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Aguilar

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(54) **METHOD AND APPARATUS FOR CONTROLLING AND DISPLAYING CONTENTS IN A USER INTERFACE**

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(73) Assignee: **Alpine Electronics, Inc.**, Tokyo (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 624 days.

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G06F 3/033 (2013.01)

(52) **U.S. Cl.**
USPC **715/863**; 715/830

(58) **Field of Classification Search**
USPC 715/810, 828–831, 840, 849, 852–853, 715/863
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,539,289	B2 *	3/2003	Ogino et al.	701/1
6,610,936	B2	8/2003	Gillespie et al.	
6,636,246	B1	10/2003	Gallo et al.	
6,710,788	B1	3/2004	Freach et al.	
6,874,128	B1	3/2005	Moore et al.	
6,880,132	B2 *	4/2005	Uemura	715/848
6,938,218	B1	8/2005	Rosen	
7,239,947	B2	7/2007	Suzuki	
7,543,245	B2 *	6/2009	Irimajiri	715/836
7,705,833	B2 *	4/2010	Kim	345/173
7,773,075	B2 *	8/2010	Otsuka et al.	345/173
8,375,295	B2 *	2/2013	Zalewski et al.	715/234
2006/0020903	A1	1/2006	Wang et al.	
2006/0025920	A1	2/2006	Nezu et al.	
2006/0066507	A1	3/2006	Yanagisawa	
2007/0150842	A1 *	6/2007	Chaudhri et al.	715/863
2007/0222769	A1	9/2007	Otsuka et al.	
2008/0129684	A1	6/2008	Adams et al.	
2010/0005418	A1 *	1/2010	Miyazaki et al.	715/823
2010/0081475	A1 *	4/2010	Chiang et al.	455/564
2010/0309148	A1 *	12/2010	Fleizach et al.	345/173

FOREIGN PATENT DOCUMENTS

EP	1648149	A1 *	4/2006
JP	2006084919		3/2006

OTHER PUBLICATIONS

Ni et al., "Tech-note: rapMenu: Remote Menu Selection Using Free-hand Gestural Input", IEEE Symposium on 3D User Interface, Mar. 8-9, 2008, Reno, Nevada, USA, copyright 2008 IEEE, pp. 55-58—pertains to using rotational gestures to search and select objects in a 3D menu.*

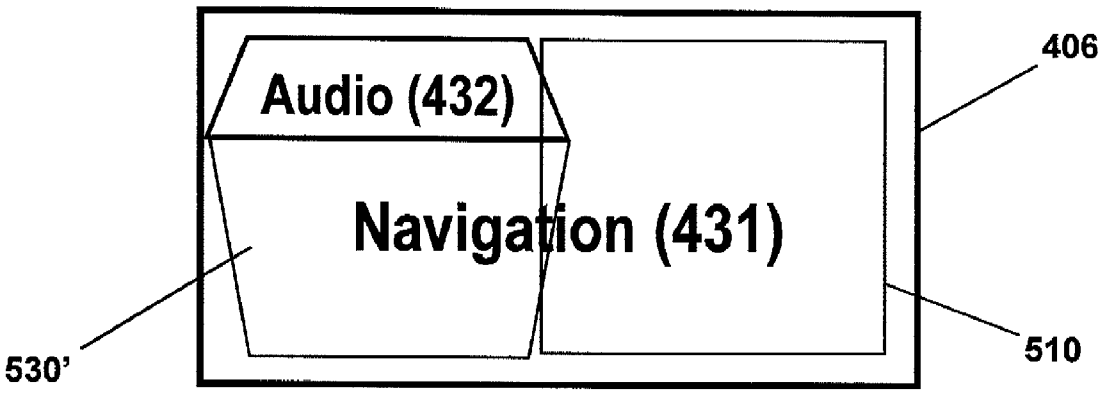
* cited by examiner

Primary Examiner — Omar Abdul-Ali
Assistant Examiner — Andrew Tank
(74) *Attorney, Agent, or Firm* — Muramatsu & Associates

(57) **ABSTRACT**

A user interface with multiple applications which can be operated concurrently and/or independently by using simple finger gestures allows a user to intuitively operate and control digital information, functions, applications, etc. to improve operability. The user is able to use finger gesture to navigate the user interface via a virtual spindle metaphor to select different applications. The user can also split the user interface to at least two display segments which may contain different applications. Moreover, each display segment can be moved to a desirable location on the user interface to provide a seamless operation environment.

19 Claims, 17 Drawing Sheets



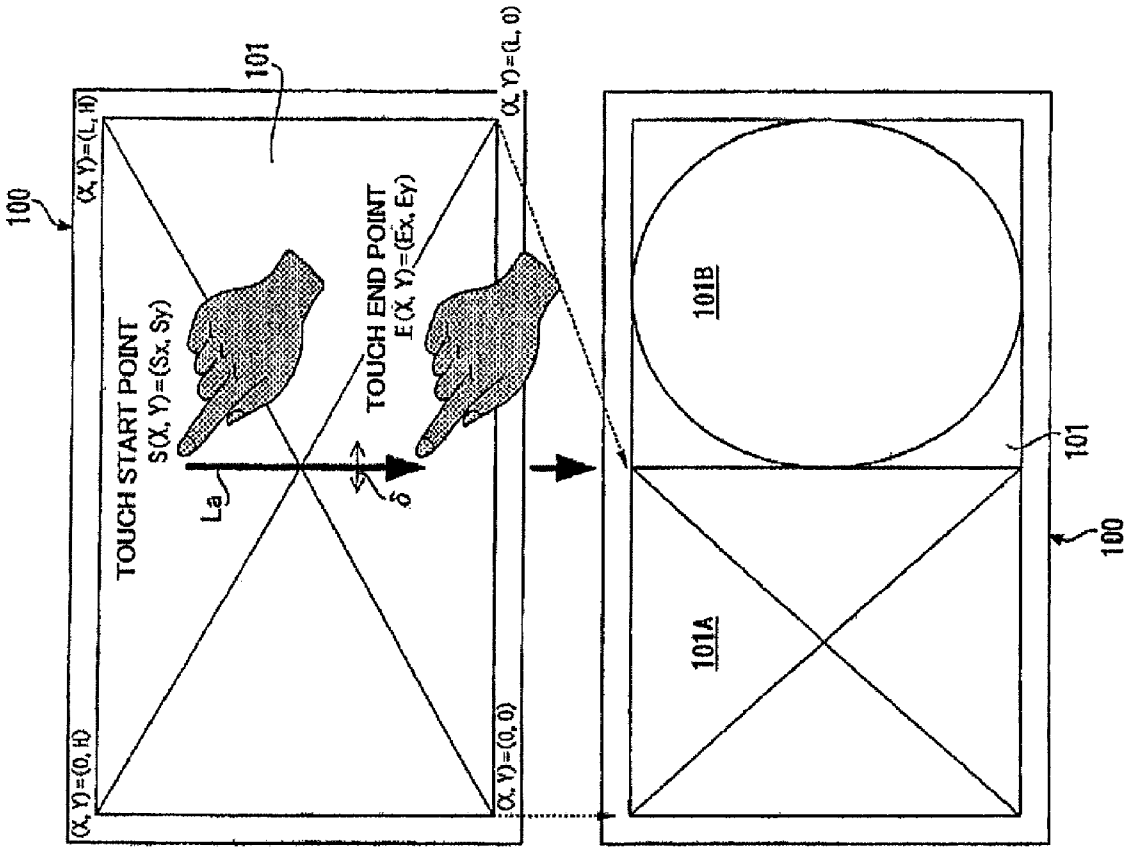


FIG. 1 (Prior art)

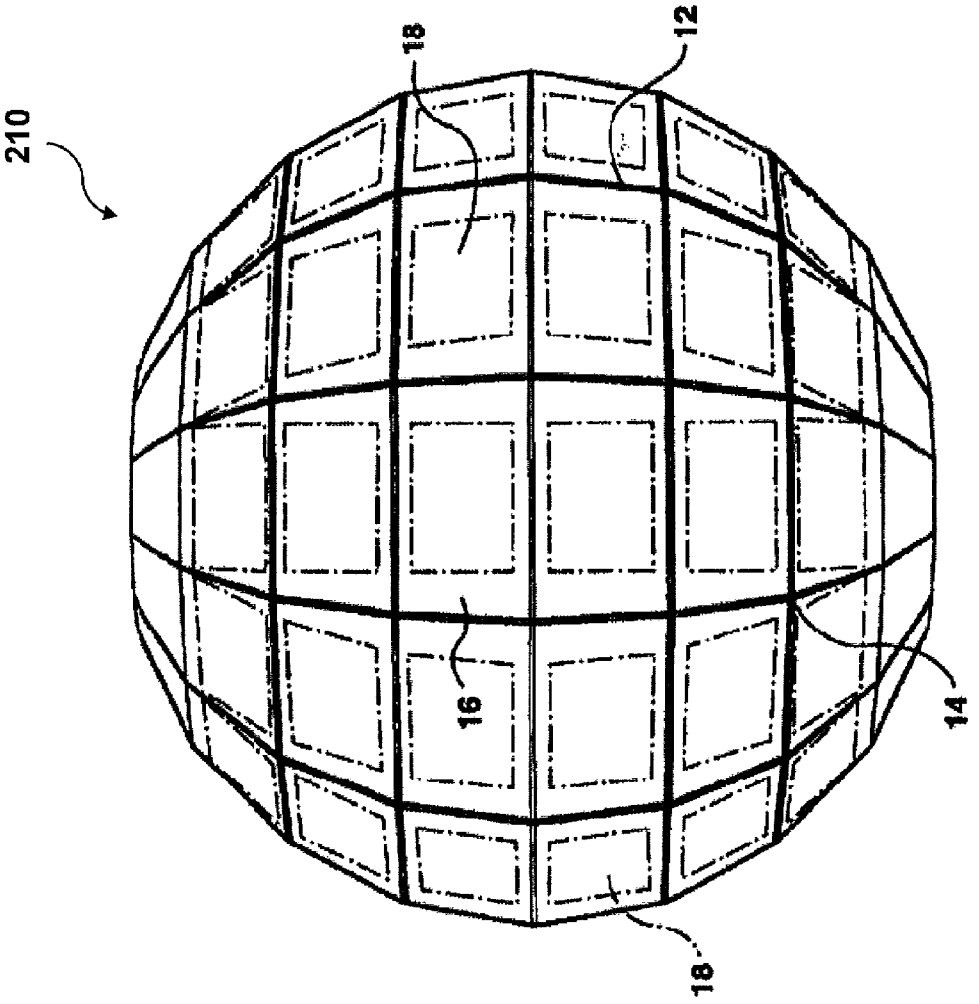


FIG. 2 (Prior art)

