受付部４１００がそのタッチパネルに候補画像を表示する場合、例えば第１入力受付部４１００は、タッチパネルに表示された候補画像が押されたことを検出することで、その候補画像の選択を受け付ける。図９の場合、顧客は、いずれかの候補画像５０を押すことで、その候補画像５０を選択する。また例えば、第１入力受付部４１００は、キーボードなどの入力デバイスによる候補画像の選択を受け付けてもよい。

[0098] 第１入力受付部４１００が候補画像の選択を受け付けた場合、取得部４０６０は、関連付け情報を用いて、選択された候補画像（第１顧客画像）と関連付けられている精算情報を取得する（Ｓ２１４）。第１顧客画像と関連付けられている精算情報を取得する方法は、前述した通りである。

[0099] ＜その他の機能について＞

精算装置４０００は、判定部４１２０をさらに有していてもよい。図１０は、判定部４１２０を有する精算装置４０００を例示するブロック図である。判定部４１２０は、第１入力受付部４１００が候補画像の選択操作を受け付けなかった場合（顧客が候補画像の選択を行わなかった場合）、第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像がないと判定す

る。例えば図９の例の場合、判定部４１２０は、顧客がボタン６０を押したり、所定時間以上候補画像５０や各ボタンを押さなかった場合に、第１入力受付部４１００が候補画像の選択を受け付けなかったと判定する。また、判定部４１２０は、第１表示制御部４０８０によって表示される候補画像が無い場合にも、第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像がないと判定する。ここで、第１表示制御部４０８０によって表示される候補画像が無い場合とは、例えば前述した候補画像を決定する方法において、第２類似度が第１閾値以上である第１顧客画像がない場合や、第１類似度が第２閾値以上である第１顧客画像がない場合などである。

[0100] 判定部４１２０によって、「第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像がない」と判定された場合、精算装置４０００は種々の処理を行う。例えば第１表示制御部４０８０が、ディスプレイ装置に、その顧客に対応する精算情報がない旨のメッセージなどを表示する。また例えば、精算装置４０００は、再度第２顧客画像などをやり直してもよい。つまり、精算装置４０００は、図４の処理を再度実行する。これにより、新たに顧客を撮像して生成された第２顧客画像を用いて、類似度の算出などが行われる。こうすることで、顧客がより確実に精算を行えるようになる。

[0101] ［実施形態２］

図１１は、実施形態２の精算システム２０００を例示するブロック図である。図１１において、各ブロックは、ハードウエア単位の構成ではなく、機能単位の構成を表している。

[0102] 実施形態２の精算システム２０００は、精算装置４０００が設置されているエリアを出ようとしている顧客が精算処理を終えていない場合に、警告処理を行う機能を有する。そのために、実施形態２の精算システム２０００は、以下のように構成される。

[0103] 実施形態２の生成部３０４０が生成する関連情報は、完了フラグをさらに示す。完了フラグは、その関連情報によって示される精算情報を用いた精算が完了したか否かを示す。つまり、実施形態２の生成部３０４０は、第１顧

客画像、精算情報、及び完了フラグを関連付けた関連情報を生成する。以下、精算が完了していることを示す完了フラグの値は「精算完了」であり、精算が完了していないことを示す完了フラグの値は「精算未完了」であるとする。図１２は、実施形態２における関連付け情報３００を例示する図である。関連付け情報３００は、第１顧客画像３０２と精算情報ＩＤ３０４に加え、完了フラグ３０６をさらに有する。

[0104] 実施形態２の精算システム２０００は警告装置５０００をさらに有する。警告装置５０００は、第３撮像部５０２０、警告部５０４０、第２算出部５０６０、第２表示制御部５０８０、及び第２入力受付部５１００を有する。第３撮像部５０２０は、撮像を行って、精算装置４０００が設置されているエリアの出口（以下、単に「出口」とも表記する）にいる顧客を含む画像を生成する。以下、第３撮像部５０２０によって生成される画像を第３顧客画像と表記する。

[0105] 警告部５０４０は、警告条件が満たされた場合に警告処理を行う。警告条件は、「第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像に関連付けられている完了フラグが精算未完了を示していること」である。警告部５０４０は、第２算出部５０６０、第２表示制御部５０８０、及び第２入力受付部５１００による処理の結果に基づいて、警告条件が満たされているか否かを判定する。

[0106] 第２算出部５０６０は、第３顧客画像に写っている顧客と各第１顧客画像に写っている顧客との第３類似度を算出する。警告部５０４０は、第３類似度が所定の第３閾値以上である顧客が写っている第１顧客画像がある場合、この第１顧客画像を、第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像とする。そこで、警告部５０４０は、この第１顧客画像と関連付けられている完了フラグが精算未完了を示している場合、警告条件が満たされていると判定する。なお、第３閾値の値は、第１閾値の値又は第２閾値の値と同じであってもよいし、これらと異なる値であってもよい。

[0107] 第２表示制御部５０８０は、第３類似度が第３閾値以上である顧客が写っ

ている第１顧客画像がない場合に、店員が閲覧できるディスプレイ装置１１０に、第２候補画像を表示する。第２候補画像は、第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である。

[0108] 第２入力受付部５１００は、第２候補画像を選択する入力を受け付ける。警告部５０４０は、第２入力受付部５１００を介して選択された第２候補画像を、第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像とする。そこで、警告部５０４０は、この第１顧客画像と関連付けられている完了フラグが精算未完了を示している場合、警告条件が満たされていると判定する。

[0109] ＜処理の流れ＞

図１３は、実施形態２の警告装置５０００によって実行される処理の流れを例示するフローチャートである。第３撮像部５０２０は、出口にいる顧客を撮像して、第３顧客画像を生成する（Ｓ３０２）。第２算出部５０６０は、各第１顧客画像について第３類似度を算出する（Ｓ３０４）。警告部５０４０は、第３類似度が第３閾値以上である顧客が写っている第１顧客画像があるか否かを判定する（Ｓ３０６）。第３類似度が第３閾値以上である顧客が写っている第１顧客画像がある場合（Ｓ３０６：ＹＥＳ）、図１３の処理はＳ３０８に進む。一方、第３類似度が第３閾値以上である顧客が写っている第１顧客画像がない場合（Ｓ３０６：ＮＯ）、図１３の処理はＳ３１２に進む。

[0110] Ｓ３０８において、警告部５０４０は、「第３類似度が第３閾値以上である顧客が写っている第１顧客画像と関連付けられている完了フラグが、精算未完了を示しているか否か（警告条件が満たされているか否か）」を判定する。この警告条件が満たされている場合（Ｓ３０８：ＹＥＳ）、警告部５０４０は警告処理を行う（Ｓ３１０）。この警告条件が満たされていない場合（Ｓ３０８：ＮＯ）、図１３の処理は終了する。

[0111] Ｓ３１２において、第２表示制御部５０８０は、ディスプレイ装置１１０に第２候補画像を表示する。第２入力受付部５１００は、第２候補画像を選

択する入力を受け付ける（Ｓ３１４）。

[0112] 警告部５０４０は、「選択された第２候補画像と関連付けられている完了フラグが精算未完了を示しているか否か（警告条件が満たされているか否か）」を判定する（Ｓ３１６）。この警告条件が満たされている場合（Ｓ３１６：ＹＥＳ）、図１３の処理はＳ３１０に進む。一方、この警告条件が満たされていない場合（Ｓ３１６：ＮＯ）、図１３の処理は終了する。

[0113] ＜ハードウエア構成例＞

例えば警告装置５０００は、商品登録装置３０００や精算装置４０００を実現する計算機と同様のハードウエア構成を有する計算機によって実現される。この計算機の入出力インタフェースには、第３撮像部５０２０を構成するハードウエア（例えばカメラ）が接続される。第３撮像部５０２０は、出口の付近に設けられる。例えば、第３撮像部５０２０は、この出口付近の天井に設けられる。また例えば、この出口に顧客が通るゲートがある場合、第３撮像部５０２０はこのゲートに設けられてもよい。ただし、第３撮像部５０２０は、出口にいる顧客を撮像できればよく、その設置場所は上述の例に限定されない。その他の点については、第３撮像部５０２０は、第１撮像部３０２０や第２撮像部４０２０と同様に実装される。

[0114] 警告装置５０００を実現する計算機の入出力インタフェースには、ディスプレイ装置１１０が接続される。ディスプレイ装置１１０は出口付近に設けられている。また、ディスプレイ装置１１０は、店員が閲覧できるように設置される。

[0115] 警告装置５０００を実現する計算機の入出力インタフェースには、第２入力受付部５１００を実現するための入力デバイスが接続される。例えばこの入力デバイスは、ディスプレイ装置１１０に内蔵されるタッチパネルである。また例えば、この入力デバイスは、キーボードやマウスなどであってもよい。

[0116] 警告装置５０００を実現する計算機のストレージは、第３撮像部５０２０、警告部５０４０、第２算出部５０６０、第２表示制御部５０８０、及び第

２入力受付部５１００を実現するプログラムモジュールをそれぞれ有する。警告装置５０００を実現する計算機のプロセッサは、このプログラムモジュールを実行することで、これらの機能構成部の機能を実現する。

[0117] ＜第２算出部５０６０が行う処理の詳細＞

第２算出部５０６０は、各第１顧客画像に写っている顧客と第３顧客画像に写っている顧客との第３類似度を算出する（Ｓ３０４）。第３類似度の算出に用いるアルゴリズムは、第１類似度又は第２類似度を算出するアルゴリズムと同じであってもよいし、異なっていてもよい。

[0118] 第３類似度の算出対象である第１顧客画像は、いずれかの関連情報において精算情報と関連付けられている第１顧客画像である。第２算出部５０６０は、第１算出部４０４０が関連情報において精算情報と関連付けられている各第１顧客画像を取得する方法と同様の方法で、各第１顧客画像を取得する。

[0119] ＜第２表示制御部５０８０が行う処理の詳細＞

第２表示制御部５０８０は、第３類似度が第３閾値以上である第１顧客画像がない場合（Ｓ３０６：ＮＯ）、第２表示制御部５０８０は、店員が閲覧できるディスプレイ装置１１０において、第２候補画像（第３顧客画像に写っている顧客の候補を表す第１顧客画像）を表示する（Ｓ３１２）。ここで、どの第１顧客画像を第２候補画像にするかを決定する方法は、実施形態１において候補画像を決定する方法と同様である。以下、この方法を具体的に説明する。

[0120] 例えば第２算出部５０６０が、第３類似度を算出する方法と異なる方法を用いて、第１顧客画像に写っている顧客と第３顧客画像に写っている顧客との第４類似度を算出する。そして、第２表示制御部５０８０は、第４類似度が第３閾値以上である第１顧客画像を、第２候補画像として表示する。

[0121] ここで、第２類似度を算出するアルゴリズムは第１類似度を算出するアルゴリズムよりも大きい類似度を算出することが好ましい理由と同様の理由により、第４類似度を算出するアルゴリズムは第３類似度を算出するアルゴリ

ズムよりも大きい類似度を算出することが好ましい。例えば第２算出部５０６０は、第３類似度を算出するアルゴリズムに、第１類似度を算出するアルゴリズムと同じアルゴリズムを利用し、第４類似度を算出するアルゴリズムに、第２類似度を算出するアルゴリズムと同じアルゴリズムを利用する。

[0122] また例えば、第２表示制御部５０８０は、第３類似度が第４閾値以上である第１顧客画像を、第２候補画像として表示してもよい。第４閾値は、第３閾値より小さい値である。

[0123] ＜第２入力受付部５１００が行う処理の詳細＞

第２入力受付部５１００は、第２候補画像を選択する処理を受け付ける（Ｓ３１４）。第２候補画像の選択は、店員によって行われる。第２入力受付部５１００が第２候補画像の選択を受け付ける方法は、第１入力受付部４１００が候補画像の選択を受け付ける方法と同様である。

[0124] ＜警告部５０４０が行う処理の詳細＞

警告部５０４０は、警告条件が満たされている場合に警告処理を行う（Ｓ３１０）。前述したように、警告条件は、「第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像に関連付けられている完了フラグが精算未完了を示していること」である。ここで、警告部５０４０は、１）第３類似度が第３閾値以上である第１顧客画像、又は２）顧客によって選択される第２候補画像を、「第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像」として扱う。１）及び２）については、前述した通りである。

[0125] 警告部５０４０は、関連情報が記憶されている記憶部にアクセスして、「第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像」と関連付けられている完了フラグを取得する。そして、警告部５０４０は、完了フラグの値が精算未完了であるか否かを判定する。

[0126] ＜＜警告処理の詳細＞＞

警告部５０４０が行う警告処理は様々である。例えば警告部５０４０は、第１撮像部３０２０によって撮像された顧客、又は店員や警備員などが聞く

ことができる場所で、アラーム音を出力する。例えばこの場所は、出口付近、商品登録装置３０００の付近、又は警備室などである。この場合、アラーム音を出力する場所に、アラーム音を出力するスピーカなどが設置される。

[0127] また例えば、警告部５０４０は、第３撮像部５０２０によって撮像された顧客、又は店員や警備員などが見ることができる場所に、精算が完了していない旨の警告メッセージを表示する。具体的には、警告部５０４０は、出口に設けられているディスプレイ装置１１０、各商品登録装置３０００に設けられているディスプレイ装置２０、又は警備員室に設けられているディスプレイ装置などに警告メッセージを表示する。

[0128] また、出口にゲートが設置されている場合、警告部５０４０は、警告条件が満たされた場合に、そのゲートを閉じる処理を行ってもよい。こうすることで、顧客が出口から出られなくなるため、精算を行っていない顧客が誤って帰ってしまうことを防ぐことができる。

[0129] また、精算システム２０００を運用する店舗において会員制度が導入されている場合、警告部５０４０は、会員情報を利用して警告を行ってもよい。具体的には、会員の画像（顔写真など）及び会員の連絡先（メールアドレスなど）が、会員情報として予め登録されているとする。警告条件が満たされている場合、警告部５０４０は、会員情報が記憶されているデータベース等にアクセスし、第３顧客画像に写っている顧客と同じ顧客が写っている会員の画像を検索する。そして、警告部５０４０は、このような画像があった場合、その画像が示されている会員情報が示す顧客の連絡先に、警告メッセージを送信する。例えば警告部５０４０は、顧客のメールアドレス宛に、警告メッセージを含むメールを送信する。会員情報を利用することで、顧客に対して直接的に警告メッセージを行うことができる。そのため、顧客が誤って精算を忘れて出口を出てしまった場合でも、そのことが他の人に分からないように、顧客に対して警告を行うことができる。よって、顧客のプライバシーを守ることができる。

[0130] ＜具体例＞

実施形態２の精算システム２０００の動作を具体的に例示する。図１４は、実施形態２の精算システム２０００の運用環境を例示する図である。図１４において、精算装置４０００は、エリア８０の中に設置されている。出口９０は、エリア８０の出口である。ゲート１００は、出口９０を出る際に顧客が通過するゲートである。図１４において、第３撮像部５０２０は、このゲート１００に備えられている。

[0131] 通常、顧客は、商品登録装置３０００を利用した後、精算装置４０００を利用して精算を行う。精算装置４０００は、その顧客の精算が完了した際、入力受付部４１００を介して顧客が選択した第１顧客画像に関連付けられている完了フラグの値を「精算完了」に変更する。

[0132] 顧客がゲート１００を通過する際、第３撮像部５０２０は、その顧客を撮像して第３顧客画像を生成する。そして、警告部５０４０は、第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像と関連付けられている完了フラグが「精算未完了」を示しているか否かを判定する。上述のように、顧客が精算を完了していれば、完了フラグは「精算完了」を示している。そのため、警告部５０４０は警告処理を行わない。

[0133] 一方、顧客が精算を行っていないと、第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像と関連付けられている完了フラグは「精算未完了」を示している。この場合、警告部５０４０は警告処理を行う。例えば警告部５０４０は、ゲート１００を閉じ、ゲート１００に設けられているディスプレイ装置に警告メッセージを表示する。

[0134] ＜作用・効果＞

本実施形態の精算システム２０００は、「第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像」と関連付けられている完了フラグが精算未完了である場合、警告処理を行う。これは、顧客が、購入する商品の精算を行う前に出口を出ようとした場合（又は出口を出た場合）に警告が行われることを意味する。よって、本実施形態の精算システム２０００によれば、顧客が精算を忘れて帰ってしまうことを防止することができるため、顧

客と店舗との間でトラブルが発生することを未然に防ぐことができる。

[0135] また、警告装置５０００は、第３類似度が第３閾値以上である第１顧客画像がない場合、第２候補画像を表示して、ディスプレイ装置１１０を閲覧する店員に第２候補画像を選択させる。例えば、商品登録装置３０００を利用した時と出口を出る時とで、顧客が身につけているものが変わっている場合がある。具体的には、顧客が、商品登録装置３０００を利用した時に装着していたマスクを、出口を出る前に外すことなどが考えられる。このような場合、実際には第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像があるにも関わらず、これらの第３類似度が低くなってしまう。よって、精算が完了していない顧客が出口を出ても、警告が行われないことになってしまう。