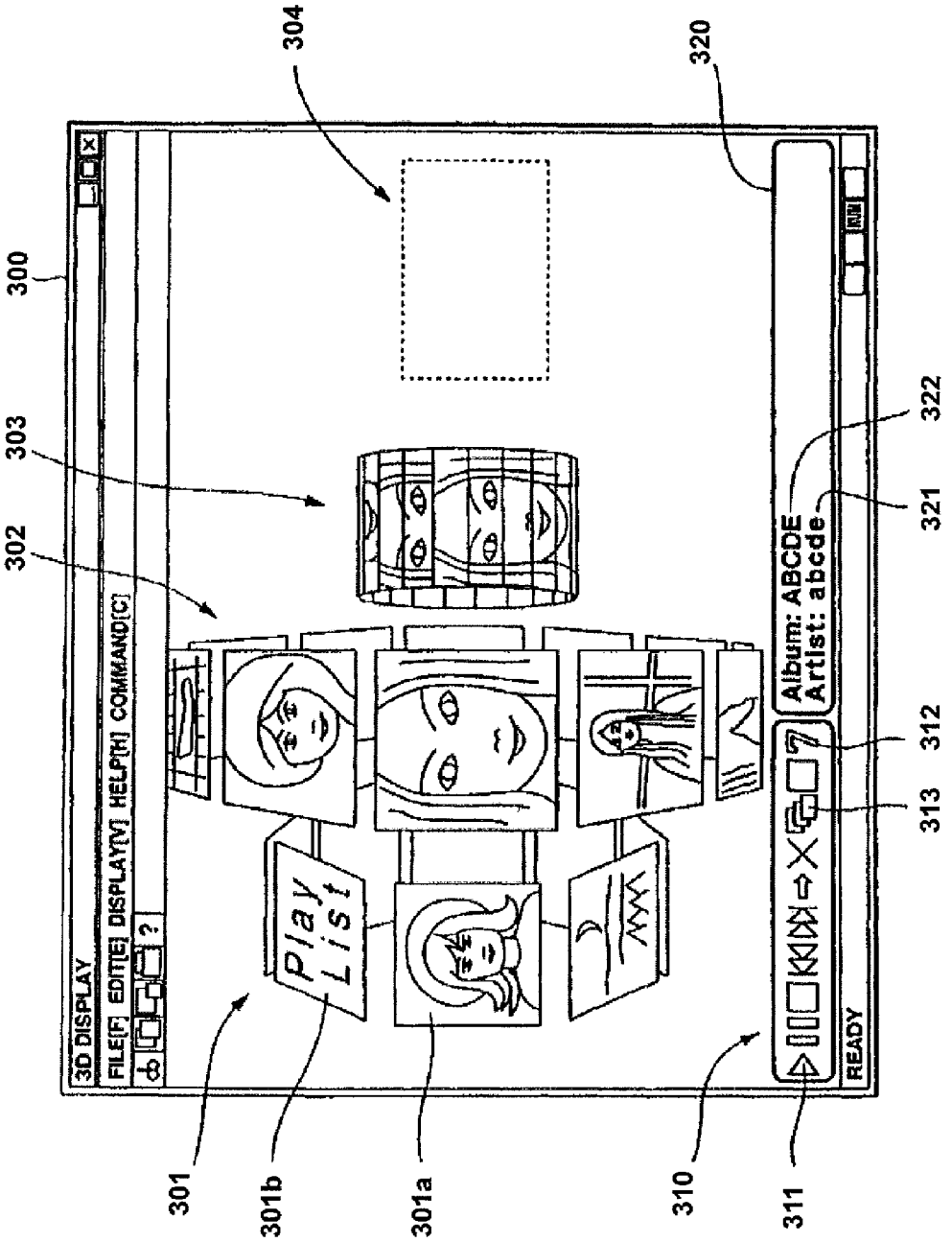


FIG. 3 (Prior art)

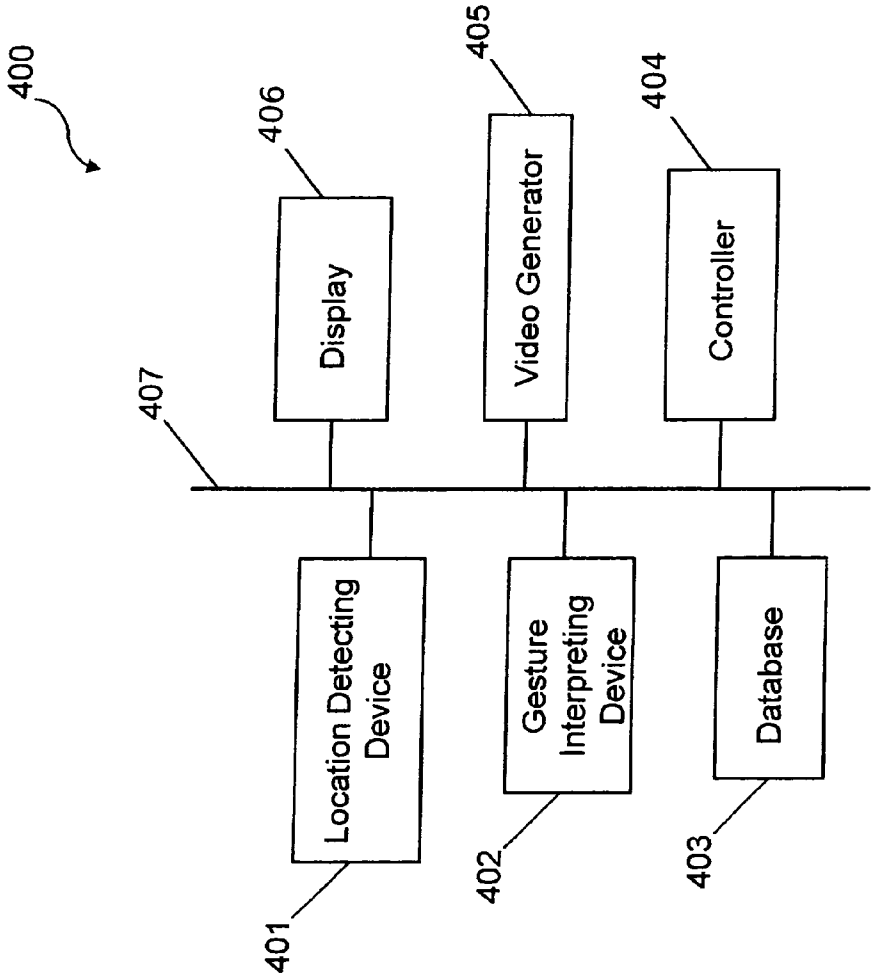

400
407
406
Display
405
Video Generator
404
Controller
Location Detecting Device
401
Gesture Interpreting Device
402
Database
403

FIG. 4

408

Finger Gesture	Corresponding Action
One finger dragging down	Spinning the spindle
Two finger dragging down	Splitting the screen
One finger tapping twice on an application	Executing corresponding application
One finger pushing on an application for a predetermined period of time	Executing corresponding application
One finger dragging Application 1 toward the direction of Application 2	Replacing Application 2 with Application 1
...	...

FIG. 4a

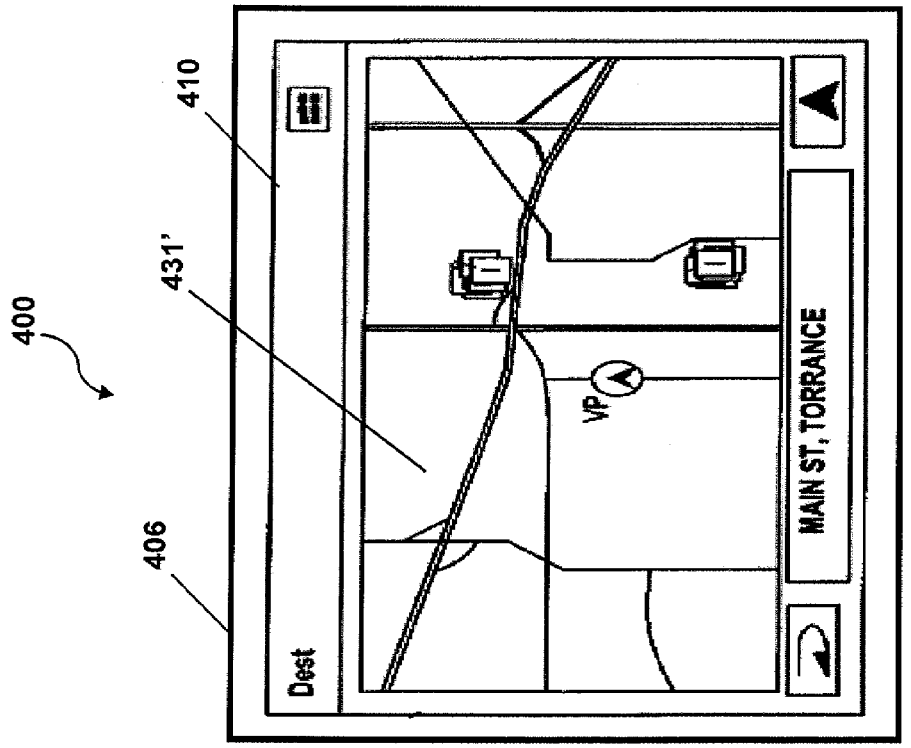

400
406
410
431'
Dest
VP
MAIN ST, TORRANCE

FIG. 4c

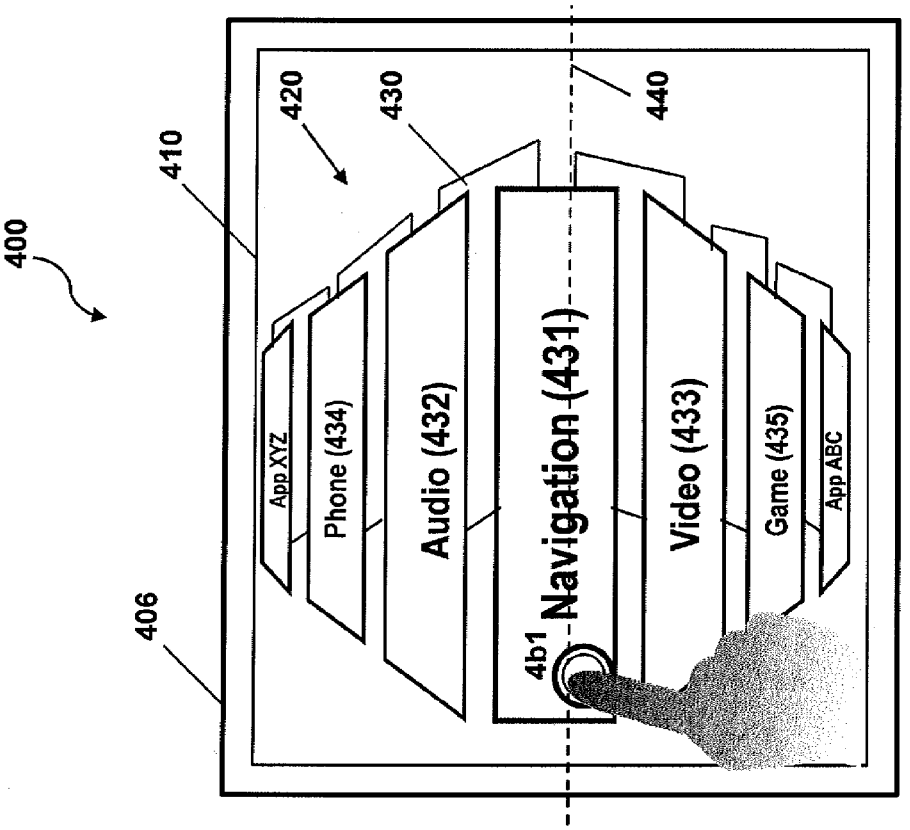

400
406
410
420
430
440
4b1
App XYZ
Phone (434)
Audio (432)
Navigation (431)
Video (433)
Game (435)
App ABC

FIG. 4b

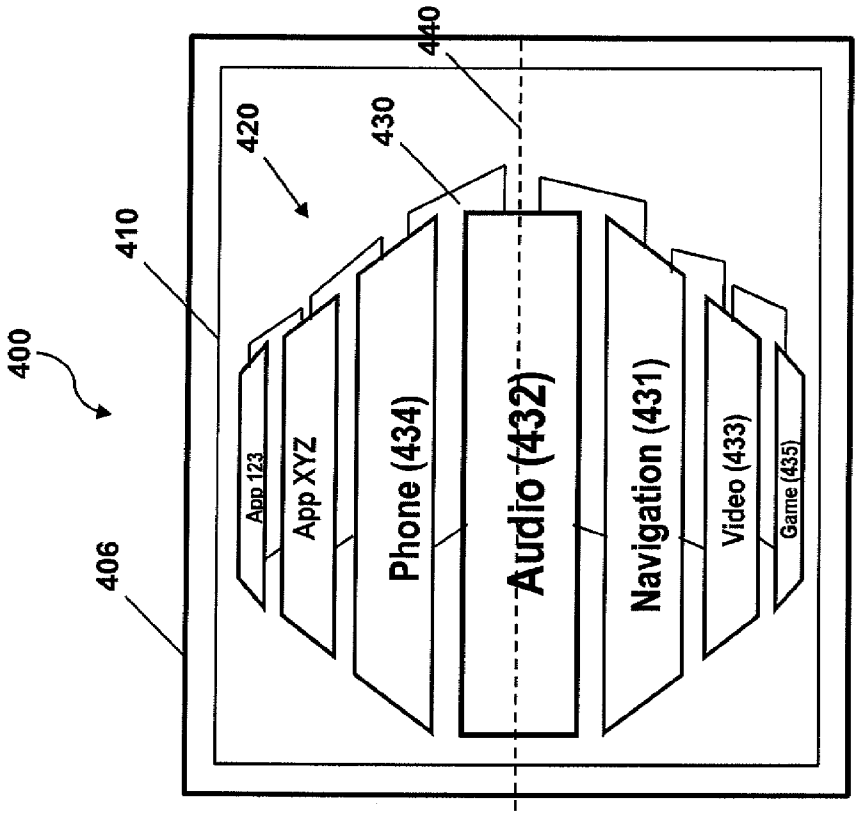

400
406
410
420
430
440
App 123
App XYZ
Phone (434)
Audio (432)
Navigation (431)
Video (433)
Game (435)

FIG. 4e

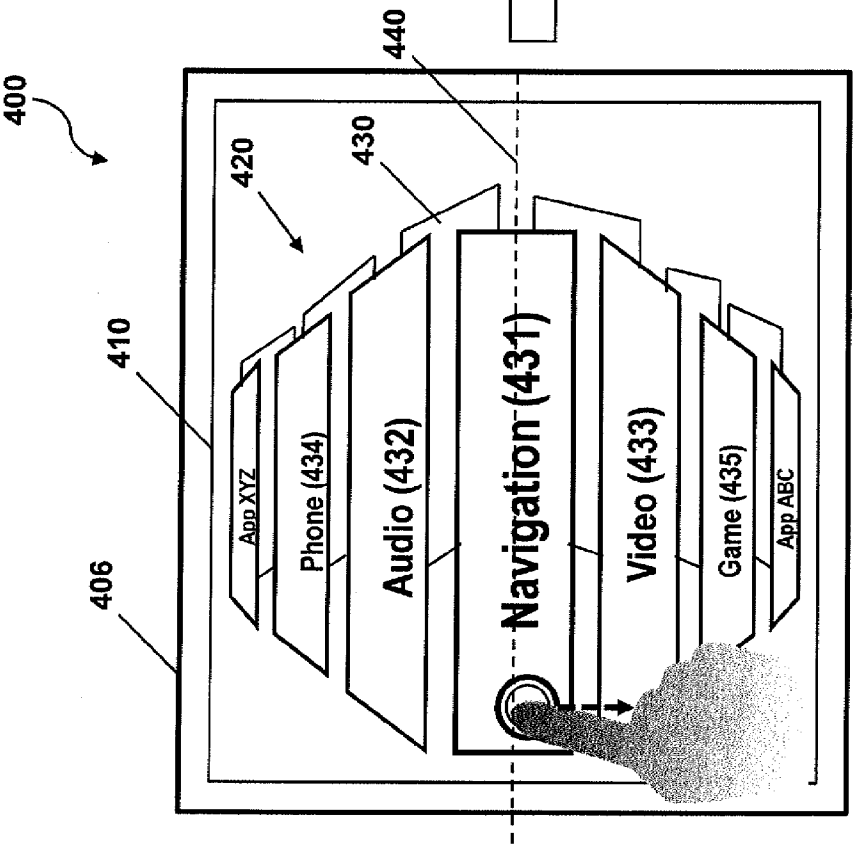

400
406
410
420
430
440
App XYZ
Phone (434)
Audio (432)
Navigation (431)
Video (433)
Game (435)
App ABC

FIG. 4d

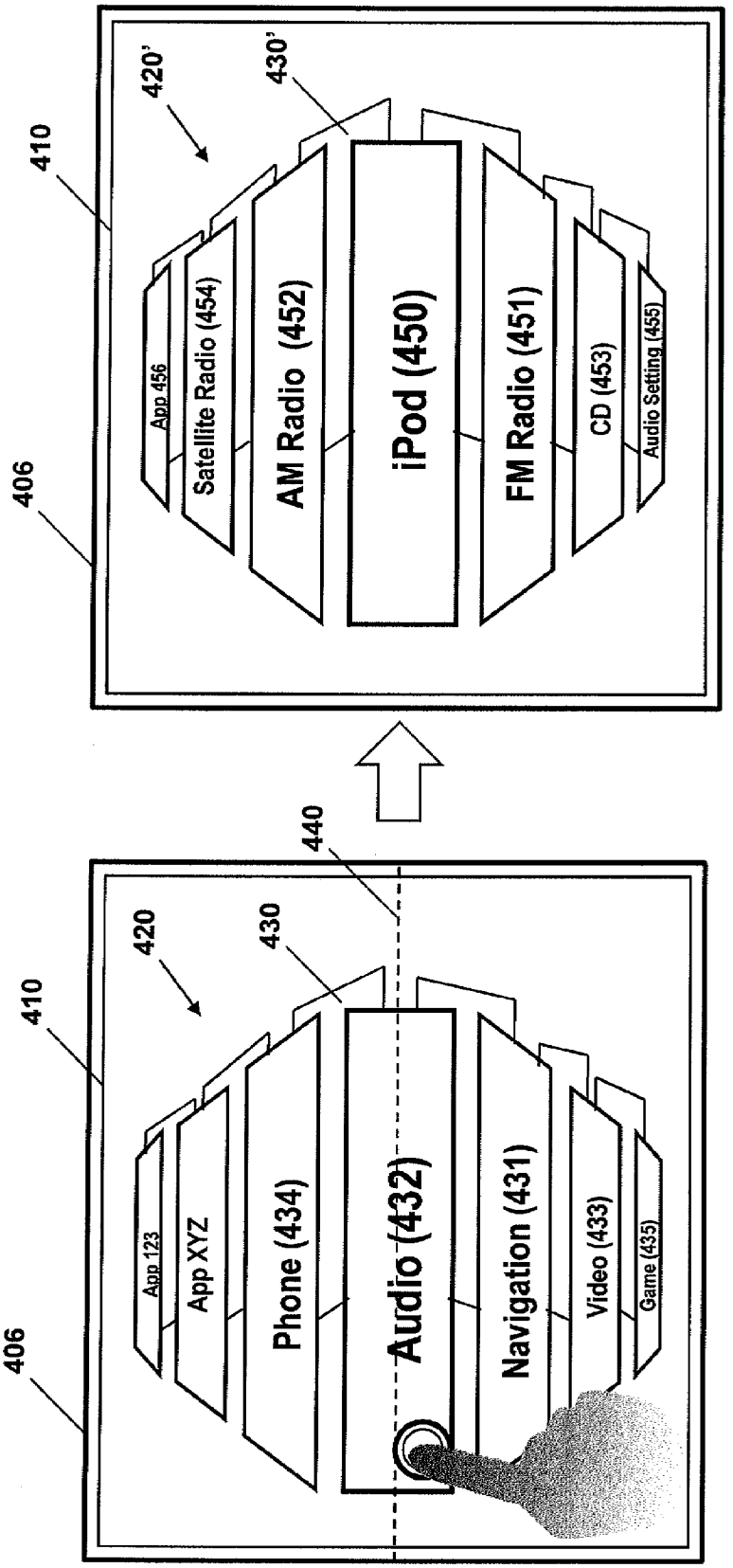

406
410
420
430
440
App 123
App XYZ
Phone (434)
Audio (432)
Navigation (431)
Video (433)
Game (435)
406
410
420'
430'
App 456
Satellite Radio (454)
AM Radio (452)
iPod (450)
FM Radio (451)
CD (453)
Audio Setting (455)