[0136] 本実施形態の警告装置５０００によれば、第３類似度が第３閾値以上である第１顧客画像がない場合に第２候補画像が表示されるため、店員は、出口を出ようとしている顧客と同じ顧客が写っている第２候補画像があるか否かを、目で見て判断することができる。そして、店員の目から見て、出口から出ようとしている顧客と同じ顧客が写っている第２候補画像がある場合、店員がその第２候補画像を選択することで、警告装置５０００は、その第２候補画像と関連付けられている精算情報に基づく精算が完了しているか否かを判定する。そして、警告装置５０００は、精算が完了していない場合、警告処理を行う。よって、本実施形態の警告装置５０００は、人による判断も利用することで、顧客が精算を忘れて帰ってしまうことをより確実に防止することができる。

[0137] 以上、図面を参照して本発明の実施形態について述べたが、これらは本発明の例示であり、上記各実施形態の組み合わせ、又は上記以外の様々な構成を採用することもできる。

[0138] 以下、参考形態の例を付記する。

１． 商品登録装置及び精算装置を有する精算システムであって、

前記商品登録装置は、

顧客を含む第１顧客画像を生成する第１撮像手段と、

前記第１顧客画像に対して商品の精算に用いる精算情報を関連付けた関連付け情報を生成する生成手段と、を有し、

前記精算装置は、

顧客を含む第２顧客画像を生成する第２撮像手段と、

前記第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である候補画像を、顧客が閲覧できるディスプレイ装置に表示する第１表示制御手段と、を有する精算システム。

２．　前記第２顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第１類似度を算出する第１算出手段と、

前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がある場合、その第１顧客画像と関連付けられている前記精算情報を取得する取得手段と、を有し、

前記第１表示制御手段は、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合に、前記候補画像を表示する、１．に記載の精算システム。

３．　前記精算装置は、前記候補画像に対する選択操作を受け付ける入力受付手段を有し、

前記取得手段は、選択された前記候補画像と関連付けられている前記精算情報を取得する、２．に記載の精算システム。

４．　前記精算装置は、前記候補画像が選択されなかった場合、前記第２顧客画像に写っている顧客と同じ顧客が写っている前記第１顧客画像がないと判定する判定手段を有する３．に記載の精算システム。

５．　前記第１算出手段は、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合、第１類似度を算出する方法とは異なる方法を用いて、前記第２顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第２類似度を算出し、

前記第１表示制御手段は、前記第２顧客画像に写っている顧客との第２類

似度が前記第１閾値以上である顧客が写っている第１顧客画像を、前記候補画像として表示する、２．乃至４．いずれか一つに記載の精算システム。

６．　前記第１表示制御手段は、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合、前記第２顧客画像に写っている顧客との第１類似度が、前記第１閾値より小さい第２閾値以上である顧客が写っている第１顧客画像を、前記候補画像として表示する、２．乃至４．いずれか一つに記載の精算システム。

７．　当該精算システムは、複数の前記商品登録装置及び複数の前記精算装置を有し、

前記第１表示制御手段は、その第１表示制御手段を有する精算装置と関連付けられている前記商品登録装置によって生成された前記第１顧客画像を、前記候補画像として表示する、１．乃至４．いずれか一つに記載の精算システム。

８．　前記生成手段は、前記第１顧客画像の撮像時点をさらに示す前記関連付け情報を生成し、

前記第１算出手段は、撮像時点と現在時刻との差が所定時間以内である前記第１顧客画像について類似度を算出する２．乃至６．いずれか一つに記載の精算システム。

９．　前記生成手段は、前記関連付け情報において、その関連付け情報によって示される前記精算情報を用いた精算が完了したか否かを示す完了フラグをさらに関連付け、

前記精算システムは、

前記精算装置が設置されているエリアの出口にいる顧客を含む第３顧客画像を生成する第３撮像手段と、

前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像に関連付けられている前記完了フラグが、前記精算情報を用いた精算が完了していないことを示している場合、警告処理を行う警告手段と、を有する警告装置を有する１．乃至８．いずれか一つに記載の精算システム。

１０．　前記警告装置は、前記第３顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第３類似度を算出する第２算出手段を有し、

前記警告手段は、前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がある場合、その第１顧客画像を、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像とし、

前記警告装置は、

前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がない場合に、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である第２候補画像を前記出口に設けられているディスプレイ装置に表示する第２表示制御手段と、

前記第２候補画像を選択する入力を受け付ける第２入力受付手段と、を有し、

前記警告手段は、前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がない場合、前記第２入力受付手段を介して選択された第２候補画像を、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像とする、９．に記載の精算システム。

１１　前記第２算出手段は、前記第３類似度が前記第３閾値以上である顧客が写っている第１顧客画像がない場合、前記第３類似度を算出する方法とは異なる方法を用いて、前記第３顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第４類似度を算出し、

前記第２表示制御手段は、前記第４類似度が前記第３閾値以上である顧客が写っている第１顧客画像を、第２候補画像として表示する、１０．に記載の精算システム。

１２．　前記第２表示制御手段は、前記第３類似度が前記第３閾値より小さい第４閾値以上である顧客が写っている第１顧客画像を前記第２候補画像として表示する、１０．に記載の情報処理システム。

１３．　１．乃至１２．いずれか一つに記載の情報処理システムが有する精算装置。

１４．　コンピュータを１３．に記載の精算装置として動作させるプログラム。

１５．　商品登録装置及び精算装置を有する精算システムにおいて実行される精算方法であって、

前記商品登録装置が、顧客を含む第１顧客画像を生成する第１撮像ステップと、

前記商品登録装置が、前記第１顧客画像に対して商品の精算に用いる精算情報を関連付けた関連付け情報を生成する生成ステップと、

前記精算装置が、顧客を含む第２顧客画像を生成する第２撮像ステップと、

前記精算装置が、前記第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である候補画像を、顧客が閲覧できるディスプレイ装置に表示する第１表示制御ステップと、を有する精算方法。

１６．　前記精算装置が、前記第２顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第１類似度を算出する第１算出ステップと、

前記精算装置が、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がある場合、その第１顧客画像と関連付けられている前記精算情報を取得する取得ステップと、を有し、

前記第１表示制御ステップは、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合に、前記候補画像を表示する、１５．に記載の精算方法。

１７．　前記精算装置が、前記候補画像に対する選択操作を受け付ける入力受付ステップを有し、

前記取得ステップは、選択された前記候補画像と関連付けられている前記精算情報を取得する、１６．に記載の精算方法。

１８．　前記精算装置が、前記候補画像が選択されなかった場合、前記第２顧客画像に写っている顧客と同じ顧客が写っている前記第１顧客画像がない

と判定する判定ステップを有する、１７．に記載の精算方法。

１９．　前記第１算出ステップは、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合、第１類似度を算出する方法とは異なる方法を用いて、前記第２顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第２類似度を算出し、

前記第１表示制御ステップは、前記第２顧客画像に写っている顧客との第２類似度が前記第１閾値以上である顧客が写っている第１顧客画像を、前記候補画像として表示する１６．乃至１８．いずれか一つに記載の精算方法。

２０．　前記第１表示制御ステップは、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合、前記第２顧客画像に写っている顧客との第１類似度が、前記第１閾値より小さい第２閾値以上である顧客が写っている第１顧客画像を、前記候補画像として表示する、１６．乃至１８．いずれか一つに記載の精算方法。

２１．　当該精算方法は、複数の前記商品登録装置及び複数の前記精算装置を有し、

前記第１表示制御ステップは、その第１表示制御ステップを実行する精算装置と関連付けられている前記商品登録装置によって生成された前記第１顧客画像を、前記候補画像として表示する、１５．乃至１８．いずれか一つに記載の精算方法。

２２．　前記生成ステップは、前記第１顧客画像の撮像時点をさらに示す前記関連付け情報を生成し、

前記第１算出ステップは、撮像時点と現在時刻との差が所定時間以内である前記第１顧客画像について類似度を算出する１６．乃至２０．いずれか一つに記載の精算方法。

２３．　前記生成ステップは、前記関連付け情報において、その関連付け情報によって示される前記精算情報を用いた精算が完了したか否かを示す完了フラグをさらに関連付け、

前記精算システムは、警告装置をさらに有し、

当該精算システムは、

前記警告装置が、前記精算装置が設置されているエリアの出口にいる顧客を含む第３顧客画像を生成する第３撮像ステップと、

前記警告装置が、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像に関連付けられている前記完了フラグが、前記精算情報を用いた精算が完了していないことを示している場合、警告処理を行う警告ステップと、を有する１５．乃至２２．いずれか一つに記載の精算方法。

２４．　前記警告装置が、前記第３顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第３類似度を算出する第２算出ステップを有し、

前記警告ステップは、前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がある場合、その第１顧客画像を、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像とし、

前記警告装置が、前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がない場合に、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である第２候補画像を前記出口に設けられているディスプレイ装置に表示する第２表示制御ステップと、

前記警告装置が、前記第２候補画像を選択する入力を受け付ける第２入力受付ステップと、を有し、

前記警告ステップは、前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がない場合、前記第２入力受付ステップを介して選択された第２候補画像を、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像とする、２３．に記載の精算方法。

２５．　前記第２算出ステップは、前記第３類似度が前記第３閾値以上である顧客が写っている第１顧客画像がない場合、前記第３類似度を算出する方法とは異なる方法を用いて、前記第３顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第４類似度を算出し、

前記第２表示制御ステップは、前記第４類似度が前記第３閾値以上である顧客が写っている第１顧客画像を、第２候補画像として表示する、２４．に記載の精算方法。

２６．　前記第２表示制御ステップは、前記第３類似度が前記第３閾値より小さい第４閾値以上である顧客が写っている第１顧客画像を前記第２候補画像として表示する、２４．に記載の精算方法。

[0139] この出願は、２０１５年３月３１日に出願された日本出願特願２０１５－０７２０３５号を基礎とする優先権を主張し、その開示の全てをここに取り込む。

請求の範囲

[請求項1] 商品登録装置及び精算装置を有する精算システムであって、

前記商品登録装置は、

顧客を含む第１顧客画像を生成する第１撮像手段と、

前記第１顧客画像に対して商品の精算に用いる精算情報を関連付けた関連付け情報を生成する生成手段と、を有し、

前記精算装置は、

顧客を含む第２顧客画像を生成する第２撮像手段と、

前記第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である候補画像を、顧客が閲覧できるディスプレイ装置に表示する第１表示制御手段と、を有する精算システム。

[請求項2] 前記第２顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第１類似度を算出する第１算出手段と、

前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がある場合、その第１顧客画像と関連付けられている前記精算情報を取得する取得手段と、を有し、

前記第１表示制御手段は、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合に、前記候補画像を表示する、請求項１に記載の精算システム。

[請求項3] 前記精算装置は、前記候補画像に対する選択操作を受け付ける入力受付手段を有し、

前記取得手段は、選択された前記候補画像と関連付けられている前記精算情報を取得する、請求項２に記載の精算システム。

[請求項4] 前記精算装置は、前記候補画像が選択されなかった場合、前記第２顧客画像に写っている顧客と同じ顧客が写っている前記第１顧客画像がないと判定する判定手段を有する請求項３に記載の精算システム。

[請求項5] 前記第１算出手段は、前記第２顧客画像に写っている顧客との第１

類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合、第１類似度を算出する方法とは異なる方法を用いて、前記第２顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第２類似度を算出し、

前記第１表示制御手段は、前記第２顧客画像に写っている顧客との第２類似度が前記第１閾値以上である顧客が写っている第１顧客画像を、前記候補画像として表示する、請求項２乃至４いずれか一項に記載の精算システム。

[請求項6] 前記第１表示制御手段は、前記第２顧客画像に写っている顧客との第１類似度が第１閾値以上である顧客が写っている第１顧客画像がない場合、前記第２顧客画像に写っている顧客との第１類似度が、前記第１閾値より小さい第２閾値以上である顧客が写っている第１顧客画像を、前記候補画像として表示する、請求項２乃至４いずれか一項に記載の精算システム。

[請求項7] 当該精算システムは、複数の前記商品登録装置及び複数の前記精算装置を有し、

前記第１表示制御手段は、その第１表示制御手段を有する精算装置と関連付けられている前記商品登録装置によって生成された前記第１顧客画像を、前記候補画像として表示する、請求項１乃至４いずれか一項に記載の精算システム。

[請求項8] 前記生成手段は、前記第１顧客画像の撮像時点をさらに示す前記関連付け情報を生成し、

前記第１算出手段は、撮像時点と現在時刻との差が所定時間以内である前記第１顧客画像について類似度を算出する請求項２乃至６いずれか一項に記載の精算システム。

[請求項9] 前記生成手段は、前記関連付け情報において、その関連付け情報によって示される前記精算情報を用いた精算が完了したか否かを示す完了フラグをさらに関連付け、

前記精算システムは、

前記精算装置が設置されているエリアの出口にいる顧客を含む第３顧客画像を生成する第３撮像手段と、

前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像に関連付けられている前記完了フラグが、前記精算情報を用いた精算が完了していないことを示している場合、警告処理を行う警告手段と、を有する警告装置を有する請求項１乃至８いずれか一項に記載の精算システム。

[請求項10] 前記警告装置は、前記第３顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第３類似度を算出する第２算出手段を有し、

前記警告手段は、前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がある場合、その第１顧客画像を、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像とし、

前記警告装置は、

前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がない場合に、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である第２候補画像を前記出口に設けられているディスプレイ装置に表示する第２表示制御手段と、

前記第２候補画像を選択する入力を受け付ける第２入力受付手段と、を有し、

前記警告手段は、前記第３類似度が第３閾値以上である顧客が写っている第１顧客画像がない場合、前記第２入力受付手段を介して選択された第２候補画像を、前記第３顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像とする、請求項９に記載の精算システム。

[請求項11] 前記第２算出手段は、前記第３類似度が前記第３閾値以上である顧客が写っている第１顧客画像がない場合、前記第３類似度を算出する

方法とは異なる方法を用いて、前記第３顧客画像に写っている顧客と各前記第１顧客画像に写っている顧客との第４類似度を算出し、

前記第２表示制御手段は、前記第４類似度が前記第３閾値以上である顧客が写っている第１顧客画像を、第２候補画像として表示する、請求項１０に記載の精算システム。

[請求項12] 前記第２表示制御手段は、前記第３類似度が前記第３閾値より小さい第４閾値以上である顧客が写っている第１顧客画像を前記第２候補画像として表示する、請求項１０に記載の情報処理システム。