FIG. 4f

FIG. 4g

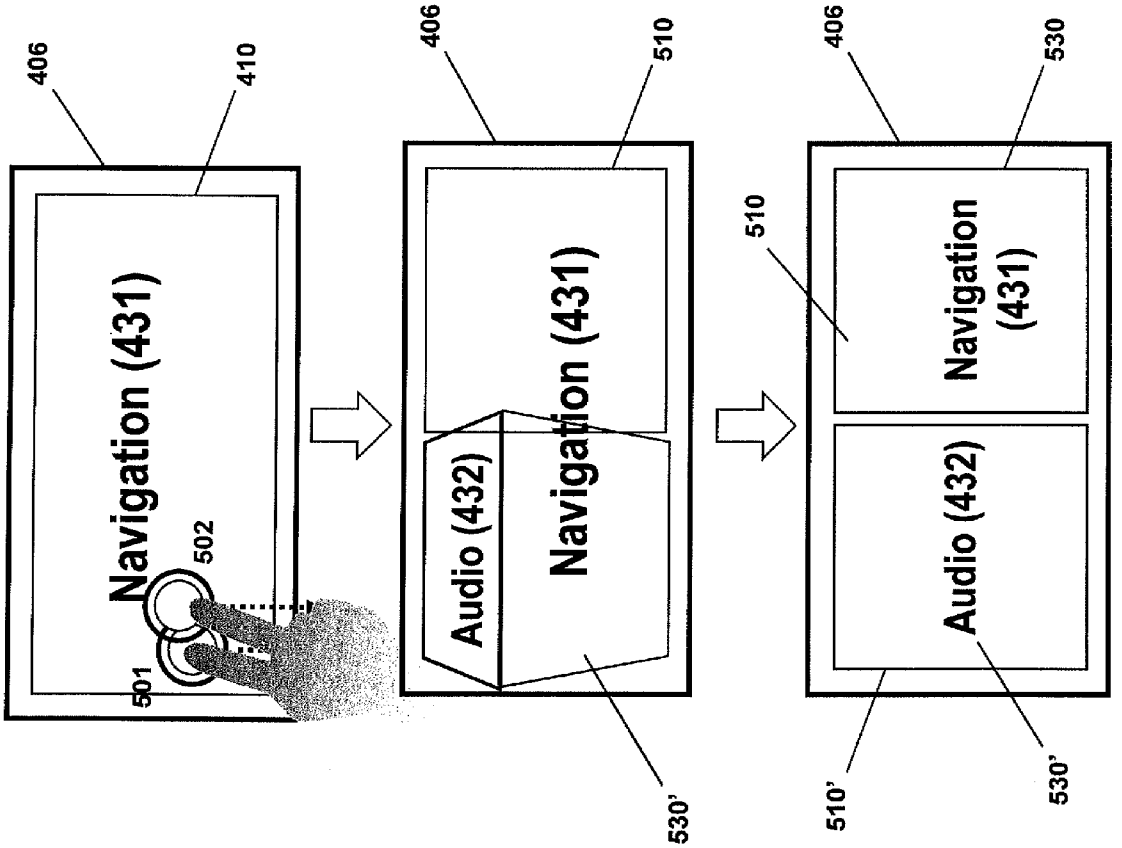


FIG. 5

FIG. 5a

FIG. 5b

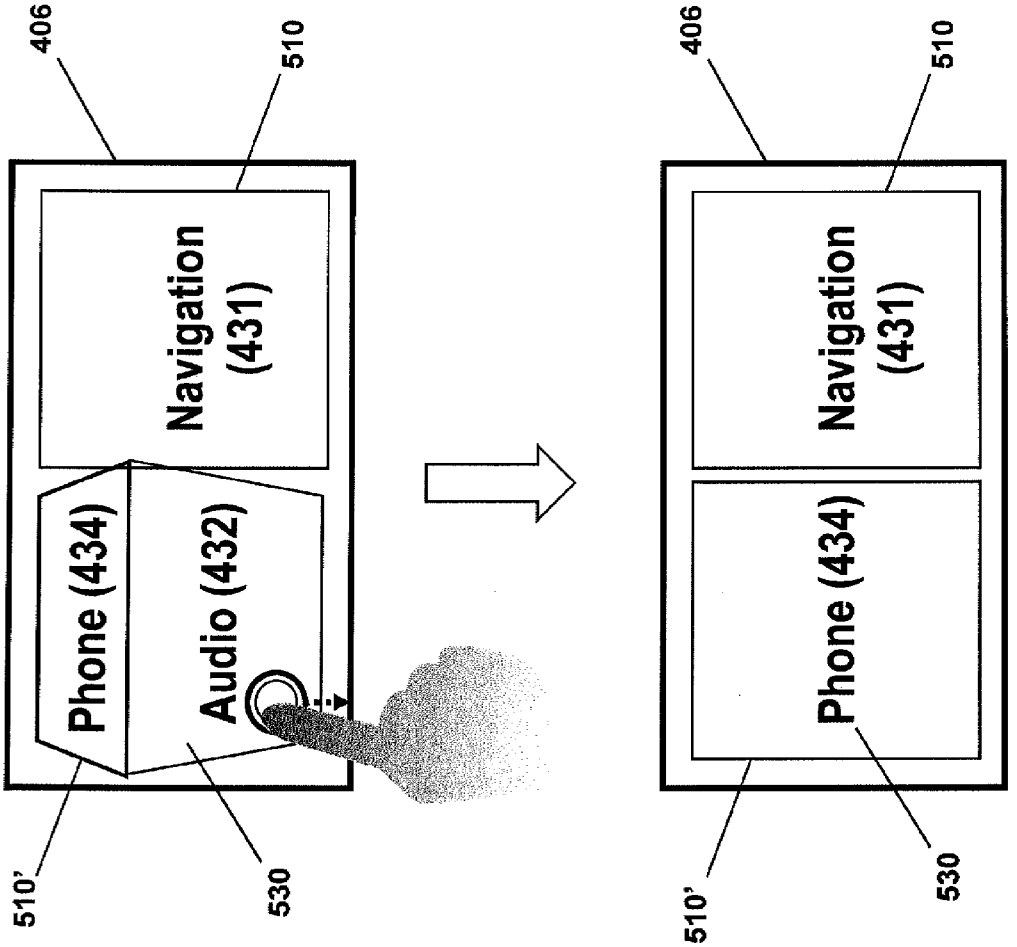

406
510
Navigation (431)
Phone (434)
Audio (432)
510'
530
406
510
Navigation (431)
Phone (434)
510'
530

FIG. 5c

FIG. 5d

FIG. 5e

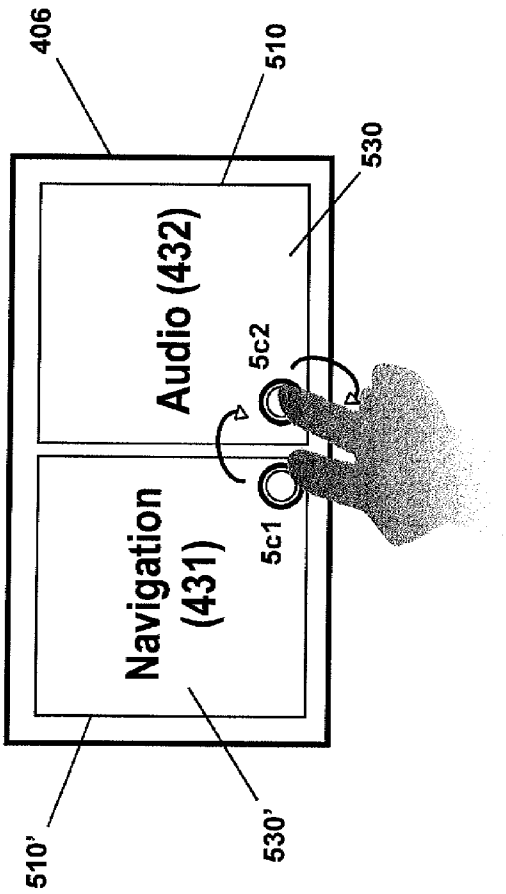
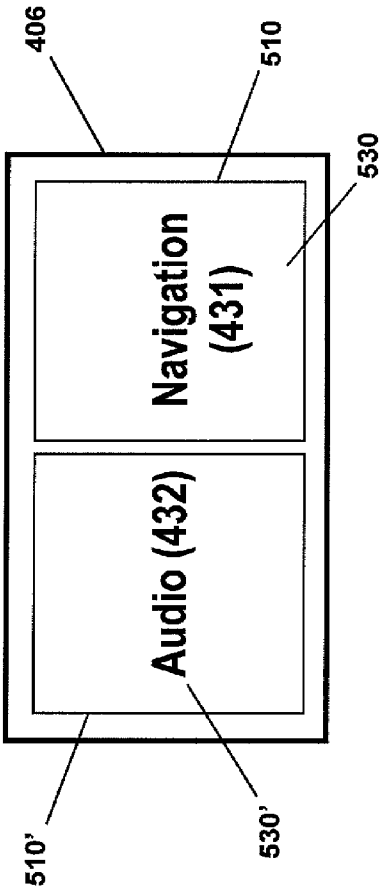