[請求項13] 請求項１乃至１２いずれか一項に記載の情報処理システムが有する精算装置。

[請求項14] コンピュータを請求項１３に記載の精算装置として動作させるプログラム。

[請求項15] 商品登録装置及び精算装置を有する精算システムにおいて実行される精算方法であって、

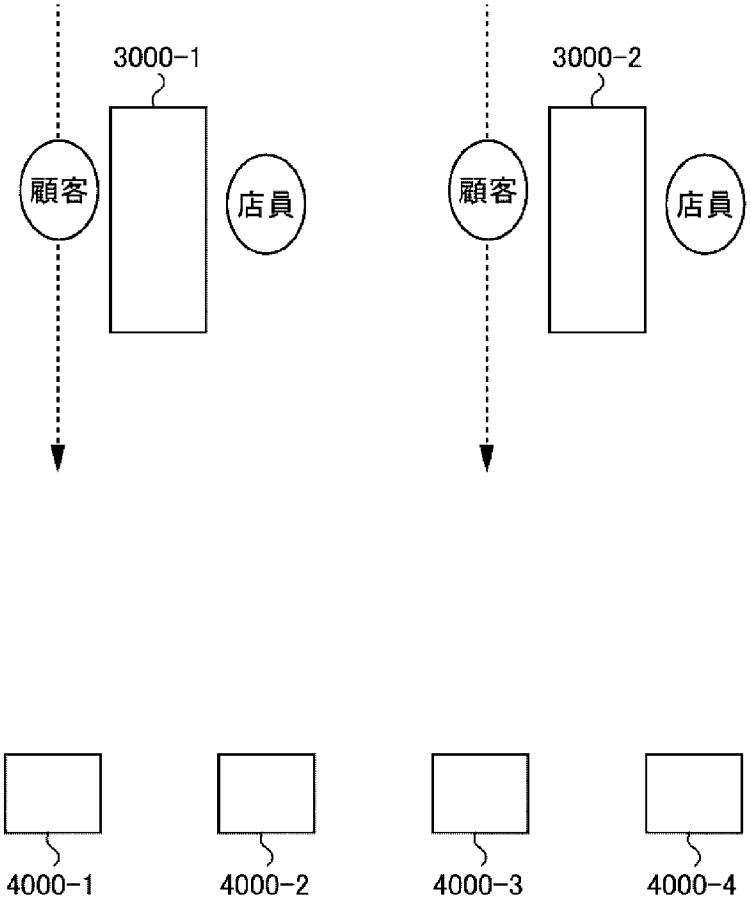
前記商品登録装置が、顧客を含む第１顧客画像を生成する第１撮像ステップと、

前記商品登録装置が、前記第１顧客画像に対して商品の精算に用いる精算情報を関連付けた関連付け情報を生成する生成ステップと、

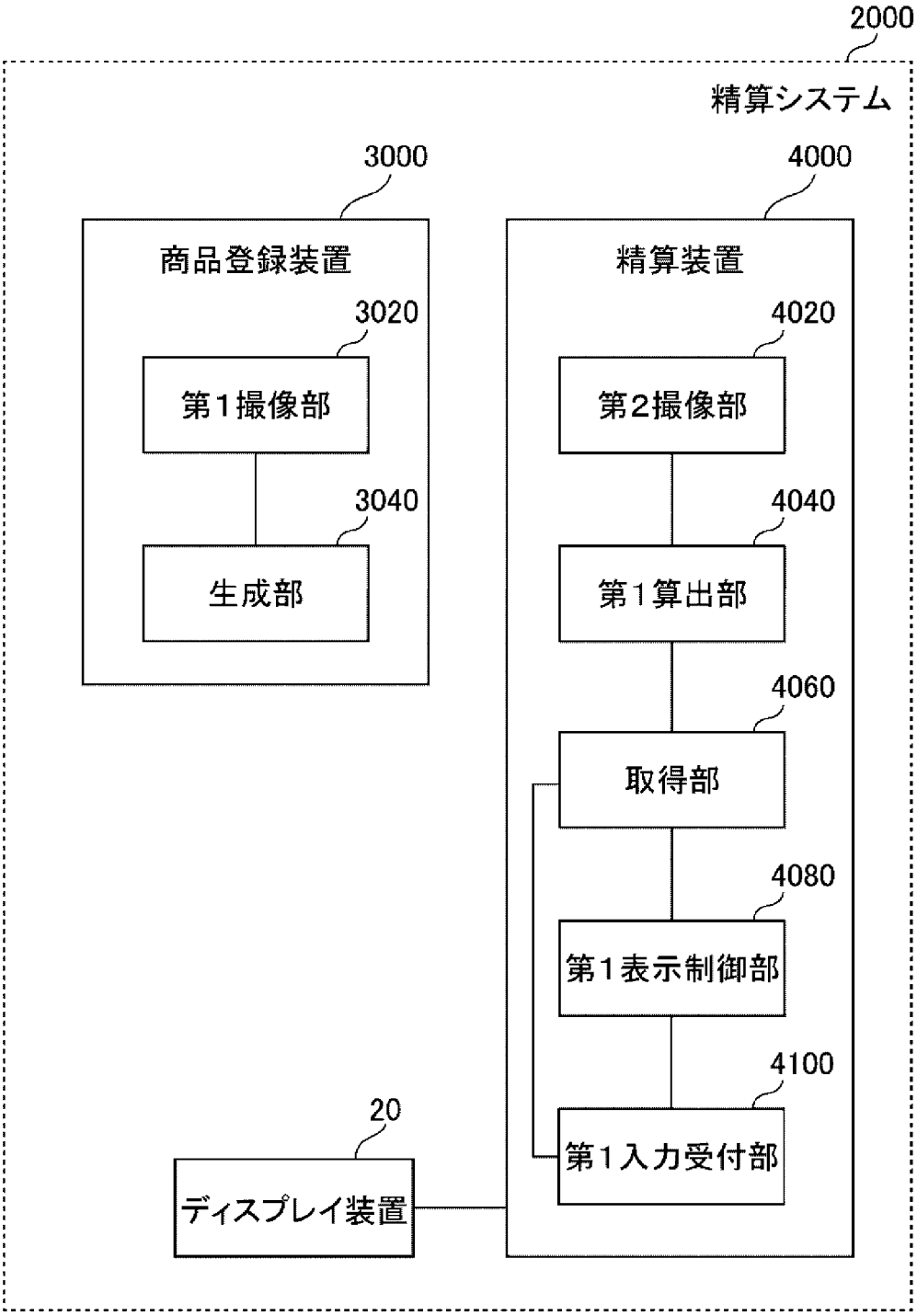
前記精算装置が、顧客を含む第２顧客画像を生成する第２撮像ステップと、

前記精算装置が、前記第２顧客画像に写っている顧客と同じ顧客が写っている第１顧客画像の候補である候補画像を、顧客が閲覧できるディスプレイ装置に表示する第１表示制御ステップと、を有する精算方法。

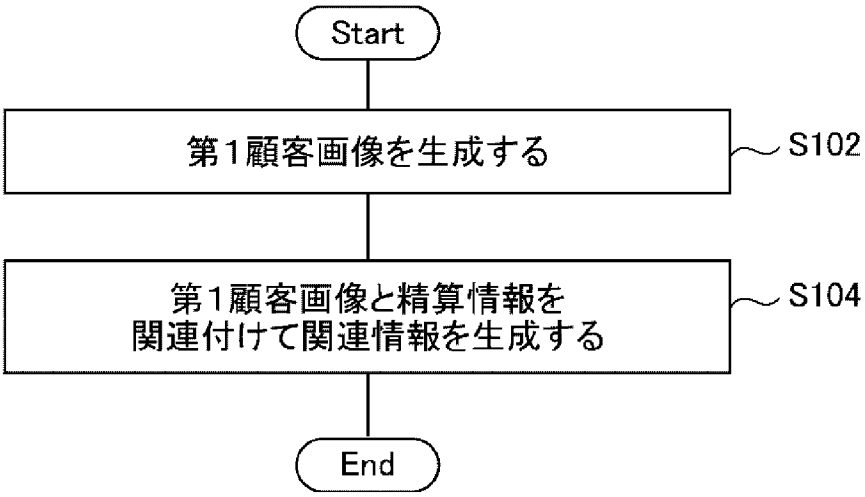
[図1]



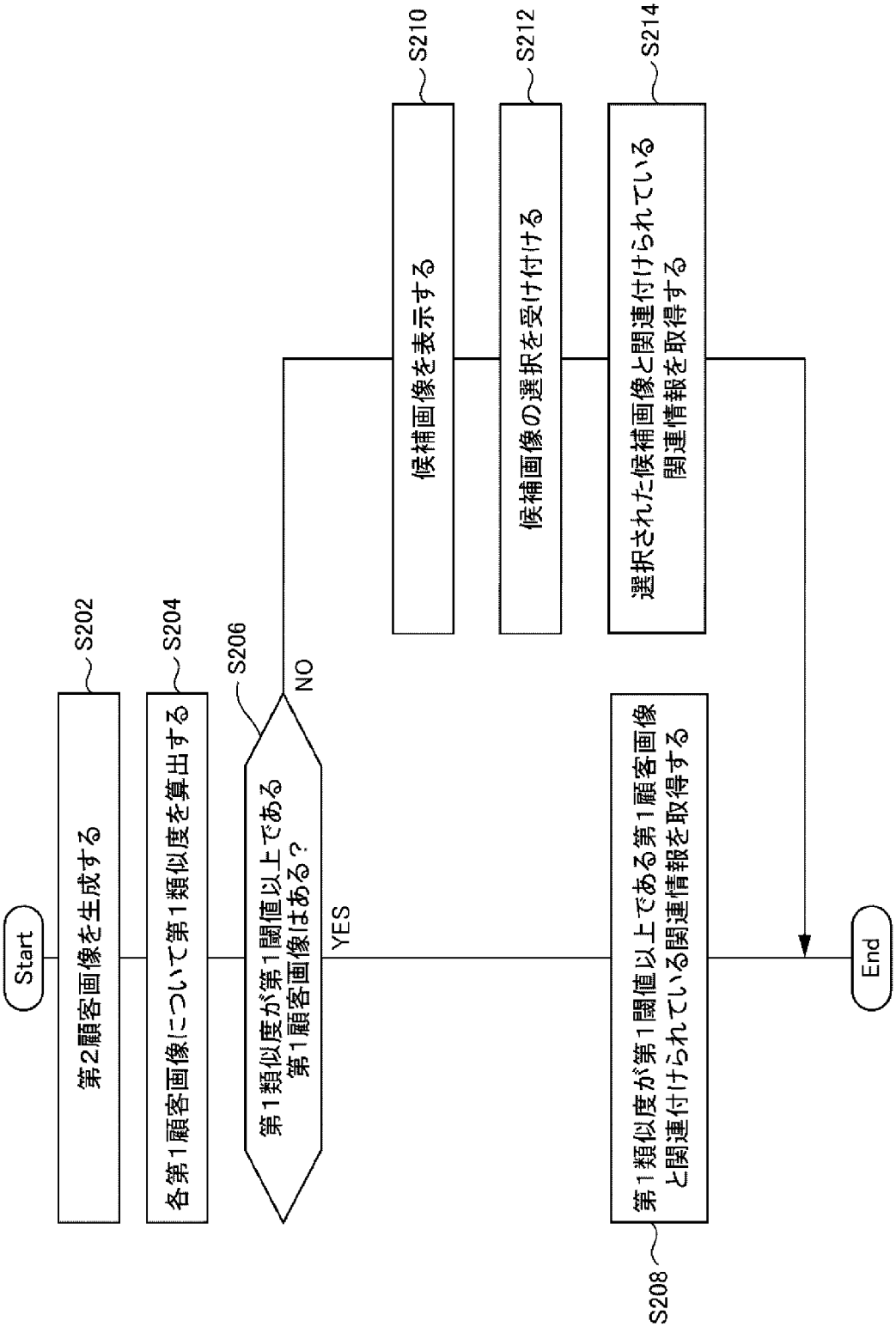
[図2]


2000
精算システム
3000
商品登録装置
3020
第1撮像部
3040
生成部
4000
精算装置
4020
第2撮像部
4040
第1算出部
4060
取得部
4080
第1表示制御部
4100
第1入力受付部
20
ディスプレイ装置

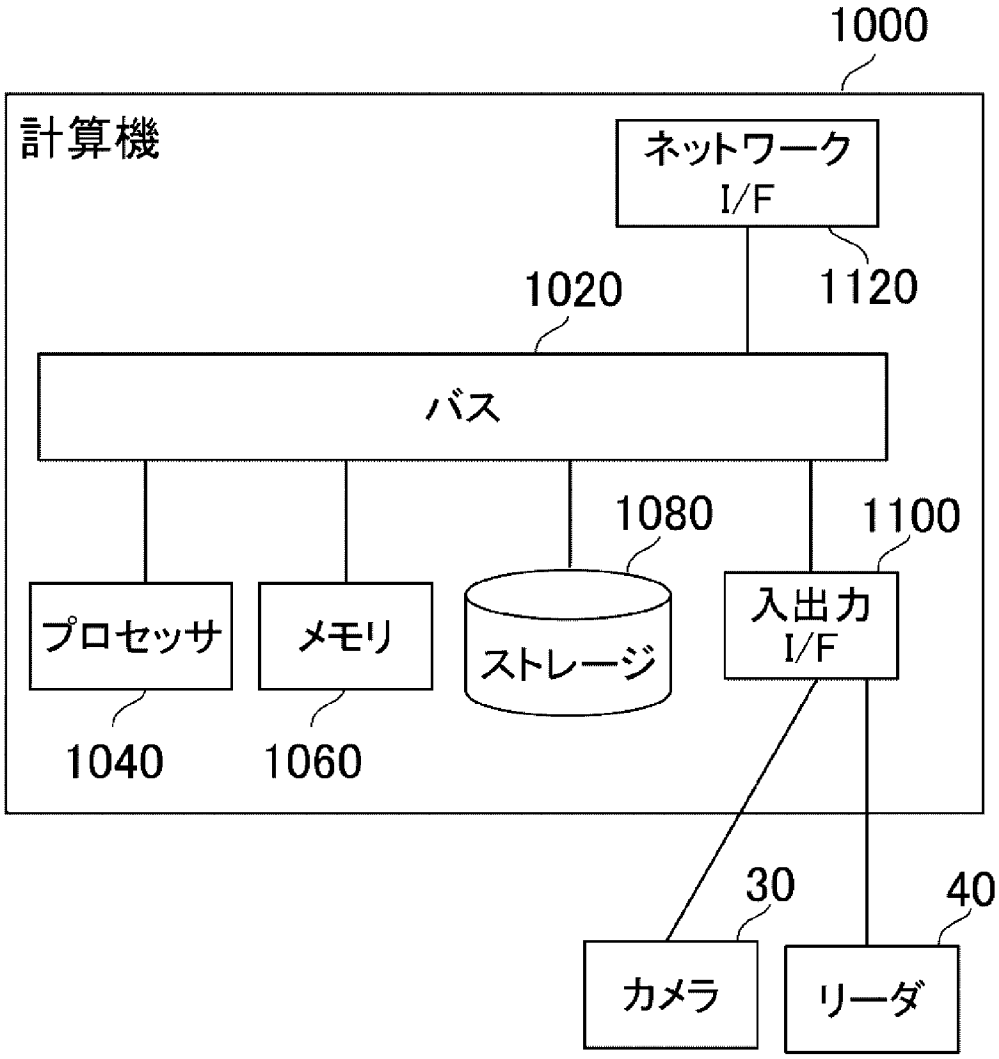
[図3]


Start
第1顧客画像を生成する
S102
第1顧客画像と精算情報を
関連付けて関連情報を生成する
S104
End

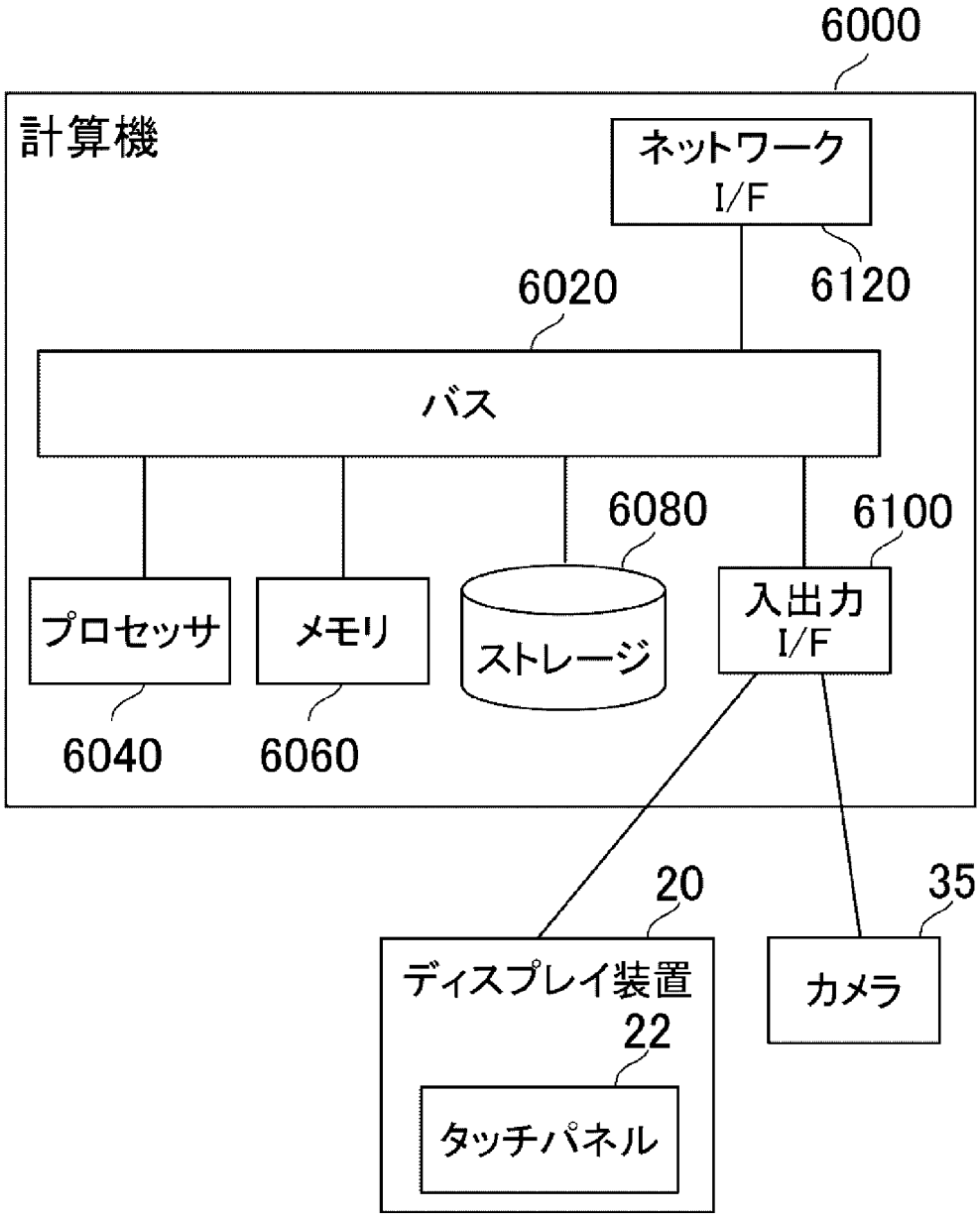
[図4]