406
510
530
Audio (432)
5c2
5c1
Navigation (431)
510'
530'

FIG. 5f


406
510
530
Navigation (431)
Audio (432)
510'
530'

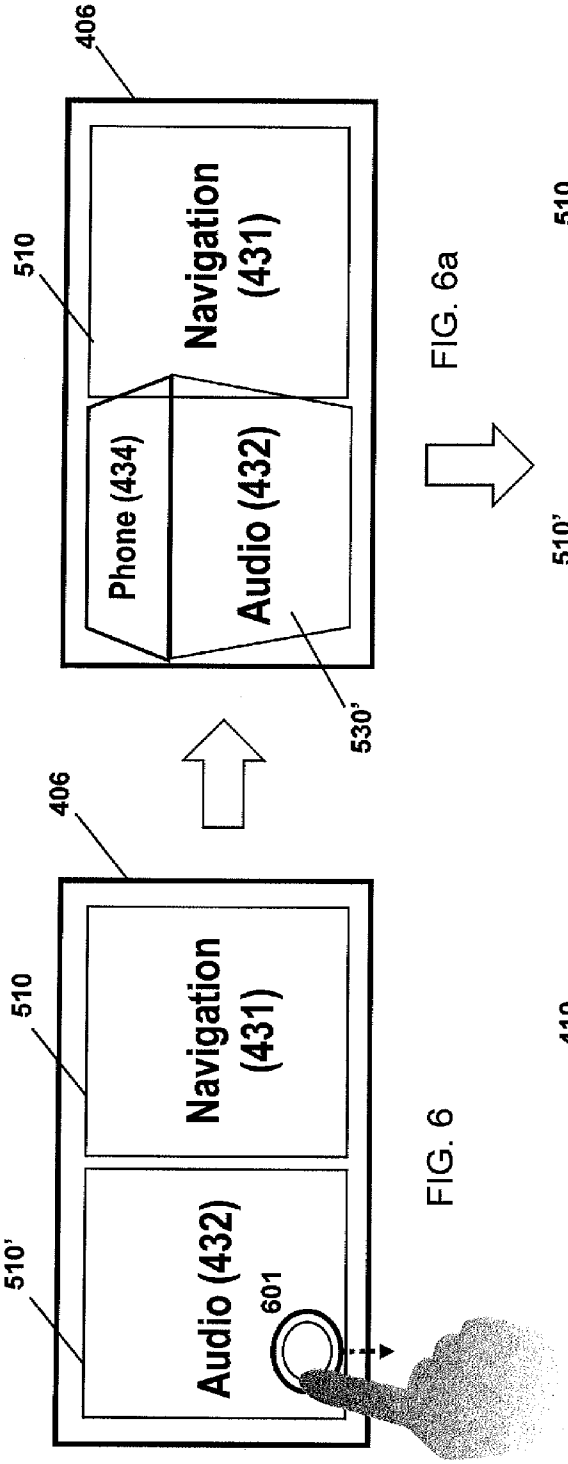


FIG. 6a

FIG. 6

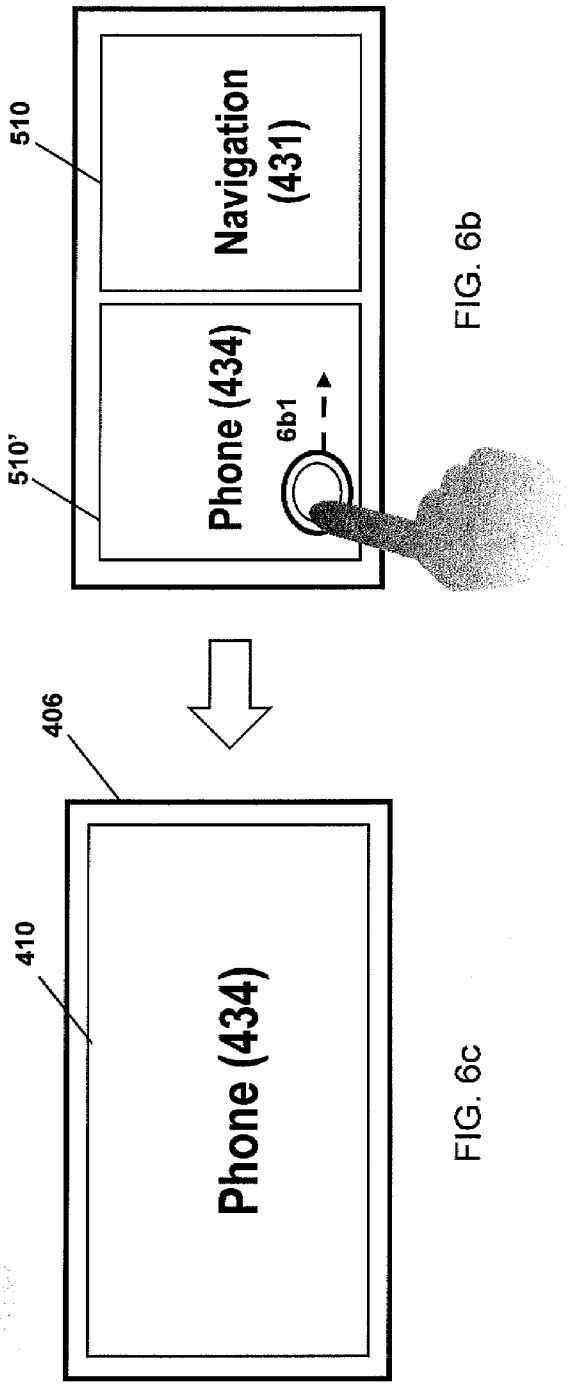


FIG. 6b

FIG. 6c

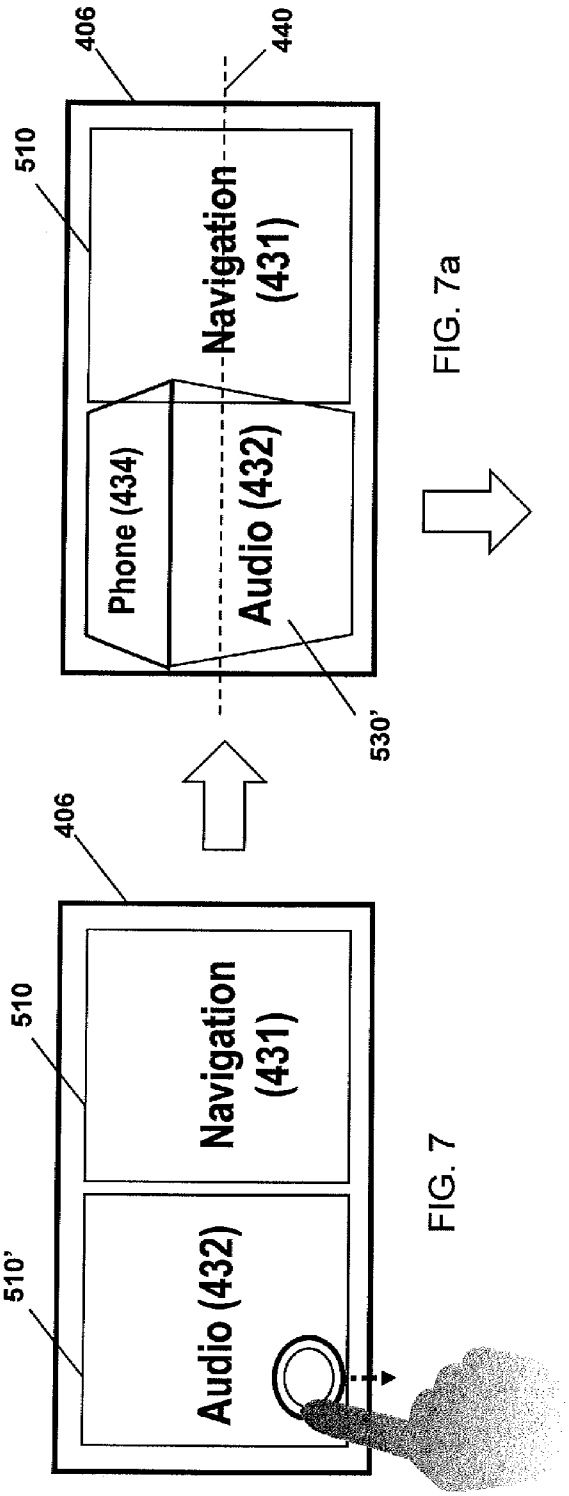


FIG. 7

FIG. 7a

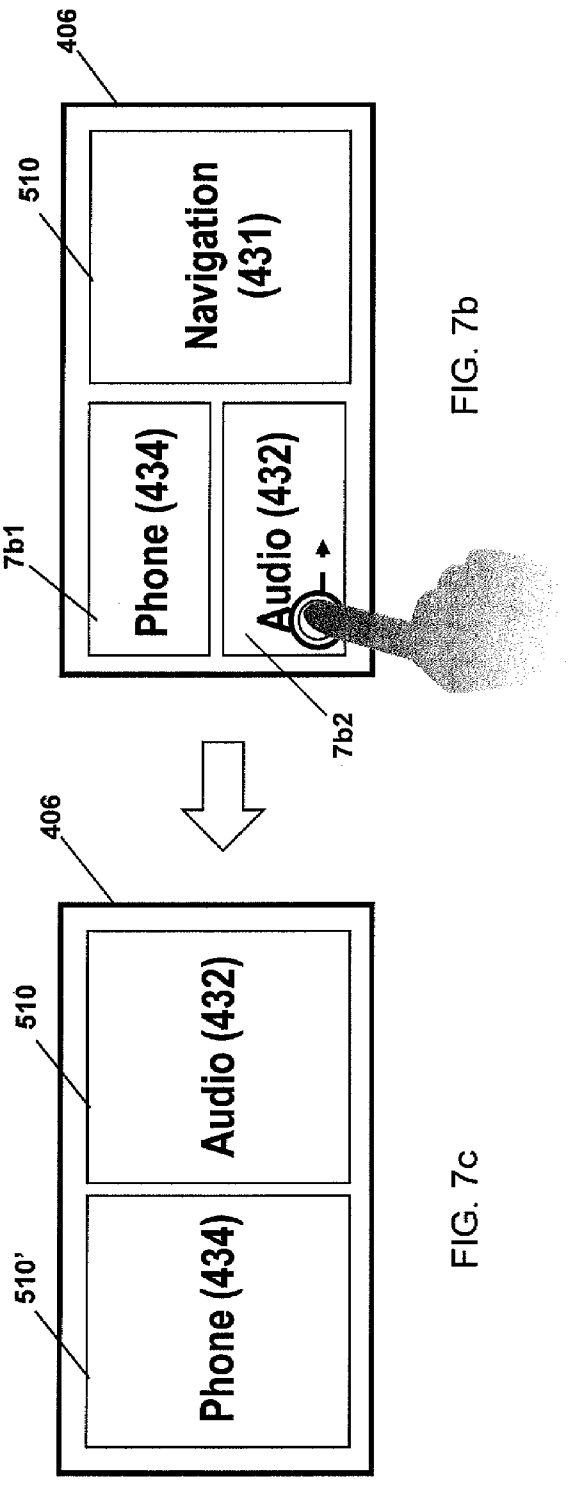


FIG. 7b

FIG. 7c

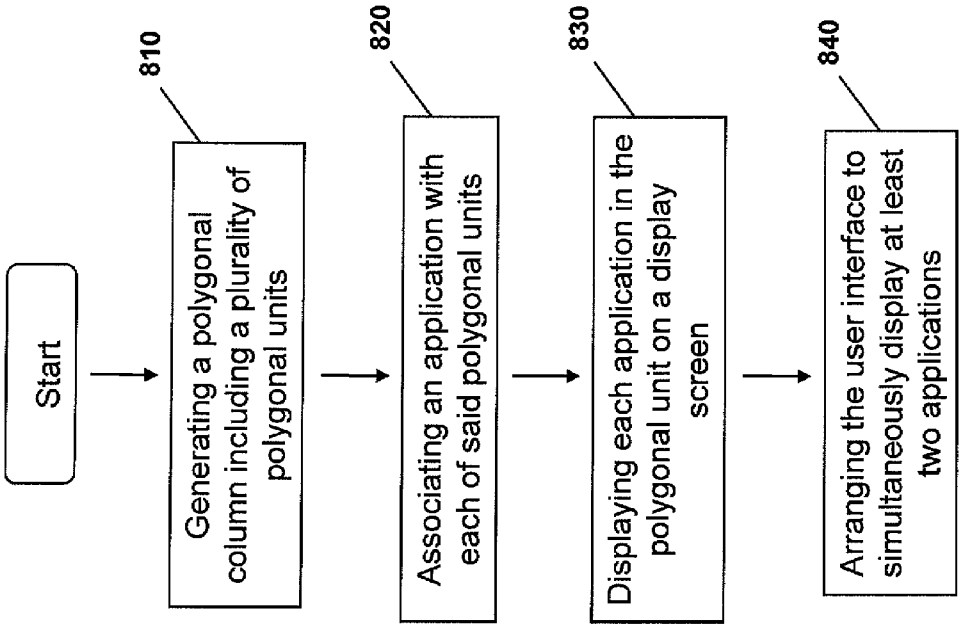

Start
810
Generating a polygonal column including a plurality of polygonal units
820
Associating an application with each of said polygonal units
830
Displaying each application in the polygonal unit on a display screen
840
Arranging the user interface to simultaneously display at least two applications

FIG. 8