Start
第2顧客画像を生成する
S202
各第1顧客画像について第1類似度を算出する
S204
第1類似度が第1閾値以上である第1顧客画像はある？
S206
NO
YES
候補画像を表示する
S210
候補画像の選択を受け付ける
S212
選択された候補画像と関連付けられている関連情報を取得する
S214
第1類似度が第1閾値以上である第1顧客画像と関連付けられている関連情報を取得する
S208
End

[図5]


1000
計算機
ネットワーク
I/F
1120
1020
バス
1080
1100
プロセッサ
メモリ
ストレージ
入出力
I/F
1040
1060
30
40
カメラ
リーダ

[図6]


6000
計算機
ネットワーク
I/F
6120
6020
バス
6080
6100
プロセッサ
メモリ
ストレージ
入出力
I/F
6040
6060
20
35
ディスプレイ装置
22
タッチパネル
カメラ

[図7]

200

202 206 204

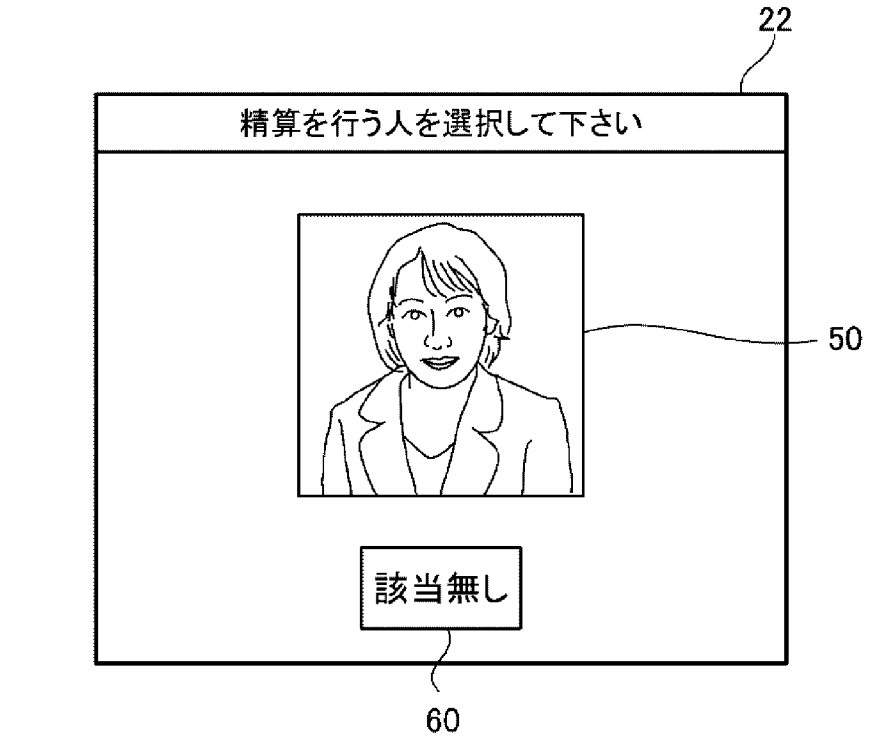
精算情報ID	商品リスト		
	商品ID	商品ID	・・・
P001	I001	I003	・・・

[図8]

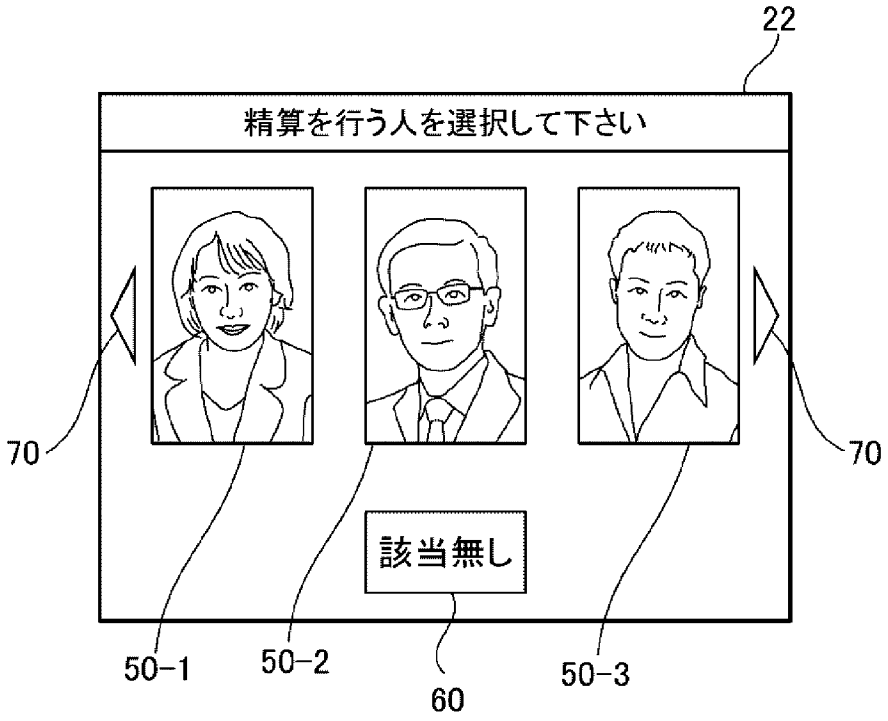
300

302 第1顧客画像	304 精算情報ID
FC_001.png	P003
FC_002.png	P005
FC_003.png	P001

[図9]

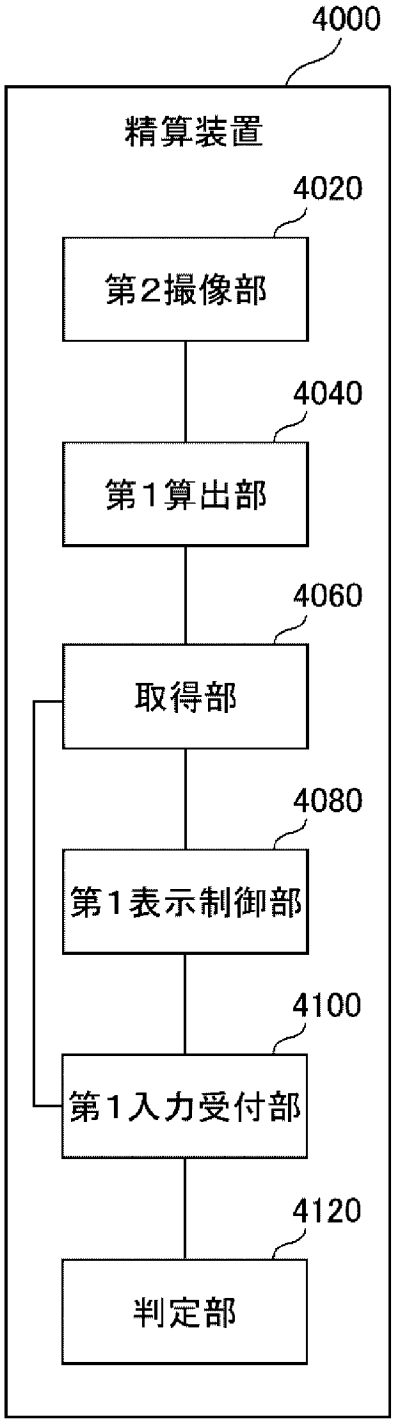

22
精算を行う人を選択して下さい
50
該当無し
60

(a)

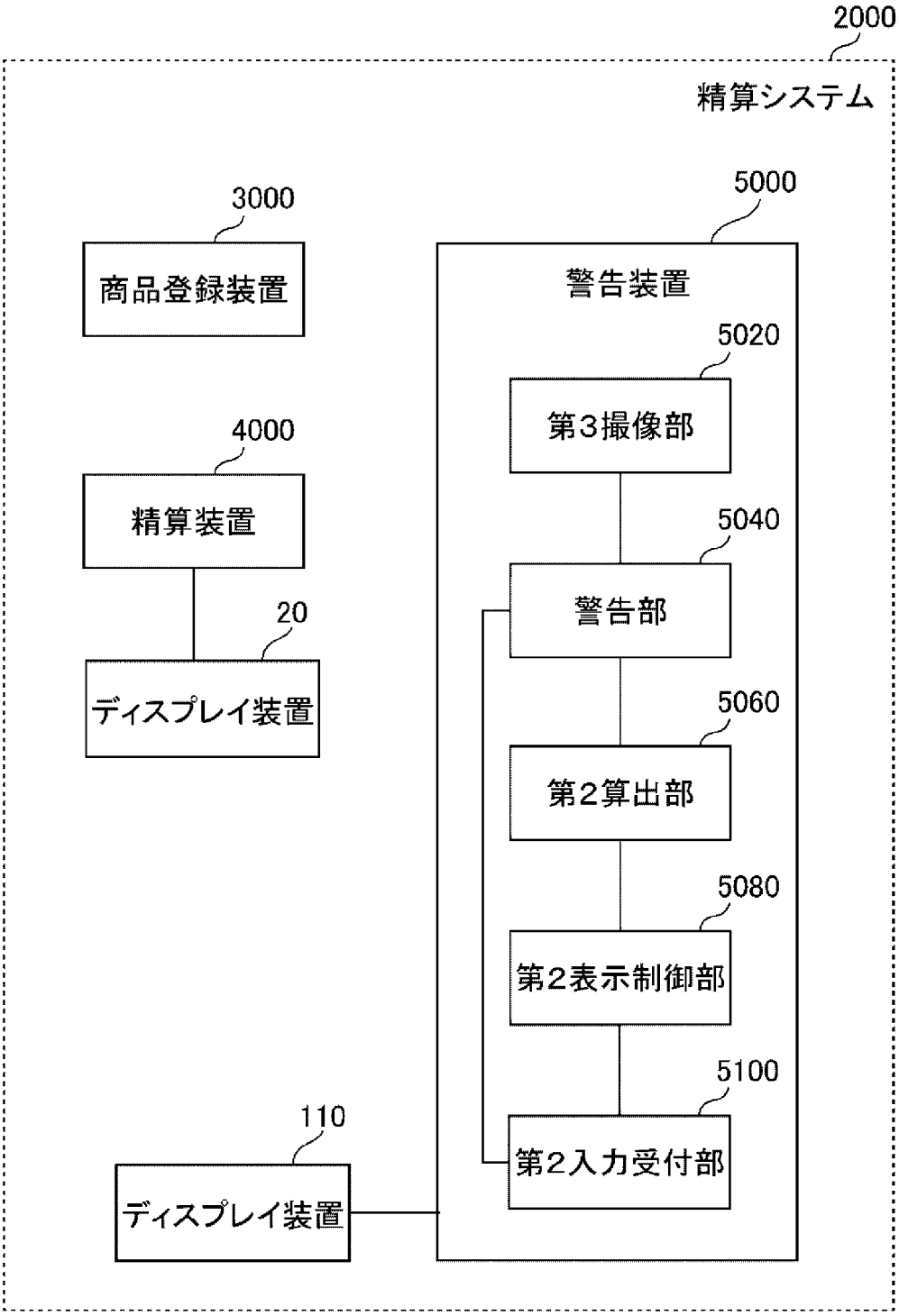

22
精算を行う人を選択して下さい
70
70
該当無し
50-1
50-2
60
50-3

(b)

[図10]


4000
精算装置
4020
第2撮像部
4040
第1算出部
4060
取得部
4080
第1表示制御部
4100
第1入力受付部
4120
判定部

[図11]

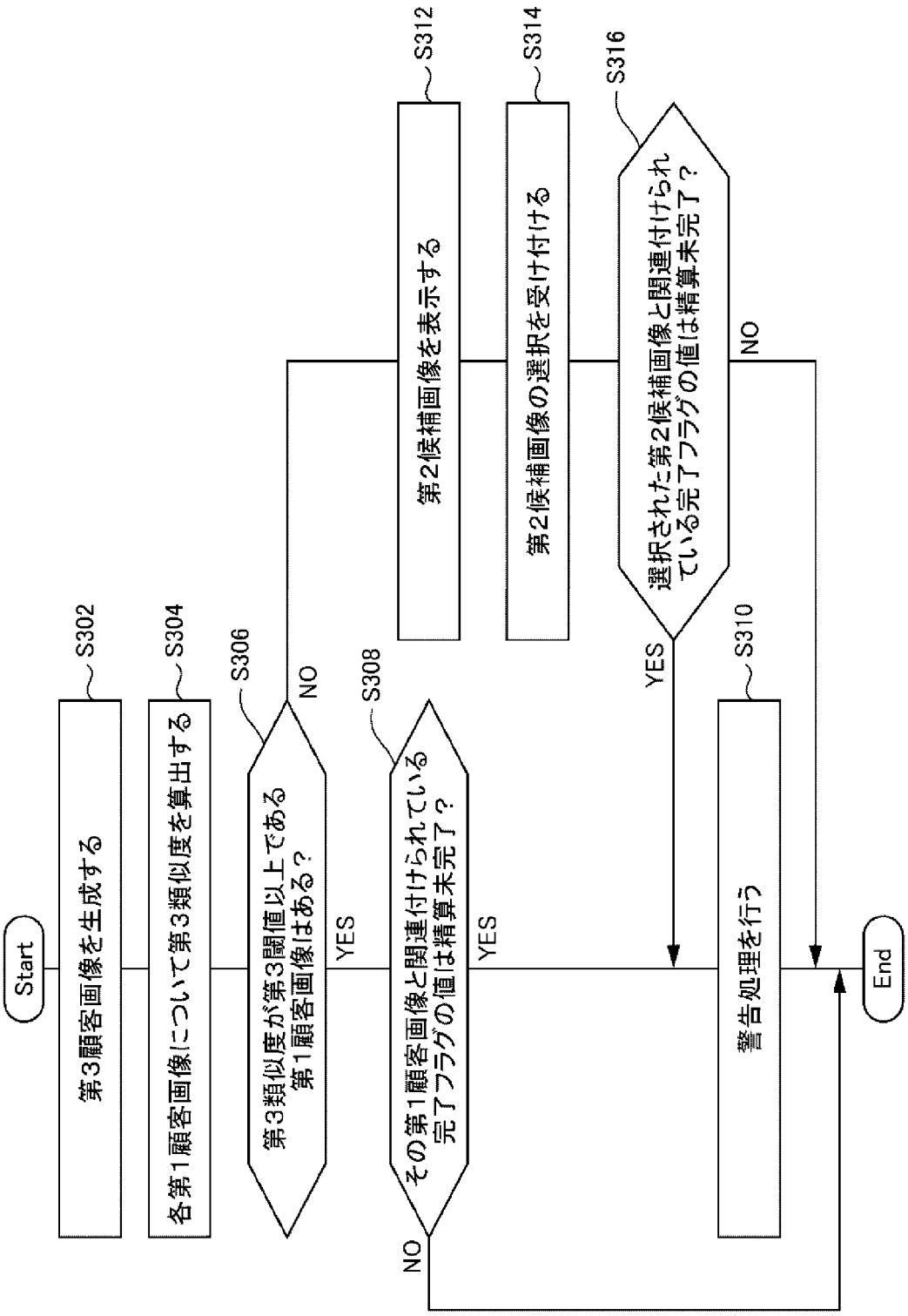

2000
精算システム
3000
商品登録装置
4000
精算装置
20
ディスプレイ装置
110
ディスプレイ装置
5000
警告装置
5020
第3撮像部
5040
警告部
5060
第2算出部
5080
第2表示制御部
5100
第2入力受付部

[図12]