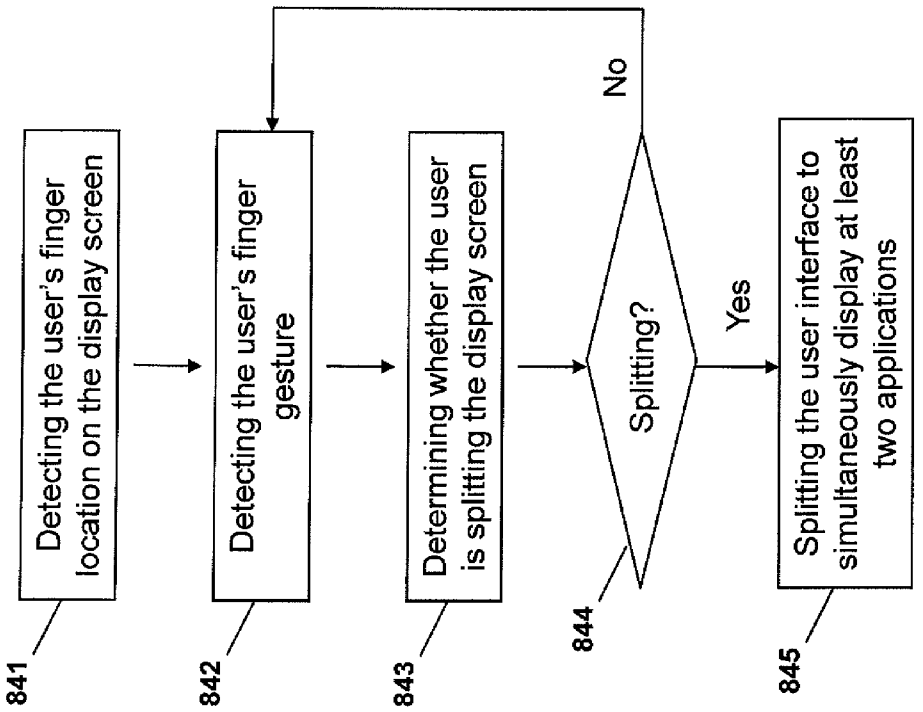

Detecting the user's finger location on the display screen
841
Detecting the user's finger gesture
842
Determining whether the user is splitting the display screen
843
Splitting?
844
No
Yes
Splitting the user interface to simultaneously display at least two applications
845

FIG. 8a

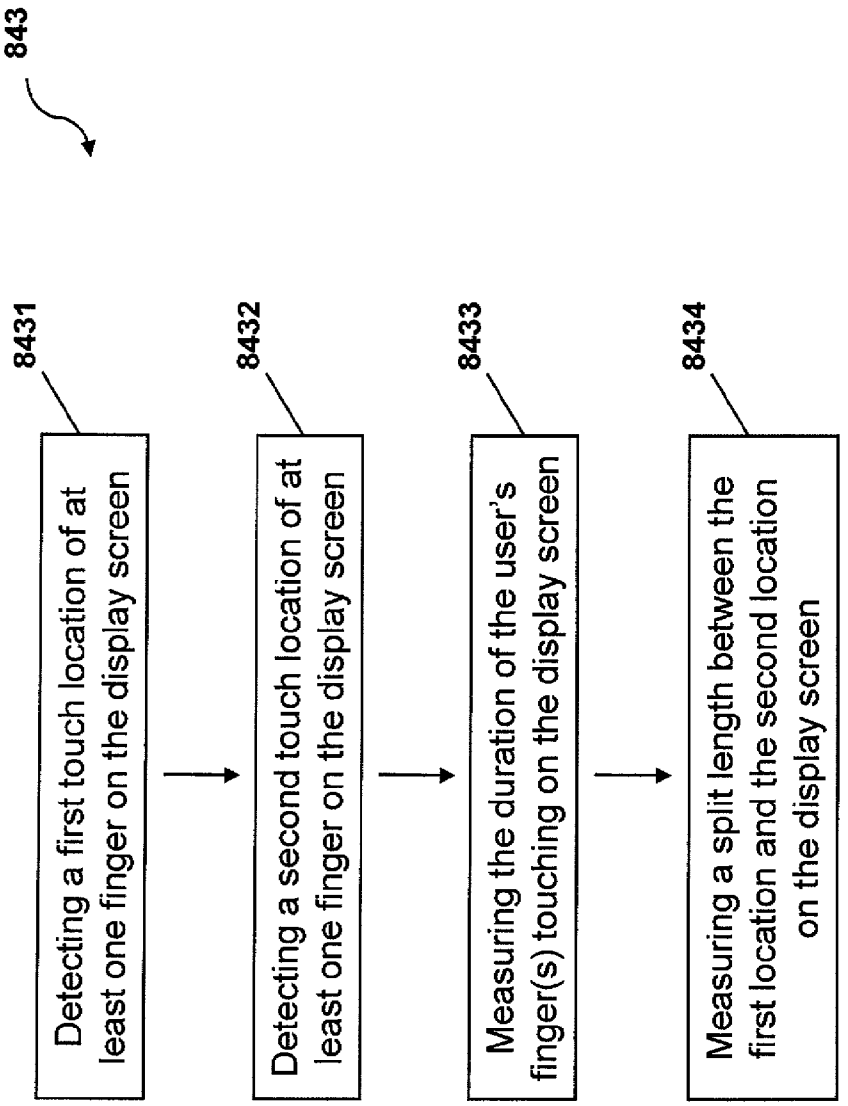

843
8431
Detecting a first touch location of at least one finger on the display screen
8432
Detecting a second touch location of at least one finger on the display screen
8433
Measuring the duration of the user's finger(s) touching on the display screen
8434
Measuring a split length between the first location and the second location on the display screen