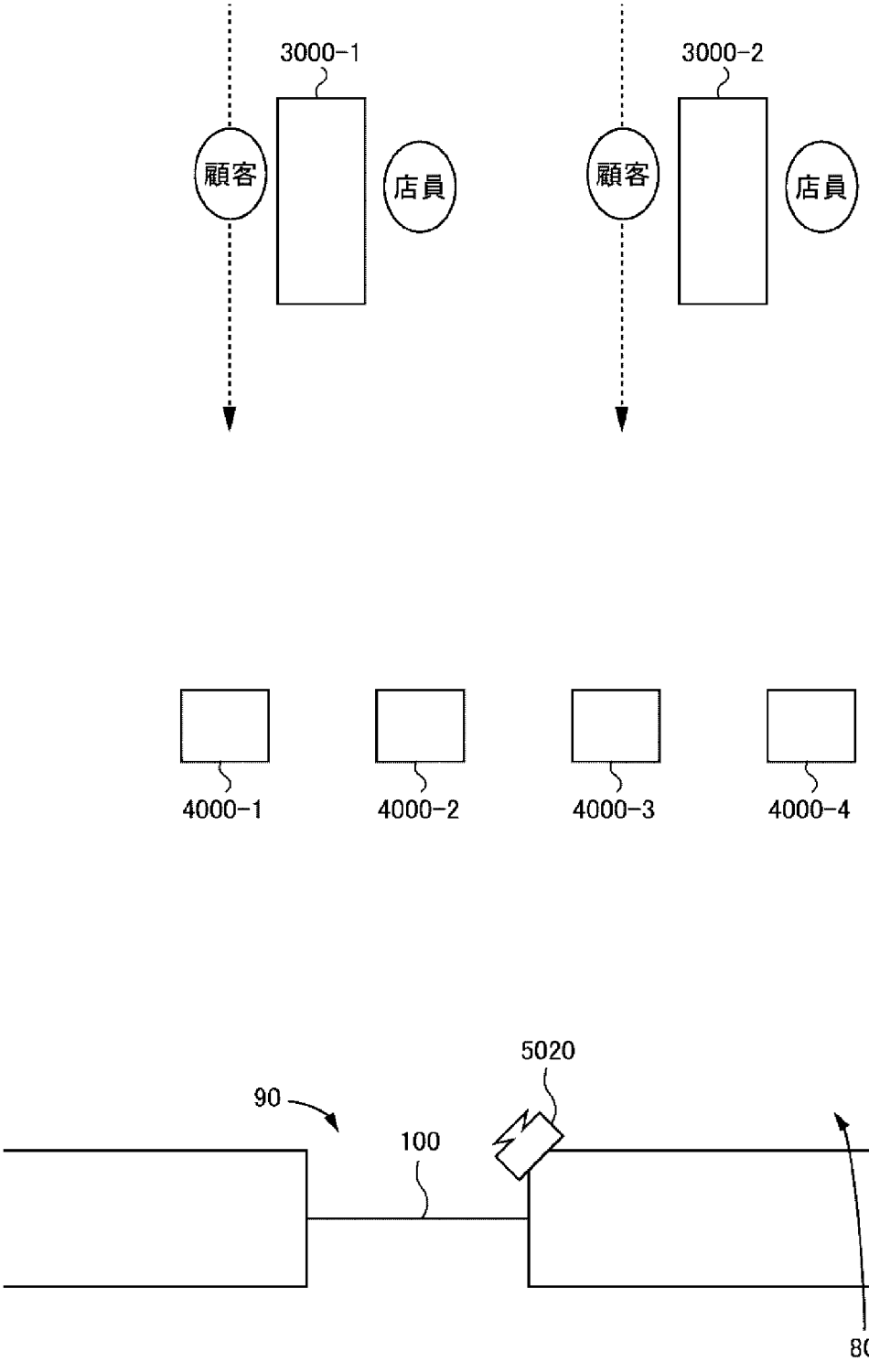
300

302 第1顧客画像	304 精算情報ID	306 完了フラグ
FC_001.png	P003	精算完了
FC_002.png	P005	精算未完了
FC_003.png	P001	精算未完了

[図13]


Start
第3顧客画像を生成する
S302
各第1顧客画像について第3類似度を算出する
S304
第3類似度が第3閾値以上である第1顧客画像はある？
S306
NO
YES
その第1顧客画像と関連付けられている完了フラグの値は精算未完了？
S308
NO
YES
第2候補画像を表示する
S312
第2候補画像の選択を受け付ける
S314
選択された第2候補画像と関連付けられている完了フラグの値は精算未完了？
S316
YES
NO
警告処理を行う
S310
End

[図14]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2016/059621

A. CLASSIFICATION OF SUBJECT MATTER
G07G1/00(2006.01)i, *G06T7/00*(2006.01)i, *G07G1/12*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G07G1/00, G06T7/00, G07G1/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2016
Kokai Jitsuyo Shinan Koho 1971-2016 Toroku Jitsuyo Shinan Koho 1994-2016

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2012-248162 A (Teraoka Seiko Co., Ltd.), 13 December 2012 (13.12.2012), paragraphs [0010] to [0098]; fig. 11 to 14 (Family: none)	1,7,13-15 2-6,9 8,10-12
Y	JP 2015-38721 A (Toshiba Tec Corp.), 26 February 2015 (26.02.2015), paragraph [0086] & US 2015/0026018 A1 paragraph [0098] & CN 104299337 A	2-6
Y	JP 2013-186495 A (Glory Ltd.), 19 September 2013 (19.09.2013), paragraphs [0016], [0095] to [0101]; fig. 12 (Family: none)	9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 June 2016 (07.06.16)	21 June 2016 (21.06.16)
Name and mailing address of the ISA/ Japan Patent Office 3-4-3,Kasumigaseki,Chiyoda-ku, Tokyo 100-8915,Japan	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

Petitioner Exhibit 1002-2828

国際調査報告

国際出願番号　ＰＣＴ／ＪＰ２０１６／０５９６２１

Ａ．　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Int.Cl.　G07G1/00(2006.01)i, G06T7/00(2006.01)i, G07G1/12(2006.01)i

Ｂ．　調査を行った分野

調査を行った最小限資料（国際特許分類（ＩＰＣ））

Int.Cl.　G07G1/00, G06T7/00, G07G1/12

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	１９２２－１９９６年
日本国公開実用新案公報	１９７１－２０１６年
日本国実用新案登録公報	１９９６－２０１６年
日本国登録実用新案公報	１９９４－２０１６年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

Ｃ．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求項の番号
X	JP 2012-248162 A (株式会社寺岡精工) 2012.12.13, 段落	1, 7, 13-15
Y	[0010]-[0098], 図 11-14 (ファミリーなし)	2-6, 9
A		8, 10-12
Y	JP 2015-38721 A (東芝テック株式会社) 2015.02.26, 段落[0086] & US 2015/0026018 A1, [0098] & CN 104299337 A	2-6
Y	JP 2013-186495 A (グローリー株式会社) 2013.09.19, 段落 [0016][0095]-[0101], 図 12 (ファミリーなし)	9

☐　Ｃ欄の続きにも文献が列挙されている。

☐　パテントファミリーに関する別紙を参照。

＊　引用文献のカテゴリー

「Ａ」特に関連のある文献ではなく、一般的技術水準を示すもの

「Ｅ」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの

「Ｌ」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）

「Ｏ」口頭による開示、使用、展示等に言及する文献

「Ｐ」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献

「Ｔ」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの

「Ｘ」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの

「Ｙ」特に関連のある文献であって、当該文献と他の１以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの

「＆」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
０７．０６．２０１６	２１．０６．２０１６

国際調査機関の名称及びあて先
日本国特許庁（ＩＳＡ／ＪＰ）
郵便番号１００－８９１５
東京都千代田区霞が関三丁目４番３号

特許庁審査官（権限のある職員）　３Ｒ　９８２６
永石　哲也

電話番号　０３－３５８１－１１０１　内線　３３７２

様式ＰＣＴ／ＩＳＡ／２１０（第２ページ）（２０１５年１月）

Petitioner Exhibit 1002-2829

Espacenet

Bibliographic data: CN108367497 (A) — 2018-08-03

PRINTING 3D OBJECTS WITH AUTOMATIC DIMENSIONAL ACCURACY COMPENSATION

Inventor(s): BENNETT TEDDY LELAND; GHEORGHESCU GHEORGHE MARIUS ± (T·L·贝内特, ; G·M·格奥尔盖斯库)

Applicant(s): MICROSOFT TECHNOLOGY LICENSING LLC ± (微软技术许可有限责任公司)

Classification: - international: ***B29C64/20; B29C64/393; B33Y30/00; B33Y50/02***
- cooperative: **B29C64/106 (EP, US)**; **B29C64/232 (EP, US)**; **B29C64/386 (EP)**; **B29C64/393 (US)**; **B33Y50/00 (EP)**; **G05B15/02 (US)**; B33Y30/00 (EP, US); B33Y50/02 (US)

Application number: CN20178004298 20170112 Global Dossier

Priority number(s): US201614996210 20160114 ; WO2017US13080 20170112

Also published as: CN108367497 (B) EP3402650 (A1) US10761497 (B2) US2017203515 (A1) WO2017123681 (A1)

Abstract of CN108367497 (A)

Techniques are described for improving dimensional accuracy, and more specifically z-axis or vertical dimensional accuracy in generating a 3 dimensional (3D) object comprising a plurality of formablelayers. In one example, a height configuration parameter, (such as a selected layer height, a print resolution, one or more tolerance values for certain layers or portions of a 3D object to be printed, etc.,) and a total object height, may be obtained. A first height corresponding to a subset of the plurality of formable layers may be selected based on the received height configuration parameter and the total object height. In some aspects, the first height may include a

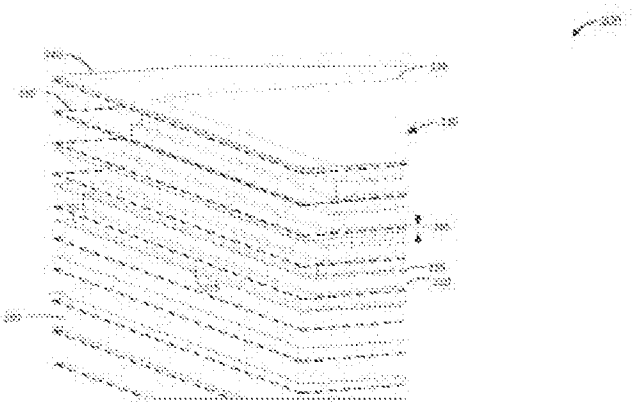


FIG. 2

global layer height for the 3D object. The first height may be selected to optimize accuracy of the height configuration parameter or the total object height.

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

DESCRIPTION CN108367497A

10 Print 3D objects using automatic dimensional accuracy compensation

[0001]

14 Technical field

[0002]

18 The present disclosure relates generally to three-dimensional (3D) printing or additive manufacturing, and more specifically to improving scale accuracy when creating 3D objects.

[0003]

23 background

[0004]

27 Creating 3D objects presents special challenges in terms of the complexity of modeling the 3D objects and the complexity of generating the 3D objects to accurately depict real-life objects.

29 Many 3D printers or additive manufacturing devices print or generate objects from a 3D model generated from a computer-aided design application, such as by slicing the model into thin horizontal layers and depositing material vertically layer by layer (e.g., melted plastic, clay, concrete, metal powder, food).

32 Layer height (thickness) is typically selected via a user interface (UI) control that allows either a direct fixed setting of the layer height (e.g., .25mm or 250 microns) or in a simpler general form with correlation to standard printer items Layer resolution associated with a predetermined layer height (e.g., fine, standard, coarse, etc.).

36 Layer height or layer resolution is closely linked to the trade-off between print speed versus vertical step resolution print quality. Contemporary slicing applications (slicing programs) generally fail to take into

account the impact of fixed layer height on the overall vertical scale accuracy of the printed object. Quantization in the form of fixed-height layer slices can result in a vertical (z-axis) scale error of +-50% for the selected layer height (e.g. .125mm for a .25mm layer height), larger than what can typically be achieved by a well-tuned 3D printer. The resulting typical x-y plane scale of 2 microns (0.002mm) is two orders of magnitude more accurate.

[0005]

46 As a result of blind selection of layer heights, 3D printed objects turn out to have vertical or z-axis features (including the top of the object) aligned with multiples of the desired layer height and with potentially large errors in the z-dimension of the printed object.

49 For example, printing a 1.12mm 3D object using 250 micron layers will result in an object that is actually 1mm tall, or a 12% error. This error occurs because the object would require 4.48 layers, but the slicing program rounds down to 4 layers. The effect of this error is not limited to the top of the object, but to all features of the object at different z-level heights. For example, consider printing a chair object where the step increments are not aligned with the layer height. This configuration results in errors at every step up to the upper surface of the object. Typically controlled by steppers or servo motors or other moving devices, 3D printer hardware is capable of much higher accuracy in the Z axis - in practice, typically in the range of 10 microns to less than 1 micron (100 steps/mm - 1600 steps/mm) resolution. This fine positioning control in the z-axis hardware results in the creation of objects with z-scale accuracy in the range of 1-10 microns (0.1% to 1% error). Accordingly, improvements to the 3D printing process can be made.

[0006]

62 Overview

[0007]

66 Illustrative examples of the present disclosure include, but are not limited to, methods, systems, and various devices.

68 In one aspect, scale accuracy may be improved when generating three-dimensional (3D) objects that include multiple formable layers.

70 Receives at least one height configuration parameter and the total object height. A first height corresponding to at least a subset of the plurality of formable layers is selected based on the received at least one height configuration parameter and the total object height. The first height may be selected to optimize accuracy of at least one of the at least one height configuration parameter or the total object height. The first height can be passed to a 3D printer to generate a 3D object.

[0008]

78 Other features of the system and methods are described below.

79 Features, functions, and advantages may be implemented independently in each example, or may be combined

in yet other examples, and further details of the features, functions, and advantages may be seen with reference to the following description and drawings.

[0009]

85 Brief description of the drawings

[0010]

89 Various embodiments of the present disclosure will be described more fully hereinafter with reference to the accompanying drawings, in which:

[0011]

94 Figure 1 depicts an example of a computing device in communication with a 3D printer capable of printing three-dimensional (3D) objects.

[0012]

99 Figure 2 depicts an example perspective view of a 3D object split into a set of 2 layers, each layer having a different thickness or layer height.

[0013]

104 Figure 3 depicts an example process for segmenting an object into layers via a slicing program associated with a 3D printer.

[0014]

109 Figure 4 depicts an operational procedure for selecting layer heights for at least a subset of a plurality of layers forming a 3D object.

[0015]

114 Figure 5 depicts an example of a more detailed operational procedure for selecting a global layer height and a localized layer height for at least a layer subset of a 3D object.

[0016]

119 Figure 6 depicts another example of a detailed operational procedure for selecting a layer height of at least a layer subset of a 3D object.

[0017]

124 Figure 7 depicts an example process for segmenting an object into layers by a slicing program associated with a 3D printer in accordance with the operating procedures of Figures 4 and/or 6.

[0018]

129 Figure 8 depicts an example process for segmenting an object into layers by a slicing program associated with a 3D printer according to the operating procedures of Figures 4, 5 or 6.

[0019]

134 Figures 9A and 9B depict example perspective views of a 3D object with certain z-axis features positioned between layers of the 3D object.

[0020]

139 Figure 10 is an example general computing environment in which techniques described herein may be implemented.

[0021]

144 Detailed description of illustrative embodiments

[0022]

148 At least for the purposes of this specification, the terms and phrases selected herein may have the following meanings:

[0023]

153 a) Bed Leveling: Refers to the 3D printer calibration process that measures the height of the print nozzle (hot end) relative to the surface on which the printed object will be made (also known as the print surface, print bed, build plate).

156 The calibration process may include moving the printhead across the print bed and stopping at multiple locations to measure the clearance between the nozzle and the surface.

158 Calibration measurements may be used by the printer controller to adjust the z-axis height during printing, or may be used by the slicing program to adjust the layer height of one or more layers where it is necessary to compensate the printer at the point being measured. Changes in nozzle-surface clearance.

[0024]

164 b) Feature: refers to any area or aspect of the 3D model in which the scale tolerance of the printed object is important.

[0025]

169 c) Local features: refers to 3D model features such as vertical slopes or sloping surfaces, or high/low points that have a higher/lower height than nearby surrounding surfaces but always lower than the total height of the 3D model (also known as maxima) /minimum) of those surfaces.

[0026]

175 d) Layer: A single incremental z-axis fixed-height plane horizontal slice of the 3D model through which the 3D printer is guided to deposit material on the platform or forwardly deposited layer of material.

[0027]

180 e) Slice: refers to a single (usually vertical) section layer of a 3D object model.

[0028]

184 f) Slicing program: a software program that converts a 3D object model into a collection of sliced layers of one or more layer heights.

186 The sliced layers may be viewed graphically on a display or converted into tool path commands used to instruct the 3D printer to create a physical representation of the 3D object model.

188 Slicing program functionality may be implemented entirely or partially on a mobile or other personal computing device, on computing components within a 3D printer, or locally or remotely that may include physical or virtualized computing resources (e.g., data center servers, virtual machines) executed on the computing environment.

[0029]

195 g) Global layer height: refers to the layer height defined by the print quality selection (e.g., coarse, normal, fine), which is adjusted as needed to produce precise and in some cases the most accurate overall results in the 3D printed object. Height scale, as specified by the corresponding model data.

[0030]

201 h) Optimal layer height: refers to the layer height that is such that when combining multiple parameters such as, for example, tolerances for multiple object model height characteristics, minimum resolution capabilities of 3D conductor rows, or local layer height characteristics (proximity to other layer height features), the printed 3D object height features have exactly the same scale as the model or as close to the scale as can be achieved.

[0031]

i) Height configuration parameter: Specifies the height aspect (z-axis scale) of the 3D model or object.

For example, this could be, but is not limited to, nominal story height, overall height, local feature height, height tolerance, z-axis height tolerance for vertical slopes or curved surfaces, etc.

[0032]

j) Total height: refers to the distance from the lowest surface of the 3D model to the highest surface or highest point (ie, the total z-axis scale).

[0033]

This article describes systems and techniques for selecting layer heights to generate 3D objects to improve the scale accuracy of the generated 3D objects.

In this aspect, the layer height may be determined based on the total height (z-axis scale) of the 3D object model to be generated using a 3D printer or other additive manufacturing technology and at least one height configuration parameter that may be obtained or received.

The layer heights selected for at least a subset of the plurality of formable material layers to be printed to form the 3D object may be determined based on the total object height and at least one height configuration parameter.

The layer height may be selected to maximize the accuracy of at least one of the total height of the 3D object or one or more local/global maximum height features or other configuration parameters of the 3D object model.

In some aspects, for example, based on design considerations or user choices/preferences, optimal layer heights may be calculated and printed using nominal or current layer heights to achieve the next local/global maximum height feature of the 3D object model or to achieve the total object height. The required remaining layers are selected with associated errors.

In some aspects, when selecting an optimal layer height, the error associated with the total object height is compared to the error associated with using the nominal or current layer height to print the remaining layers to achieve the next local maximum height characteristic of the 3D object model. Errors may be weighted more heavily, vice versa, or in any proportion (e.g., based on user preference, etc.).

In some aspects, the calculated positive error in printing the remaining layers to reach the next local/global maximum height characteristic of the 3D object model or to reach the total object height can result in a selection due to a slightly higher print resolution than the user selected. The layer height is slightly smaller than the slice layer height, while the negative error of selecting a slightly higher layer height can be attributed to the slightly lower print resolution and not being selected.

[0034]

In some cases, height configuration parameters that may be obtained or received may include print resolution (e.g., slice layer height), such as a selection of fine, standard, or coarse print modes (similar to inkjet or other

such printers).), user-selected layer height value (e.g., 250 microns), selection of the total height of the 3D object (with corresponding tolerances or required accuracy), local/global maximum/minimum height characteristics of the 3D object (with corresponding tolerances) or required accuracy), one or more layer height variance constraints (e.g., to preserve uniform ridges on vertical walls or side walls of a 3D object by not changing the layer height too much), etc.

[0035]

256 In some cases, a single level height value can be selected as the global level height.

257 In this scenario, the global layer height can be chosen so that the total object height is as close as possible to an even multiple of the layer height.

259 In some aspects, the total number of layers may also be chosen in conjunction with the global layer height to be equal to or optimally close to the total object height.

261 Global layer height.

262 May also be selected to maximize the accuracy of at least one height configuration parameter (such as print resolution, user-selected layer height value), or to meet tolerance values, or to maximize the accuracy of one or more local maxima/minimum height characteristics. Error minimization.

265 It should be appreciated that several different techniques may be used to determine global or other layer height values, including the weighting schemes described above, machine learning techniques, and the like.

[0036]

270 In some aspects, the described techniques may also include local optimization of layer heights (eg, dynamic adjustment of layer heights) corresponding to subsets of multiple layers that form local maximum/minimum height characteristics of the 3D object.

273 In some cases, selection of layer heights corresponding to a subset of layers may be performed in a similar manner as described above for global layer heights.

275 In some cases, the total height or z-dimension of the layer subset may be considered the total object height.

276 In some aspects, the localized error can be weighted less heavily than the global error, such that for selecting one or more layer heights, the total object height/total height of the layer subset is more accurate than the local z-scale accuracy. Important factor.

279 In other cases, acceptable error bounds may be configured or selected individually.

[0037]

283 In some aspects, a 3D printing software application (generally referred to as a slicer or 3D printing driver) (which may execute on a computing device) may perform the above for selecting one or more layer heights of a 3D object to be printed or generated. Technology.

286 Any of, for example, several input devices of the computing device may be used to obtain the total object height and height configuration parameters.

288 In some cases, the slicer or other device or application may determine the total object height and/or based on a model of the 3D object to be printed (e.g., from a computer-aided design (CAD) package, image data from

a 3D scanner, etc.) One or more height configuration parameters (e.g., identifying z-axis features) so that scale accuracy optimization can be performed dynamically.

[0038]

295 In some cases, the layer height associated with the first layer height may be selected individually, such as selected to be greater than the global or other layer height associated with the 3D object, to ensure that the bottom layer adheres to the print bed during printing.

298 It should be appreciated that any of several individual 3D object height feature layers, or a subset of 3D object height feature layers, may be configured separately via a similar process that will be described in more detail below.

[0039]

304 It will be appreciated that the techniques described can be applied to a variety of 3D object generation techniques implementing fixed layer approaches, such as extrusion techniques including fused deposition modeling (FDM), fused filament fabrication (FFF), direct ink writing (DIW), or other additive manufacturing technologies using slicing or layering methods, such as Vat Photopolymerisation, material jetting, binder jetting, powder bed fusion, directed energy deposition, etc.

[0040]

312 FIG. 1 illustrates an example system 100 including a computing device 110 in communication with a 3D printer 105 that can be configured to print a three-dimensional (3D) object 130.

314 Computing device 110 may include any of a laptop, desktop or personal computer (PC), a mobile device (such as a smartphone, tablet, etc.), a networked device, a cloud computing resource, or a combination thereof.

317 Computing device 110 may communicate with 3D printer 105 via a wired connection or any of various wireless connections 115 known to those skilled in the art.

319 3D printer 105 may have or be associated with any of a variety of transceivers, modems, NICs, etc. (typically associated with printer controller 117) to communicate with computing device 110 via wired and/or wireless connections 115.

322 Generally speaking, computing device 110 may execute or access (via a network or via the cloud) one that obtains 3D object data and converts the data into instructions (eg, G-code) executable by printer controller 117 that controls 3D printer 105 or multiple software programs or applications to enable the 3D printer 105 to form the 3D object 130 by extruding material in multiple (eg, separately) configurable layers 135 onto the substrate 125.

327 For purposes of reference and as used throughout this document, a software application (which in some cases may include CAD components, CAM components, 3D image capture and conversion functionality, etc.) may be referred to as a slicer or driver 165.

330 In most cases, slicer 165 will be associated with computing device 110.

331 However, it is contemplated herein that slicing program 165 may be associated in whole or in part with a

separate 3D printer 105, which may, but need not, be a function of or within printer controller 117 without departing from the scope of the technology described herein. .

[0041]

337 The 3D printer 105 may include one or more extruder assemblies 120 positioned on an object substrate or bed 125.

339 The extruder assembly 120 may be moved in at least the vertical direction (z-axis) by a movement device 175, which may include one or more steppers or servo motors, as is generally known in the art.

341 The movement device 175 may also move the extruder assembly 120 in a horizontal plane (x or y axis), such as along the upper plate 170 relative to the base 125.

343 Other 3D printer 105 designs fix the extruder 120 in the z-axis and allow it to move in the x- and y-axes when the bed 123 is moved in the z-axis. Still other designs move the extruder 120 in the z- and x-axes while simultaneously moving the bed 125 in the y-axis. Still other designs operate using a polar coordinate system to move the extruder 120 on a stationary bed 125. The techniques described herein are applicable to these and other variations of 3D printer configurations such as DeltaParallel Kinematic (incremental parallel kinematic) printers. In some aspects, the extruder assembly 120 may include or house one or more filaments 150, such as spooled/stored in a spool 145. In other cases, filament 150 may be stored or contained in other parts of 3D printer 105 or completely external to 3D printer 105. The extruder assembly 120 may also include opposing rollers 155 that drive the filament 150 into the heated nozzle 160 at a designated rate, whereby the filament is melted and extruded into the most recently deposited of the layers 135 previously deposited onto the substrate 125 superior. Extruder assembly 120 may include means, such as one or more motors, other drive mechanisms, etc., for controlling the rate at which filament 150 is fed into and extruded from heated nozzle 160 by roller 155 to control the layers. 135 in height of each floor.

[0042]

359 In accordance with the techniques described herein, the extruder assembly 120 may be controlled to extrude a filament at a specified rate to deposit one or more layers of material 135 having a specific layer thickness or having a specific z-dimension.

362 In one aspect, the height of one or more of the layers 135 may be determined, such as based on the total height 140 of the 3D object 130 to be printed. In some aspects, the height of one or more of layers 135 may be determined based on at least one layer height configuration parameter, such as print resolution, a selected or default layer height, hardware limitations of the 3D printer (e.g., the highest possible z-axis resolution, or step size thereof), or various tolerance values or error requirements corresponding to one or more layers 135 (eg, maximum error values), etc. In some cases, tolerance values for certain local object maximum height characteristics or all 3D object height characteristics of the 3D object can be selected and can be based on calculations on the localized feature maximum/minimum height, global layer height, or total 3D object height. The error obtained is used to automatically select the layer height. In some aspects, slicing program 165 may determine or select one or more layer heights for printing 3D object 130. In still other cases, computing device 110 and/or slicer 165 may provide a user interface for enabling a user to manually configure or set one or more parameters for generating 3D object 130.

[0043]

377 Figure 2 illustrates an example diagram of a 3D object (such as 3D object 130 of Figure 1) that is split into 2 sets of layers, each layer having a different thickness or layer height.

379 The 3D object 130 may include a first or bottom portion 210 that includes a plurality of layers and has an upwardly facing surface 215. The 3D object 130 may also include several steps 220 stacked on top of the bottom portion 210, each step having a nearly uniform thickness and an upwardly facing surface 225. 3D object 130 may be further defined by top surface 230.

[0044]

386 3D object 130 may be printed, for example, by 3D printer 105 according to several different configurations, including different global layer heights, as represented by dashed lines 235 and dashed lines 240.

388 The layer height 235 is chosen based on the optimization described in this article for z-axis dimensional accuracy, while the layer height 240 may represent a universal or default layer height. The layer height 235 is smaller than the layer height 240 and is more aligned with the upward facing surfaces 215, 225, resulting in less z-axis error (as illustrated by the distance mark 245).

[0045]

395 In some cases, layer height 240 may be selected to most closely approximate z-axis features of 3D object 130.

396 In the illustrated example, the story height 240 still results in some error in the z-axis (every other step 220 is omitted). This may be due to print resolution limitations, such as coarse or standard modes that specify a minimum layer height (eg, greater than each of steps 220). In other cases, other layer heights may be selected to generate a best-fitting 3D object that more accurately aligns with the data defining the 3D object. In some cases, higher resolutions can result in longer print times, while lower resolutions can result in faster print times. In some aspects, the maximum print time may be selected, such as by user selection, to limit or otherwise constrain the maximum print resolution used.

[0046]

406 Figure 3 depicts an example process 300 for segmenting a 3D object 305 into layers for 3D printing or 3D generation.

408 At operation 310, a layer height may be selected (eg, a default layer height) for printing the 3D object 305 without adjusting the z-size characteristics of the 3D object 305. Operation 310 may result in slicing object 305 into layers having thickness 315. At operation 330, sliced object 305 is then printed. Thickness 315 may not be a multiple of total object height 320, and therefore may result in an error in the total object height at 325d. Level height 315 may also not align with other stepped portions of 3D object 305 (eg, portions 325a, 325c, and 325f), and/or may result in considerable errors in sloped portions of 3D object 305 (eg, 325b and 325e).

[0047]

418 4 illustrates an example operational procedure 400 for selecting layer heights for at least a subset of a plurality of layers to form a 3D object and improve z-dimensional accuracy.

420 In some examples, procedure 400 may be performed by slicer 165, computing device 110, 3D printer 105, or a combination thereof. Procedure 400 may begin at operation 402, where at least one height configuration parameter or total object height may be obtained. In some cases, operation 402 may include receiving the at least one height configuration parameter or the total object height as a selection or input event via a user interface operating in conjunction with slicer 165 (eg, provided via computing device 110). In some cases, one or more of the height configuration parameters or the total object height may be obtained or determined based on 3D object data (eg, associated with a 3D model of the object to be printed). In some aspects, the 3D object data may be accessed from a CAD or other modeling application or program, or obtained from a 3D scanner or associated application, or from other locations or applications.

[0048]

432 In some aspects, 3D object models may have localized height features that may need to be printed with specified accuracy or size tolerances.

434 For example, when a portion of the 3D object model data is selected (e.g., via CAD software or a user interface associated with slicing program 165, etc.), a higher or specified tolerance (i.e., error margin) may be assigned that must be met), so that the 3D object data is to be sent to the 3D printer and actually printed. Selecting a portion of the 3D object data may include identifying one or more z-axis features of the 3D object data, such as by a graphic. In some cases, accuracy requirements or tolerances may be automatically assigned to certain height values/layers of the 3D object model and specified in the height configuration parameters. In some aspects, the user interface may provide a visual representation including a specific height of 3D objects that will form various layers, such as in a preview or print preview format or screen. This can make it easier and more efficient for designers to optimize the layer heights for printing 3D objects when, for example, not all tolerance requirements for a particular layer can be met in one print, or in other situations, such as with fully custom printing and identify specific locations associated with different accuracy requirements.

[0049]

448 When a user selects a 3D model and prepares to print the modeled object on a 3D printer, a user interface (UI) may be presented to the user to select various options that affect the quality of the printed object, the quality of the object it will print. speed, and other user-selectable related parameters.

451 The UI may be incorporated into slicer 165, the printing application that is executed when a print command is issued from an application executing on computing device 110 (e.g., clicking a print button), or otherwise (e.g., a cloud service) at the actual layer of execution before high calculation and model slicing capabilities. In one embodiment, a feature may be provided that allows a user to activate 3D printing functionality from a 3D computer-aided design/modeling (CAD) application. This feature may include presenting a menu of 3D printer or vending machine services for the user to select. Upon user selection, the feature may present a UI that presents the user with resolution and other configuration parameter settings (eg, coarse mode, standard

mode, fine mode, with/without raft, support) for selection. Because the UI is activated directly from the CAD application, the UI can have direct and easy access to data related to the 3D model for generating parameter options for selection by the user.

[0050]

464 The UI can process data from the 3D model associated with the print request action, present configuration options for selection by the user, or provide default parameter values based on simple calculations and other parameters related to the characteristics of the 3D model that can be used by the slicing program 165 is used to determine the optimal layer height for slicing the model into preparation for printing corresponding objects.

469 The UI application may receive data describing a 3D model from which it may extract, determine, and identify (e.g., graphically for the user) not only the total 3D modeled object height, but also the fixed layer heights selected for modeling the entire model. Other features of interest may suffer from loss of dimensional accuracy in the case of slicing. For example, the UI may present a graphical representation of the model in which features of interest are identified via markers, colors, circles, highlighting, or other means of identifying features to the user. Selecting a feature (e.g., via user click, finger or stylus touch) may result in a presentation showing the feature's modeled size value and the size of the feature when used with the selected resolution setting (e.g., coarse, standard, fine, user-defined) An option box that associates layer heights with slicing cases and enables the user to specify the maximum dimensional error for selected features. Additionally or alternatively, the UI may present graphical objects that the user can use to scale the model to the various dimensions required to adjust the printed object, and in addition to illustrating the modeled dimensions and resulting errors at the current fixed resolution setting. Present information about features of interest in lists or other collections of UI factors. The UI may present the calculated time to print the object given the current configuration parameter option settings and for the changed settings. In this way, the user can evaluate the trade-offs between the choice of resolution settings, choice of error tolerance, etc., and the time required to print the object. The UI may enable the user to control the dimensional accuracy of selected 3D model features on demand to meet accuracy requirements for printing the object in a minimum amount of time. In some cases, height configuration parameters may include print resolution (such as a selection of fine, standard, or coarse print modes (similar to inkjet or other such printers)), a selection from different print resolution schemes, one or more selected layer height values (e.g., 250 microns for some layers and 150 microns for other layers), one or more selections of subsets of layers with corresponding tolerances or required accuracy, one or more a tolerance or accuracy requirement, a maximum print time or minimum print speed, one or more layer height variance constraints (e.g., to preserve ridges on vertical walls or side walls of a 3D object by not changing the layer height too much), etc. wait.

[0051]

496 In one example, a "Click to Fit" feature may be included in the 3D modeling UI, in a print preview screen or 3D print dialog window, etc., which enables selection of one or more specific points on the z-axis. features to maximize accuracy.

499 The "click fit" feature may be implemented by drawing a region (eg, a box) around one or more z-axis features

or other graphical selection actions by selecting a location on a 3D model of the 3D object to be printed or rendered via the cursor. This feature can optimize error or tolerance calculations to provide solutions to otherwise unsolvable constraints on 3D objects (e.g., by prioritizing which tolerances are most important/which are less important). In one aspect, upon receiving a selection of a plane, instructions may be sent to the slicing program to optimize the fit for that particular z-axis value or height.

[0052]

508 Procedure 400 may continue at operation 404, where layer heights for at least a subset of the plurality of layers may be selected based on the total object height and the one or more height configuration parameters.

510 In some aspects, the global layer height may be determined based on the one or more height configuration parameters such that it is optimized to best fit some or all z-axis (ie, height) characteristics of the 3D object. More details of operation 404 are described below with reference to Figures 5, 6, and 8.

[0053]

516 Next, in some aspects, at operation 406, the slicer may generate a list of tool path commands based on the selected or determined layer height and object model data.