FIG. 8b

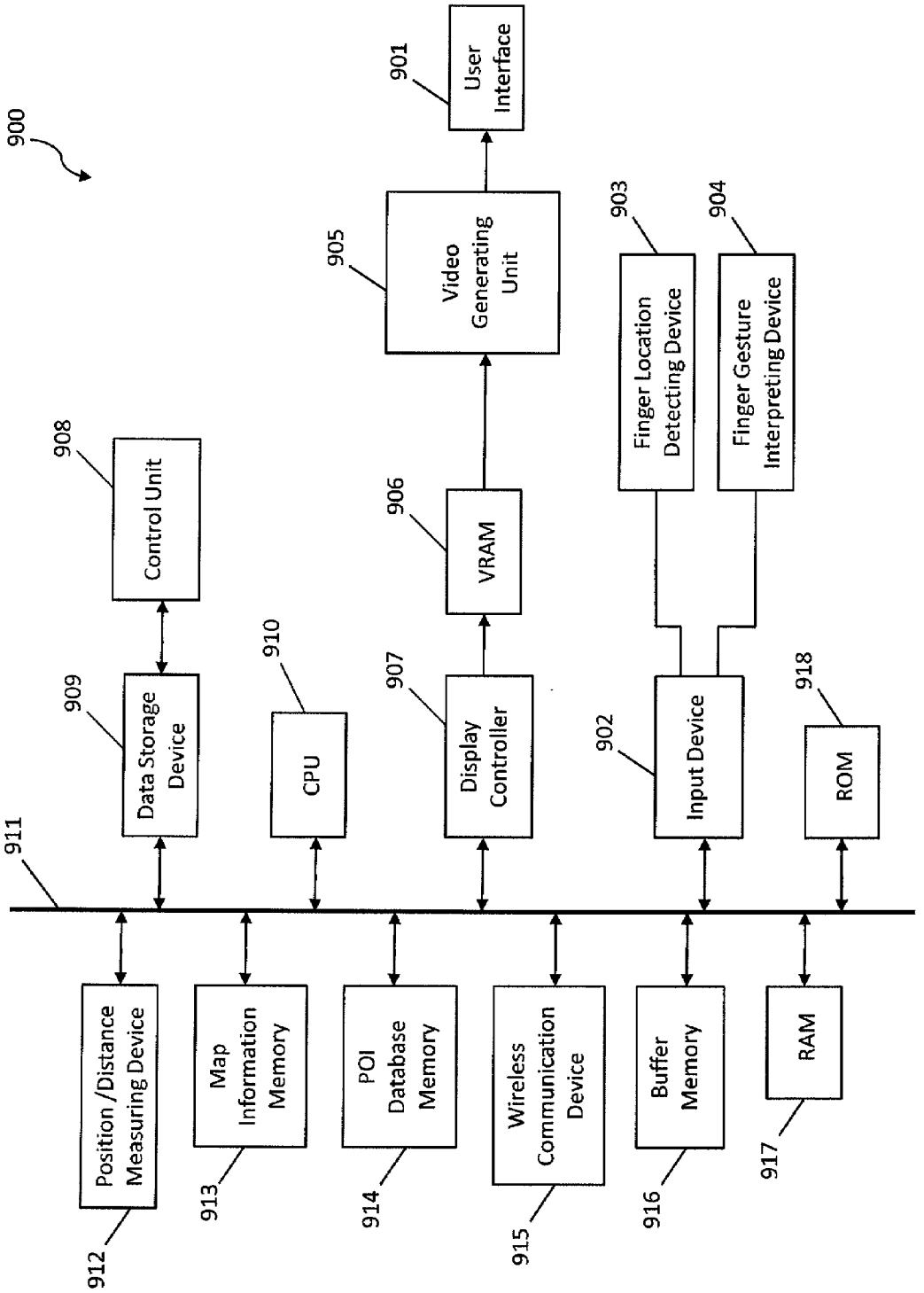

900
911
Position /Distance Measuring Device
912
Map Information Memory
913
POI Database Memory
914
Wireless Communication Device
915
Buffer Memory
916
RAM
917
Data Storage Device
909
Control Unit
908
CPU
910
Display Controller
907
VRAM
906
Video Generating Unit
905
User Interface
901
Input Device
902
Finger Location Detecting Device
903
Finger Gesture Interpreting Device
904
ROM
918

FIG. 9

METHOD AND APPARATUS FOR CONTROLLING AND DISPLAYING CONTENTS IN A USER INTERFACE

FIELD OF THE INVENTION

This invention relates to a display method and apparatus, and more particularly, this invention relates to a user interface with multiple applications which can be operated concurrently and/or independently by using simple finger gestures.

BACKGROUND OF THE INVENTION

With remarkable advances in computer technologies, the interface between a user and most computers has been transformed from a text-based interface to a graphical user interface (GUI). The GUI provides graphical icons or entities which allow the user to interact with computers, electronic devices, such as media players, gaming devices, and navigation systems, etc., such that almost every user can intuitively operate graphically interfaced devices without further knowledge or training in computer technologies.

Currently, some user interfaces of the electronic devices or systems require the user to go through a large number of menus to obtain desirable results, which may be time consuming, inflexible and counterintuitive. Furthermore, the limitation of the user interface may also constrain the electronic devices to provide increased functionality.

U.S. Pat. App. Pub. No. 2006/0066507 discloses a display apparatus that is capable of displaying a composite image of a plurality of contents on a display screen such that, when the display screen of a display unit is viewed from different viewing positions with different viewing angles with respect to a direction normal to the display screen, an image of each of the different contents corresponding to the respective viewing positions can be viewed on a viewing screen from the corresponding viewing position. Even though such a "dual view" display method is capable of displaying multiple contents on a display screen, the user cannot see different contents simultaneously at one viewing angle.

U.S. Pat. No. 6,636,246 to Gallo et al. discloses a method and system of providing a three dimensional spatial user interface (SUI) to a user of a computing device. The SUI may contain a plurality of portals arranged in a three dimensional graphical representation for display to a user. Each portal may include a sensory cue adapted to display content therein. However, Gallo does not teach anything associated with displaying more than one contents simultaneously in each sensory cue by dividing the sensory cue into more than one portions. Gallo also does not disclose an idea of using a fingertip gesture to split the sensory cue.

U.S. Pat. No. 6,880,132 to Uemura discloses an information processing apparatus and method, and a program in which when various files or contents are listed and displayed, a three-dimensional body is provided to improve operability. In one embodiment, the information processing apparatus comprises means for forming at least a part of a three-dimensional body by a plurality of panels having attached thereto images, corresponding to a plurality of files or folders, the plurality of panels are arranged so as to form a side of a polygonal column, and displayed rotatably around a center axis of the polygonal column. Uemura, however, does not disclose anything related to displaying more than one contents simultaneously in each panel by dividing the sensory cue into more than one portions. Uemura also does not disclose the idea of using a fingertip gesture to split the panel.

Therefore, there remains a need for a new and improved display apparatus and method of displaying multiple applications in a display screen, and the user can view multiple applications simultaneously and move the applications around on the display screen by using simple finger gestures.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a user interface which allows a user to intuitively operate and control digital information, functions, applications, etc. to improve operability.

It is another object of the present invention to allow the user to view multiple applications simultaneously by controlling the user interface with simple finger gestures.

It is still another object of the present invention to allow the user to navigate the user interface via a "virtual spindle metaphor," in which the virtual workspace may extend beyond the physical user interface and each function, application, service, etc. can reside in a spindle style rotary configuration.

It is a further object of the present invention to reduce driver distraction when the display screen can be split and each application can be moved around. By configuring in such a way, the passenger can operate the navigation system while the user is driving.

The present invention relates to a display method and apparatus, and more particularly, this invention relates to an intuitive and flexible user interface for infotainment devices. The display apparatus may include a display screen to display at least one application thereon; a location detecting unit; a gesture interpreting unit; and an application managing unit, in which the location detecting unit is configured to detect at least one finger from a starting point to an ending point on the display screen, the gesture interpreting unit, which is communicatively coupled with the location detecting unit, is configured to recognize and interpret the user's finger gesture on the display screen, and if the user's finger gesture is interpreted to split the display screen to at least two display segments, the application managing unit is programmed to enable at least one application displayed on one display segment.

In one embodiment, the location detecting unit may include a location sensing unit to detect the location of the finger(s), and the gesture interpreting unit may include a length measuring unit to determine a split length between the starting and ending points of the finger(s) on the display screen and if the split length is longer than a predetermined length, the display screen may be split into at least two display segments.

In another embodiment, the display apparatus may also include a control unit, which is communicatively connected with the location detecting unit and the gesture interpreting unit and adapted to control the entire screen splitting and displaying process. Furthermore, the application managing unit may comprise a video generating unit which is configured to receive a command from the control unit to generate corresponding video image according to the user's finger gesture.

In another aspect, the present invention provides a display method comprising the steps of generating a polygonal column including a plurality of polygonal units; associating an application with each of the polygonal units; displaying each application in the polygonal unit on a display screen; and arranging the display screen to simultaneously display at least two applications, in which the display screen is controlled by a user's finger gesture to split into at least two display segments to display at least two applications.

In the method of the present invention, the step of displaying each application in the polygonal unit on a display screen may include the step of grouping the plurality of applications hierarchically, such that the applications grouped in the same hierarchy can be simultaneously displayed.

In the method of the present invention, the step of displaying each application in the polygonal unit on the display screen includes the step of searching for a specific application in the polygonal unit, which may further include a step of spinning the polygonal unit around a central axis on the display screen.

In the method of the present invention, the display method may further include a step of using the finger gesture to execute a specific application. In one embodiment, the user may tap on the specific application twice to execute it. In another embodiment, the user may press the specific application for a predetermined period of time to execute it. Furthermore, the executed application may include one or more sub-applications in a different hierarchy which are simultaneously displayed in another polygonal column.

In the method of the present invention, the step of arranging the display screen to simultaneously display at least two applications includes the steps of detecting a first location of at least one finger on the user interface; detecting a second location of the finger on the user interface; calculating a split length between the first location and the second location of the finger; determining whether the split length is sufficient to split the user interface; and splitting the user interface into at least two display segments to display at least two different applications.

In the method of the present invention, the step of determining whether the length is sufficient to split the display unit includes the step of determining whether the split length is greater than a predetermined reference length.

In one embodiment, each application in the display segment may also be displayed in the form of the polygonal column, and the user is allowed to spin each column to search for desirable applications. In addition, the applications simultaneously displayed on different display segments can be in the same or different group of hierarchy.

In a further embodiment, the display method in the present invention may further comprise a step of moving the application in each display segment to a desirable position. For example, some navigation systems can prevent the driver from operating the systems by detecting the incoming direction of the finger, and the passenger is usually allowed to perform such operation. By utilizing the present invention, the driver can simply move the navigation display segment to the passenger side, and not only can the navigation be operated, but the driver distraction is significantly reduced.

The present invention together with the above and other advantages may best be understood from the following detailed description of the embodiments of the invention illustrated in the drawings below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a prior art, related to a display apparatus that is capable of displaying a composite image of a plurality of contents on a display screen, and the user is able to view different contents from different viewing positions or angles.

FIG. **2** illustrates a prior art, related to a method and system of providing a three dimensional spatial user interface (SUI) to a user of a computing device.