518 The toolpath command list is typically generated in the form of G-code instructing the 3D printer in terms of motion, material temperature and extrusion rate, print bed size, etc., and the 3D printer 105 based on the determined layer height and object model data. Print or any other instructions needed to generate the entire 3D object. The toolpath command list is typically stored in a file (eg, on a computing device or on a removable storage medium (eg, SD card)) or transferred directly to a printer to print the 3D object 408 according to the generated toolpath commands. Generating toolpath files is not limited to using G-code, but can use any various formats or codes optimized for 3D printers.

[0054]

528 Figure 5 illustrates an example of a more detailed operational procedure 500 for selecting a global layer height and a localized layer height for at least a layer subset of a 3D object.

530 Like procedure 400, procedure 500 can be performed by slicer 165, computing device 110, 3D printer 105, or a combination thereof. Procedure 500 may share some operations with procedure 400; for the sake of brevity, repeated operations will not be described again here.

[0055]

536 The procedure 500 may begin at operation 502, where height configuration parameters including a selection of a 3D printing resolution and/or a specified layer height may be received, such as via a user interface associated with or provided by the slicing program 165.

539 Configuration parameters or specifications for the 3D printer 105 may be received 502, such as by querying the 3D printer 105 for hardware specifications, via the slicer 165, a driver associated with the 3D printer 105, or including, for example, in an XML or other type of file. In other ways, information may be obtained that

indicates the minimum z-axis or height increment that the 3D printer 105 is capable of (i.e., minimum printer resolution capability, such as 0.625 microns). Such profiles associated with a particular 3D printer may contain nominal print resolution (i.e., nominal layer height) settings for coarse, standard, and fine modes specified along with other capabilities (e.g., automatic calibration), or may be based on a specific 3D printer capabilities determine operating parameter settings to produce optimal print quality and speed associated with default or user-selected modes. Next, in operation 504, the total object height of the 3D object to be printed may be obtained. The total object height may be derived or obtained from the 3D object data, or may be received via the user interface.

[0056]

553 Next, at operation 404a (which may include further details of operation 404 of Figure 4) the global layer height may be determined.

555 Operation 404a may first include, at operation 506, based on one or more configuration parameters received at operation 502, such as the minimum z-axis increment that the 3D printer 105 is capable of, the selected 3D printing resolution, and at 504 The total object height obtained) determines the optimal global layer height. Ideally, the total height of the 3D object model will be evenly divisible by the determined optimal global layer height. If the determined optimal global layer height cannot be uniformly divided by the minimum height resolution of the 3D printer 105, then the layer height that is higher or lower than the optimal global layer height and can be uniformly divided by the minimum height resolution of the 3D printer 105 The closest global layer height value can be a candidate for the global layer height.

[0057]

566 Determining to use a global layer height higher or lower than the optimal global layer height can be based on the overall height accuracy/tolerance requirements of the 3D object model, or simply based on which will result in the printed object having the closest (higher or higher) The total height below the total height of the 3D model.

[0058]

573 In some cases, if the received height configuration parameters 502 indicate the presence of one or more local height features in the 3D model that have tolerance or accuracy requirements, operation 508 may be performed to determine whose layer heights may be changed to achieve that A subset of layers with tolerance or accuracy requirements.

577 Ideally, variations in layer height determined within this subset of layers (eg, less than +/-10% of the total layer height) will be unnoticeable in the appearance of the outer surface of the resulting object printed from the 3D model.

580 For example, if its accuracy requires a local feature whose high point terminates at a point in the middle (i.e., at 50%) of the global layer height slice, the height of the layer subset may be adjusted linearly or nonlinearly at operation 510 to Make the local height feature reach as close as possible to the top of a layer in this subset of layers. Linear square wave layer height adjustment can be achieved by selecting a subset of ten layers (five

layers above the feature and five layers below the feature), where the first five layers have a height 10% less than the global layer height and the second five The layer has a height that is 10% greater than the global layer height. One non-linear layer height adjustment that can achieve the same size results as a linear adjustment but with less noticeable visual impact could be a sine wave approximation. In this case, each layer height of the subset of layers can be reduced at an incremental rate until an inflection point is reached, and at an incremental rate until a minimum layer height occurs, with its surface layer at a height that matches the local feature. A roughly sinusoidal approximation is applied to the layer height changes to achieve a subset of ten layers of local feature heights in the current example that can include coherent changes to the global layer height value in the following sequence: {-6%, -11%, -16% ,-11%,-6%,+6%,+11%,+16%,+11%,+6%}.

[0059]

596 Table 1 shows a comparison of accumulated object heights, 1) a subset without adjusted layers, 2) a subset with 10 layers adjusted using a linear layer height adjustment scheme, and 3) a subset using nonlinear (e.g., roughly sinusoidal Approximation) layer height adjustment scheme to adjust a subset of 10 layers to meet the local feature height dimensions at sublayer 5 at 50% of the global layer height of that layer.

600 The layer height values shown are in millimeters and the cumulative height is relative to the surface below the ten layers listed. Layer 5 in both the linear and non-linear subset layer adjustment columns is exactly 50% lower than where the printed object surface would be with each subset layer adjustment, and is exactly where the local height feature target is Height dimensions. After layer 5, the subset layer height feature profile compensates for the total global height resolution reduction from the first five height-adjusted subset layers by adjusting the heights of the last five subset layers, where by layer 10 this compensation has been The subset level height reduction is fully corrected and will be at the same accumulated level height that it would have been if the local height characteristics were maintained, and the global level height will be used starting at the next level.

[0061]

612 It should be appreciated that there are many ways to determine a layer subset and adjust the layer height of that layer subset, all of which will not be explicitly described herein.

614 However, most, if not all, of the calculations used to determine the number of subset layers and their heights may take into account other local features with a high degree of tolerance/accuracy that may be located within the selected subset of layers, and in some cases, Compensates for the impact of collective subset layers with different heights on the overall object height.

[0062]

621 Next, in some aspects, at operation 512, the slicing program may generate a list of tool path commands based on the selected or determined global layer height, local subset layer height (if any), and 3D object model data.

623 The toolpath command list is typically generated in the form of G-code instructing the 3D printer in terms of motion, material temperature and extrusion rate, print bed size, etc., and the 3D printer 105 based on the determined layer height and object model data. Print or any other instructions needed to generate the entire

3D object.

627 The toolpath command list is typically stored in a file (eg, on a computing device or on a removable storage medium (eg, SD card)) or may be transferred directly to a printer to print the 3D object 514 according to the generated toolpath commands. Generating toolpath files is not limited to using G-code, but can use any various formats or codes optimized for 3D printers.

[0063]

634 In other aspects, at operation 512, the optimal layer height may be determined in a software module or program, which may be used as a 3D modeling CAD application on the computing device 110, in the computing device, in the 3D printer 105, locally. or part of or associated with a 3D printer driver in a remote computing environment, or a combination thereof.

638 As an alternative to or in addition to generating a list of tool path commands, the software module or program may generate a list of optimal layer heights for slicing the object and send the list to a file stored on the storage device or directly to 3D at operation 514 Printer 105 where the resident slicer 165 module associated with the 3D model printer will slice the model based on the list.

[0064]

645 FIG. 6 illustrates another example of a detailed operational procedure 600 for selecting a layer height of at least a layer subset of a 3D object.

647 In some aspects, procedure 600 may correspond to operations 508-510 described above with reference to FIG. 5. In some examples, procedure 600 may be performed by slicer 165, computing device 110, 3D printer 105, or a combination thereof.

[0065]

653 The procedure 600 may begin at operation 602 after determining the global layer height at operation 506 described above with reference to FIG. 5.

655 Operation 602 may include determining whether local height feature data for the 3D model is available. If no local altitude characteristic data is included in the received altitude configuration parameter data, the procedure 600 may end and continue to operation 512. However, if local height characterization data is available for the 3D model, the process 600 may continue to operation 604 where the received height configuration parameter data may be analyzed to determine the local height characterization of the 3D model, along with specified size tolerances or any associated data with error limits. Next, at operation 606, the layer in the 3D model in which the closest local height feature exists may be determined, such as relative to the current layer being modeled. In some aspects, operation 606 may include determining from lowest to highest which global layer above the current layer being evaluated has the closest local height feature.

[0066]

667 The process 600 may then proceed to operation 608 where the portion of the global layer in which the local

height feature peaks is located.

669 For example, the number of layers from the base of the 3D object pattern to the local height feature can be determined by dividing the height of the base feature by the determined global layer height, where any non-zero remainder indicates where the local height feature is highest That part of the global layer height of the point. Next, at operation 610, the number of layer subsets whose heights can be adjusted to meet dimensional accuracy (tolerance) requirements, if dimensional accuracy requirements are specified for that height characteristic, may be determined. This determination may be based on at least the determined global layer height, the portion of the global layer height in which the local height feature reaches its highest point, and the minimum z-axis height resolution supported by the target 3D printer 105, user selection, etc. One can achieve it.

[0067]

681 Next, at operation 612, any of several approximation algorithms may be applied to adjust the determined number of layers from operation 610.

683 For example, if that portion of the local height feature culminates at half the determined global story height of 0.25 mm, as shown in Table 1, then use a linear square wave comparison to make the subset story height for five stories A 10% reduction (i.e. 0.225mm) would be exactly equal to the dimensional height of the local feature on top of layer 5. The 0.225mm subset layer height works well for 3D printers with a minimum height resolution of 1 micron (0.001mm), but it may not be evenly divisible by the minimum height resolution of other 3D printers (e.g., 0.010mm). In such cases, the number of subset layers, subset layer heights, other types of adjustment profiles (non-linear), and associated feature height tolerances may be considered/adjusted algorithmically to determine what will result in The optimal layer height of the local feature peak within its associated tolerance.

[0068]

695 An additional consideration used in determining subset story height adjustments is the visual impact associated with the incremental difference in height between adjacent stories.

697 In some aspects, at operation 614, the adjusted layer heights of the layer subset may be modified based on the maximum adjacent layer height change value. For example, a 10% change in the height of adjacent layers can affect the visual quality of some models while being inconsequential to others. Referring to the example depicted in Table 1, layer 6 is 20% higher than layer 5 for the linear adjustment scheme and 12% higher than layer 5 for the sinusoidal approximation scheme. Both of these adjustments can accommodate the 10% adjacent story height variation limit requirement by simply slicing the global story height of level 6 and offsetting the story heights shown for levels 6-10 to levels 7-11. Accordingly, the maximum variation in adjacent story heights may be user-adjustable through configuration settings. Some curve fitting algorithms are well suited to solving the problem of determining subset layer heights and numbers (given various potentially determined global layer heights, local feature heights, printer resolutions) and completing visual effects setups.

[0069]

711 Next, at operation 616, it may be determined whether the resulting layer height adjustment for the subset of layers meets a specified tolerance.

713 If so, the process 600 may proceed to operation 622 where it may be determined whether any more local height features are present. If the 3D model data includes more local more adjustments, the process 600 can go back to operation 606 and continue looping through operation 622 until there are no more local height features in the 3D model data, at which time the process 600 can go to Operation 512. If the tolerance has not been satisfied, the procedure 600 may proceed to operation 620 where at least one of a different number of layers or different approximation algorithms in this subset of layers may be implemented, and 610 - 616 may be repeated until satisfactory The layer height adjustment or configuration has been determined. In some aspects, if one or more local feature heights cannot be produced using local feature adjustments, the global layer height of the 3D model may be adjusted at operation 618.

[0070]

725 In some aspects, if the global layer height that will produce a printed object that satisfies the specified tolerance of the total object height cannot be determined as described at operation 506, a layer height adjustment in the subset of layers may be applied to the global height to produce the The printed object closest to meeting the specified tolerance of the total object height.

729 One way to create a global layer height adjustment that brings the total object height within a specified tolerance is to divide the total object height error that would otherwise result from using the determined global layer height by the minimum printer height resolution. For example, if using the determined global layer height with a resulting error of +28 microns would produce an object with a total object height tolerance of +0/-50 microns, and the 3D printer minimum height resolution is 10 microns, then by By reducing the height of one layer by 30 microns or by reducing the layer height of all 3 layers by 10 microns, it is possible to print a total object height with a -2 micron error (well within its specified tolerance). These layer height adjustments may preferably be made at layers near the top of the object to avoid grouping the local height feature subset layer height adjustment calculations, but may be made individually or together as layer subsets and positioned in the model slice stack any location.

[0071]

742 It should be appreciated that procedure 600 is given as an example only.

743 It is contemplated herein that different error values associated with multiple subsets of layers (including individual layers) may be used to select one or more different layer heights as desired, e.g. to accommodate all aspects of a 3D object in view of user preferences/height configuration parameters. constraint. In one example, if the procedure 600 is unsuccessful in selecting a single layer height for a layer subset, such as due to higher constraints imposed on error bounds, the layer subset may be split into two different subsets. , and each subset of the layer heights may then be tested, each in accordance with individual executions of procedure 600. If an independent solution is available, the error requirement can instead be met using a combination of these two subsets (with different layer heights for each value). If two subsets do not meet the error requirements, the main subset can be divided into 3 or 4 subsets, and so on. In some cases, the amount

Petitioner Exhibit 1002-2849

of subsetting allowed to occur may be limited by another height configuration parameter such as layer height variance, e.g. implemented to produce printed 3D objects that are more uniform across the z-dimension (e.g. to reduce the impact on the 3D object). Constraints for different layering effects visible on the exterior and vertical or partially vertical surfaces)).

[0072]

759 An example of procedures 500 and 600 is described below.

760 In one example, an object with a total object height of 1.1 mm may be selected for 3D printing (e.g., operation 504) with a user-specified standard mode layer height of 250 microns (.25 mm) (e.g., received from operation 502). At operation 506, the 3D printer driver application in the computing device 110 may receive the 10 micron (0.01 mm) 3D printer minimum resolution capability and calculate the total object height by dividing the total object height of 1100 micron by the 10 micron printer resolution. The height of 1.1 mm (1100 microns) is an even multiple of the minimum height resolution of this 3D printer. This results in uniform 110 layers of 0.01 mm (10 micron) height that will print the 1.1 mm object with zero total object height error. Printing 110 layers (each layer is 0.01 mm high) can take a significant amount of time to complete. However, dividing the 1.1 mm total object height by the selected layer height of 250 microns results in 4.4 layers - not a uniform multiple of layers, so an adjustment to the selected global layer height is warranted.

[0073]

774 Any adjustment to the global layer height that is a uniform multiple of the minimum printer resolution can be used to produce an object with an overall height that is error-free.

776 An iterative technique for determining the global layer height closest to the selected layer height of 250 microns is to coherently divide the total object height (1100 microns) by the selected layer height (250 microns) plus or minus the printer's minimum height resolution (10 microns), up to higher is an integer layer. For example, dividing 1100 by 240 microns gives 4.58333 layers; dividing by 230 microns gives 4.7826 layers; dividing by 220 microns gives exactly 5 layers. In this example, the technique determines that a global layer height of 220 microns (equal to 88% of the selected value) is closest to the selected layer height and will result in an error-free print with its total height as specified in the associated 3D model object. Similarly, for a 3D model with a total object height of 1.05 mm and a tolerance of +0/-30 microns, following the same technique used for adjusting layer heights with Fine mode selected (0.200 mm), it can be determined that the model can Sliced using a global layer height adjusted to 210 microns (5% higher than selected) to reproduce the total height of the object using 5 layers without finishing.

[0074]

790 A technique for determining the global layer height of a 3D model with a total object height and tolerance to be printed on a printer that has resolution capabilities that may not be evenly divided by the total object height value can divide each global layer into One or more layer subsets that can use linear or curve-fitting adjustments to the subset layer heights to achieve optimal object height accuracy.

794 This technique is similar to the technique for adjusting and compensating layer heights to accurately reproduce local height features discussed with reference to Table 1, except that layer height adjustments for accurately reproducing total object height may not require the compensation of local height features required by the technique. Floor height changes.

[0075]

801 In the example described above, positive user preference errors or errors associated with one or more height configuration parameters may take precedence over negative user preference errors.

803 This may be accomplished by weighting the total object height or print error using a factor It should be understood that other weighting or selection schemes or algorithms are contemplated herein. For example, in one aspect, machine learning techniques may be employed to track user selections (e.g., associated with a single user, tracked via login information, a single 3D printer, or multiple users and/or 3D printers) and 3D printing projects revision. User selections can be aggregated over time to modify default settings that can be automatically entered by slicer 165. In some instances, machine learning can be used, at least in part, to modify the bias applied to the selection algorithm such that certain error ranges are acceptable for a particular user or a particular 3D printer, but not for other users or printers of. In this scenario, factors X and Y may be selected or modified based on tracked and aggregated user preferences/selections.

[0076]

815 In some cases, collected data associated with user selections (such as the "click fit" UI feature described above) can be used as training data for the machine learning process.

817 In one example, each time the user selects "Fit this" or other similar selection associated with the Z-axis feature, that selection and the data associated with it may be added to the training set. A machine learning algorithm (such as a general purpose machine learning algorithm) can be trained and validated on this data such that it identifies the best features in any new objects printed by the user. In this scenario, the 3D modeling application or UI can automatically indicate or recommend which z-axis features to retain or be associated with a higher or specific tolerance or precision based on historical user selection data/training data, thereby reducing the user's need to configure the object. Steps required for 3D modeling/printing.

[0077]

827 Figure 7 depicts a method for segmenting an object 305 previously described with reference to Figure 3 into layers by a slicing program associated with a 3D printer in accordance with the operating procedures 400, 500 and/or 600 described above with reference to Figures 4, 5 and/or 6. Example process 700.

[0078]

833 Process 700 may begin at 705 by selecting a global layer height for printing 3D object 305a based on total object height 320 and one or more height configuration parameters, e.g., in accordance with operations 402 and 404, operations 502-510, and/or procedure 600. .

836 Layer height 710 may be selected to be equal to a multiple of total object height 320 and consistent with one or more height configuration parameters (e.g., minimum and maximum layer resolution or step size, specified layer height, and certain z-dimensions of 3D object 305 Tolerance values for features such as steps 720, 725, and 730 and slopes 735 and 740).

840 Operation 705 may result in slicing object 305d into layers having thickness 710. Sliced object 305d is then printed at operation 715 to produce object 305e. The thickness or layer height 710 may be selected to be a multiple of the total object height 320, and this may result in no total object height error. Layer height 710 may also be selected to minimize any z-dimensional errors, such as those present in process 300, such as errors 325a, 352c, and 325f. Additionally, layer height 710 may result in reduced errors for slopes of 3D object 305 such that errors 325g and 325h are less than errors 325b and 325e associated with process 300.

[0079]

849 FIG. 8 illustrates an example process 800 for segmenting an object into layers by a slicing program associated with a 3D printer in accordance with the operating procedures of FIGS. 4, 5, and/or 6.

[0080]

854 Process 800 may begin at 805 by selecting a global layer height for printing 3D object 305 based on total object height 320 and one or more height configuration parameters, such as in accordance with operations 402 and 404, operations 502-514, and/or procedure 600..

857 Layer height 710 may be selected to be equal to a multiple of total object height 320 and consistent with one or more height configuration parameters (e.g., minimum and maximum layer resolution or step size, specified layer height, and certain z-dimensions of 3D object 305 Tolerance values for features such as steps 720, 725, and 730).

861 In some situations, the errors associated with slopes 735 and 740 (illustrated in Figure 7 as errors 325g and 325h) that exist when using individual and global layer heights 710 may be unacceptable or not within the specified error range. In this case, local layer height optimization may be used (also indicated by 805) to select a second layer height 810 (eg, half the layer height 710 in the illustrated example) to lower portions 735 and 740 Errors that exist in, for example, according to operations 508 and 510. In this manner, when printing sliced 3D object 305f at 820, errors 325i and 325j associated with slopes 735 and 740 of object 305g may be reduced.

[0081]

871 Figures 9A and 9B illustrate examples of specific z-axis features of 3D objects 900a and 900b that can be modeled and/or printed with greater accuracy using the described techniques.

873 Referring to Figure 9A illustrating a top view of 3D object 900a, 3D object 600 is sliced through plane 905 into 4 layers 910, 915, 920 and 935. The top layer 935 includes text (TEXT), such as embossed text, with a specific height 940, which may be less than the global layer height 925 of layers 910 and 915. To accurately model and/or 3D print embossed text 935, the height 930 of layer 920 may be adjusted (eg, in this case, lowered) according to the techniques described above to enable a 3D printer with a specific minimum height

resolution to Prints embossed text with height 940 exactly 935. With traditional techniques for slicing 3D models, such as 3D model 900a, features such as relief features on top of objects may be completely lost in a fixed layer height approach, such as where the feature's height 940 is less than the global or fixed layer height 925 half of the cases. In one example, where a top or bottom layer has detailed features, such as text relief, the techniques described may include adjusting the layer height of the specific layer and/or one or more nearby layers (such as layer 920) to depict the specific features. High degree of accuracy is maximized. In some cases, the height of other layers can be kept constant, thereby preserving perceptible uniformity on all sides of the object, and also improving speed by not having to adjust each layer height individually. This technique can also be applied to mid-layers, by splitting one layer into two or by adjusting both layers equally.

[0082]

890 Figure 9B illustrates another example bottom perspective view of 3D object 900b.

891 3D object 900b as shown is sliced through plane 905 into five layers 975, 945, 950, 955 and 960, for example in reverse printing. The bottom layer 975 includes negative text (TEXT) with a specific height/depth 980, which may be less than the global layer height 965 of layers 945, 950, 955, and 960. To accurately model and/or 3D print negative relief text 975, the height 980 of the layer containing text 975 may be adjusted (eg, in this case, reduced) according to the techniques described above to have a specific minimum height resolution The 3D printer is able to accurately print embossed text with a height of 980° to 975°.

[0083]

900 In some embodiments, a system for printing three-dimensional (3D) objects includes: a computing device configured to: receive at least one height configuration parameter associated with a 3D object and a total object height; and convert the The 3D object is segmented into a plurality of formable layers, wherein the plurality of formable layers includes a first height.

904 Segmenting 3D objects further includes:

[0084]

908 The first height corresponding to the plurality of formable layers is selected based on the received at least one height configuration parameter and the total object height, wherein the first height is selected to optimize the at least one height configuration the accuracy of at least one of the parameter or the total object height; and

[0085]

914 A 3D printer in communication with the computing device, and the 3D printer includes:

[0086]

918 an extruder configured to deposit material in formable layers to form the 3D object; and

[0087]

922 Movement means coupled to the extruder and configured to move the extruder in at least a vertical direction to deposit the plurality of formable layers of the material according to the first height.

[0088]

927 In some embodiments, the at least one height configuration parameter includes a 3D printer resolution selection or layer height.

[0089]

932 In some embodiments, the at least one height configuration parameter includes a tolerance corresponding to a subset of the plurality of formable layers.

[0090]

937 In some embodiments, the computing device is further configured to:

[0091]

941 A second height corresponding to at least the subset of the plurality of formable layers is selected based on the received at least one height configuration parameter and the total object height, wherein the second height is selected to optimize the Accuracy of at least one of at least one height configuration parameter and the total object height.

[0092]

948 In some embodiments, a method for improving dimensional accuracy when generating a three-dimensional (3D) object including multiple formable layers includes:

[0093]

953 Receives at least one height configuration parameter and the total object height;

[0094]

957 A first height corresponding to at least a subset of the plurality of formable layers is selected based on the received at least one height configuration parameter and the total object height, wherein the first height is selected to optimize the at least the accuracy of at least one of a height configuration parameter or the total object height; and

[0095]

964 The first height is communicated to a 3D printer to generate the 3D object.

[0096]

968 In some embodiments, the at least one height configuration parameter includes a global height of the plurality of formable layers, and wherein at least the subset of the plurality of formable layers includes the plurality of formable layers.

[0097]

974 In some embodiments, selecting the first height further includes selecting one of the plurality of formable layers corresponding to the first height based at least in part on the at least one height configuration parameter or the total object height. Several formable layers.

[0098]

980 In some embodiments, the at least one height configuration parameter includes a tolerance for a subset of the plurality of formable layers, and selecting the first height further includes selecting a height associated with the plurality of formable layers based on the tolerance. A first height corresponding to the subset of formable layers or to all of the plurality of formable layers.

[0099]

987 In some embodiments, the method further includes identifying one or more formable layers of the plurality of formable layers associated with a tolerance, and selecting the first height further includes selecting based on the tolerance. A plurality of formable layers of the plurality of formable layers corresponding to the first height or at least one of the first height.

[0100]

994 In some embodiments, identifying the one or more formable layers includes receiving a selection of at least one first tolerance and at least one formable layer corresponding to the at least one first tolerance.

[0101]

999 In some embodiments, the at least one height configuration parameter includes a tolerance for a subset of the plurality of formable layers, and the method includes selecting all height configurations associated with the plurality of formable layers based on the tolerance. The second height corresponding to the subset.

[0102]

In some embodiments, the at least one height configuration parameter includes object height resolution, and wherein optimizing the first height corresponding to at least one formable layer further includes at least one of the following:

[0103]

The first height is selected to meet or exceed the object height resolution; or

[0104]

A plurality of formable layers of the plurality of formable layers corresponding to the first height is selected to meet or exceed the object height resolution.

[0105]

In some embodiments, optimization further includes:

[0106]

determining an object height accuracy error of the 3D object;

[0107]

Determine altitude configuration parameter accuracy errors; and

[0108]

At least one of: selecting the first height based on a comparison of the object height accuracy error and the height configuration parameter accuracy error or selecting a number of the plurality of formable layers corresponding to the first height Formable layer.

[0109]

In some embodiments, selecting the first height or selecting at least one of a plurality of formable layers of the plurality of formable layers corresponding to the first height further includes determining relative to an object height accuracy error. Weighting of altitude configuration parameter accuracy errors.

[0110]

In some embodiments, selecting the first height or selecting at least one of a plurality of formable layers of the plurality of formable layers corresponding to the first height is biased toward a positive height configuration

parameter accuracy error.

[0111]

1050 In some embodiments, the method further includes selecting the bottom formable layer height separately from the first height to ensure bonding of the bottom layer.

[0112]

1055 In some embodiments, a computer-readable storage medium has instructions stored thereon that, when executed by at least one processor, cause the at least one processor to perform a step in generating a layer including a plurality of formable layers. Operations that improve dimensional accuracy on three-dimensional (3D) objects, including:

[0113]

1062 Receives at least one height configuration parameter and the total object height;

[0114]

1066 Selecting a first height corresponding to the plurality of formable layers based on the received at least one height configuration parameter and the total object height, wherein the first height is selected to optimize the at least one height configuration parameter or the accuracy of at least one of the total object heights; and

[0115]

1072 The first height is communicated to a 3D printer to generate the 3D object.

[0116]

1076 In some embodiments, the at least one height configuration parameter includes a 3D printer resolution selection or layer height.

[0117]

1081 In some embodiments, the at least one height configuration parameter includes a tolerance corresponding to a subset of the plurality of formable layers.

[0118]

1086 In some embodiments, a second height corresponding to at least the subset of the plurality of formable layers is selected based on the received at least one height configuration parameter and the total object height,

wherein the second height Selected to optimize accuracy of at least one of the at least one height configuration parameter and the total object height.

[0119]

1093 The 3D object layer height selection techniques and/or slicer/driver 165 described above and any associated user interface may be implemented on one or more computing devices or environments, as described below.

1096 Figure 10 depicts an example general computing environment in which some of the techniques described herein may be embodied, which may include, for example, computing device 110.

1098 Computing system environment 1002 is but one example of a suitable computing environment and is not intended to impose any limitations on the scope or functionality of the presently disclosed subject matter.

1100 Computing environment 1002 should also not be interpreted as having any dependency or requirement on any one or combination of components illustrated in example operating environment 1002.

1102 In some embodiments, the various computing elements depicted may include circuitry configured to instantiate specific aspects of the invention.

1104 For example, the term circuitry, as used in this disclosure, may include specialized hardware components configured to perform function(s) through firmware or switches.

1106 In other example embodiments, the term circuitry may include a general-purpose processing unit, memory, or the like configured with software instructions implementing logic operable to perform the function(s).

1108 In example embodiments in which the circuitry includes a combination of hardware and software, an implementer may write source code embodying the logic, and the source code may be compiled into machine-readable code that can be processed by a general-purpose processing unit.

1111 Because those skilled in the art will appreciate that existing technology has evolved to the point where there is little differentiation between hardware, software, or hardware/software combinations, the choice of hardware or software to perform a specific function is a design choice left to the implementer.

1114 More specifically, those skilled in the art will appreciate that software processes can be transformed into equivalent hardware structures, and the hardware structures themselves can be transformed into equivalent software processes.

1117 Thus, the choice between hardware or software implementation is one of design choice and left to the implementer.

[0120]

1122 Computer 1002, which may include any of a mobile device or smartphone, a tablet, a laptop, a desktop computer, or a collection of networked devices, cloud computing resources, etc., typically includes a variety of computer-readable media.

1125 Computer-readable media can be any available media that can be accessed by computer 1002 and includes both volatile and nonvolatile media, removable and non-removable media.

1127 System memory 1022 includes computer-readable storage media in the form of volatile and/or non-volatile memory, such as read-only memory (ROM) 1023 and random access memory (RAM) 1060.

1129 A basic input/output system 1024 (BIOS), which contains basic routines such as to help transfer information

between elements within the computer 1002 during startup, is typically stored in ROM 1023.

1131 RAM 1060 typically contains data and/or program modules that processing unit 1059 has immediate access to and/or is currently operating on.

1133 By way of example, and not limitation, Figure 10 shows an operating system 1025, applications 1026, other program modules 1027 (including a 3D layer height optimizer 1065), and program data 1028.

[0121]

1138 Computer 1002 may also include other removable/non-removable, volatile/non-volatile computer storage media.

1140 By way of example only, FIG. 10 illustrates a hard drive 1038 reading from or writing to a non-removable, non-volatile magnetic media, and a removable, non-volatile disk 1054 reading from or writing to it. a disk drive 1039, and an optical disk drive 1004 that reads from or writes to a removable, non-volatile optical disk 1053 such as a CDROM or other optical media.

1144 Other removable/non-removable, volatile/non-volatile computer storage media that may be used in this example operating environment include, but are not limited to, magnetic tape cartridges, flash memory cards, digital versatile disks, digital video tapes, solid state RAM, solid state ROM etc.

1147 Hard drive 1038 is typically connected to system bus 1021 through a non-removable memory interface such as interface 1034, while magnetic disk drive 1039 and optical disk drive 1004 are typically connected to system bus 1021 through a removable memory interface such as interface 1035 or 1036. .

[0122]

1153 The drives and their associated computer storage media discussed above and illustrated in FIG. 10 provide storage for computer 1002 of computer-readable instructions, data structures, program modules, and other data.

1156 In Figure 10, for example, hard drive 1038 is shown storing an operating system 1058, application programs 1057, other program modules 1056, and program data 1055.

1158 Note that these components may be the same as the operating system 1025, applications 1026, other program modules 1027, and program data 1028, or may be different from them.

1160 Here, the operating system 1058, application programs 1057, other program modules 1056, and program data 1055 are given different numbers to at least indicate that they are different copies.

1162 A user may enter commands and information into computer 1002 through input devices such as a keyboard 1051 and a pointing device 1052 (often referred to as a mouse, trackball, or touch pad).

1164 Other input devices (not shown) may include microphones, joysticks, game pads, satellite dishes, scanners, retinal scanners, and the like.

1166 These and other input devices are often connected to the processing unit 1059 through the user input interface 1036 coupled to the system bus 1021, but may also be connected through other interfaces and bus structures, such as parallel ports, game ports, universal serial bus (USB) ports. Make a connection.

1169 A monitor 1042 or other type of display device is also connected to system bus 1021 via an interface such as video interface 1032.

1171 In addition to the monitor, the computer may also include other peripheral output devices such as speakers

1044 and printer 1043 (such as 3D printer 105) that may be connected through output peripherals interface 1033.

[0123]

1177 Computer 1002 may operate in a networked environment using logical connections to one or more remote computers, such as remote computer 1046.

1179 Remote computer 1046 may be a personal computer, server, router, network PC, peer-to-peer device, or other common network node, and typically includes many or all of the elements described above with respect to computer 1002, although in Figure 10 only memory storage is shown Device 1047.

1182 The logical connections depicted in Figure 10 include a local area network (LAN) 1045 and a wide area network (WAN) 1049, but other networks may also be included.

1184 Such networking environments are commonly found in offices, enterprise-wide computer networks, intranets, the Internet, and cloud computing resources.

[0124]

1189 When used in a LAN networking environment, computer 1002 is connected to LAN 1045 through a network interface or adapter 1037.

1191 When used in a WAN networking environment, computer 1002 typically includes a modem 1005 or other means for establishing communications over a WAN 1049 such as the Internet.

1193 Modem 1005 may be internal or external and may be connected to system bus 1021 via user input interface 1036 or other suitable mechanism.

1195 In a networked environment, program modules shown with respect to computer 1002, or portions thereof, may be stored in a remote memory storage device.

1197 By way of example, and not limitation, FIG. 10 shows remote application 1048 residing on memory device 1047.

1199 It should be understood that the network connections shown are exemplary and other means of establishing communication links between computers may be used.

[0125]

1204 In some aspects, other programs 1027 may include a 3D layer height optimizer application 1065 that includes the functionality described above, such as functionality in or associated with the 3D printer slicer or driver 165.

1207 In some cases, the 3D layer height optimizer application 1065/slicer 165 may perform some or all of the operations in processes 400, 500, 600, and/or 800, and perform the operations as described above via the graphics interface 1031, the video interface 1032, the output peripheral Interface 1033 and/or one or more monitors or touch screen devices 1042 to provide a user interface.

1211 In some aspects, the 3D layer height optimizer application 1065/slicer 165 can communicate with the 3D printer 105 to generate physical 3D objects of 3D image data, as described above.

1213 In some aspects, other programs 1027 may include one or more 3D virtualization applications that may