FIG. **3** illustrates an information processing apparatus and method, and a program in which when various files or contents are listed and displayed, a three-dimensional body is provided to improve operability.

FIG. **4** illustrates a functional structure of a user interface for implementing the display method in the present invention.

FIG. **4***a* illustrates one embodiment in the present invention to, depict finger gestures and corresponding actions in the present invention.

FIGS. **4***b* and **4***c* illustrate one example according to the embodiment in FIG. **4**, in which the user executes a specific application by tapping the application twice or pressing the application for a predetermined period of time.

FIGS. **4***d* and **4***e* illustrate another example according to the embodiment in FIG. **4**, in which the user uses one finger to drag down the spindle to search for a desirable application.

FIGS. **4***f* and **4***g* illustrate a further example according to the embodiment in FIG. **4**, in which the user is allowed to view the contents of one application, and the contents are also arranged in a spindle form.

FIGS. **5**, **5***a* and **5***b* illustrate a further embodiment of the present invention in which the user is allowed to split the display screen to two display segments by using a dragging-down gesture with two fingers.

FIGS. **5***c* and **5***d* depict another embodiment in which the user is allowed to select different applications in one of the display segments.

FIGS. **5***e* and **5***f* depict another embodiment in which the applications in different display segments can be swapped by the user's finger gesture.

FIGS. **6**, **6***a* to **6***c* illustrate another embodiment in the present invention in which the user is allowed to close one application by the user's finger gesture.

FIGS. **7**, **7***a* to **7***c* illustrate a further embodiment in the present invention in which the user is allowed to further split the display segment and close one of the applications by the user's finger gesture.

FIGS. **8**, **8***a* and **8***b* illustrate another aspect of the present invention, depicting a display method for controlling and displaying contents on a user interface.

FIG. **9** illustrates a functional block diagram showing an example of structure of a navigation system implementing the method and apparatus for controlling and displaying contents on a user interface.

DETAILED DESCRIPTION OF THE INVENTION

The detailed description set forth below is intended as a description of the presently exemplary device provided in accordance with aspects of the present invention and is not intended to represent the only forms in which the present invention may be prepared or utilized. It is to be understood, rather, that the same or equivalent functions and components may be accomplished by different embodiments that are also intended to be encompassed within the spirit and scope of the invention.

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood to one of ordinary skill in the art to which this invention belongs. Although any methods, devices and materials similar or equivalent to those described can be used in the practice or testing of the invention, the exemplary methods, devices and materials are now described.

All publications mentioned are incorporated by reference for the purpose of describing and disclosing, for example, the designs and methodologies that are described in the publications which might be used in connection with the presently described invention. The publications listed or discussed above, below and throughout the text are provided solely for

their disclosure prior to the filing date of the present application. Nothing herein is to be construed as an admission that the inventors are not entitled to antedate such disclosure by virtue of prior invention.

This invention relates to a display method and apparatus, and more particularly, this invention relates to a user interface with multiple applications which can be operated concurrently and/or independently by using simple finger gestures. Furthermore, the user is allowed to intuitively operate and control digital information, functions, applications, etc. to improve operability. In one exemplary embodiment of the present invention, the user is able to use finger gesture to navigate the user interface via a "virtual spindle metaphor" to select different applications. The user can also split the user interface to at least two display segments which may contain different applications. Moreover, each display segment can be moved to a desirable location on the user interface to provide a user-friendly operating environment without using any menu.

FIG. **4** illustrates a functional structure of a user interface **400** for implementing the display method in the present invention, which may include a location detecting device **401**, a gesture interpreting device **402**, a database **403**, a controller **404**, a video generator **405**, a display unit **406** and a bus **407**. The location detection device **401**, which may include one or more touch sensors, is adapted to detect the location of the user's finger on the display unit **406**. A gesture interpreting device **402**, which is communicatively coupled with the location detecting device **401**, is configured to interpret the user's finger gesture on the display unit **406**. Sometimes, it may be difficult to interpret or recognize the user's finger gesture, the gesture interpreting device **402** may also include one or more length calculating units and direction determining units to determine the length and direction of the user's finger gesture. In one embodiment, the length drawn by the user has to be greater than a predetermined length to split a screen or move applications in the present invention.

The controller **404** is adapted to receive the information provided by the location detection device **401** and the gesture interpreting device **402**, analyze such information and control the overall screen splitting or application moving operation. The video generator **405** is configured to generate video data shown on the display unit **406** according to the results provided by the controller **404**. The database **403** stores information such as application panels and contents therein.

FIG. **4***a* illustrates a table **408** which depicts finger gestures and corresponding actions in the present invention. The finger gestures and corresponding actions are not limited in the table **408**, but may have other variations. In one implementation, the table **408** can be integrated into the gesture interpreting device **402** to analyze the user's finger gesture. In another embodiment, the user can design the table **408** according to his or her preference.

FIGS. **4***b* to **4***g* illustrate a number of examples in more detail according to one embodiment of the present invention. The user interface **400** may comprise the display unit **406** comprising a screen **410**, and an application assembly **420** which includes a plurality of applications. As can be seen in FIG. **4***b*, the applications in the application assembly **420** may be arranged in a spindle form **430** which may include a plurality of application panels such as Navigation **431**, Audio **432**, Video **433**, Phone **434**, Game **435**, etc. Furthermore, in order to provide a friendly user interface, the font of each application panel may change according to the location of each application, namely, the font of each application panel may increase when the application panel is moving closer to a center line **440**. For example, the font in the Navigation panel **431**, which is the closest panel to the center line **440**, is larger than the fonts in the Audio panel **432**, Video panel **433**, Phone panel **434** and the Game panel **435**.

The screen **410** may be a touch screen or multi-touch device to allow a user to execute each application by either pressing the corresponding application panel for a predetermined period of time or tapping twice on the corresponding application panel. For example, as shown in FIGS. **4**, **4***b* and **4***c*, the location detecting device **401** detects the location of the user's finger (**4***b***1**) on the screen **410** and if the user wants to execute the application, e.g. Navigation **431**, by further pressing the Navigation panel **431** or tapping it twice, the gesture interpreting device **402** is adapted to recognize the finger gesture and transmit such information to the controller **404** through the bus **407**. The controller **404**, which is configured to control the overall operation of performing the display method in the present invention, sends a command to the video generator **405** and the display unit **406** to show the navigation screen **431'** with a map and the vehicle's current position. In another embodiment, the application can be executed by a rotary mechanical dial.

Furthermore, the user can select different applications in the spindle **430** by spinning it around the center line **440**. For example, as can be seen in FIGS. **4***d* and **4***e*, if the Navigation panel **431** is at the middle of the screen **410** and user wants to view the contents in the Audio panel **432** which is just above the Navigation panel **431**, the user can use one finger to slightly drag down or spin the spindle **430** so that the Audio panel **432** will be shown in the middle of the screen **410** for the user to operate. Similarly, the user can view the contents in the Audio panel **432** by tapping it twice on the screen **410**. As depicted in FIGS. **4***f* and **4***g*, the contents in the Audio panel **432** can also be shown in a sub-application assembly **420'** which is also in a spindle form **430'**, including applications such as iPod **450**, FM Radio **451**, AM Radio **452**, CD **453**, Satellite Radio **454**, Audio setting **455**, etc. The user can take the same action when the user is interested in viewing the contents in the sub-application assembly **420'**. For example, if the user wants to listen to some music from a CD player, the user can tap the CD panel **453** twice to see music titles in a CD and again tap twice on the specific music title to listen. Likewise, the user can view the contents in the Video panel **433**, the Phone panel **434** and the Game panel **435**. In some embodiments, the spindles **430** and **430'** can be spun faster if the user applies more force to drag down the spindles **430** and **430'**.

In another embodiment shown in FIGS. **5**, **5***a* and **5***b*, if the user wishes to have a "dual view" on the screen **410**, the user may be allowed to split the screen **410** into at least two display segments (**530**, **530'**) by using the "two finger dragging down" gesture exemplified in the table **408** in FIG. **4***a*. As described above, the location detecting device **401** detects the location of the user's fingers (**501**, **502**) and the gesture interpreting device **402** is adapted to interpret and recognize the user's gesture. In the current embodiment, the gesture interpreting device **402** may further include a touch sensor (not shown) to detect the number of the user's finger on the screen **410**. Once the touch sensor determines the number of the user's finger, such information is transmitted to the gesture interpreting device **402** to recognize the finger gesture, and the controller **404** starts and controls the screen splitting process. The screen **410** can be split when a smaller spindle **530'** starts to spin by the two-finger gesture and the screen splitting process may stop when one of the application panels (e.g. Audio **432**) is mainly shown on one side of the screen **510'**.

Similar to the spindle **430**, the smaller spindle **530'** includes a plurality of application panels and if the user wants to view other application panels on the smaller spindle **530'** while using the Navigation **431**, the user can simply use one finger to spin the smaller spindle **530'** at the lower corner of the left side of the screen **510'** until a desirable application is found, as shown in FIGS. **5***c* and **5***d*. The user can also view the content of each application panel in the smaller spindle **530'** by either pressing or tapping twice on the corresponding application panel, as previously shown in FIGS. **4***d* and **4***e*.

In some vehicle navigation systems, the driver is prohibited from operating the navigation system while driving to avoid driver distraction. It may be inconvenient for the driver if operating the navigation system is necessary to search or reroute. This problem can be solved if the passenger in the vehicle can operate the navigation system when the driver is driving. As can be seen in FIGS. **5***e* and **5***f*, there are two screens **510** and **510'** on the display unit **406**, and the Navigation panel **431** is shown on the left screen **510'** while the Audio panel **432** is shown on the right screen **510**. Assuming that the driver is on the left side and being prohibited from operating the navigation system, the driver can simply swap the Navigation panel **431** to the passenger side on the right, such that the navigation system can still be operated while the driver is driving.

More specifically, in the current embodiment, the location detecting device **401** can detect the location of the user's finger(s) for example, at a touching point **5***c***1** on the screen **510'** and another touching point **5***c***2** on the screen **510**. When the user slightly rotates the fingers as if simultaneously moving the touching point **5***c***1** to the screen **510** and the touching point **5***c***2** to the screen **510'**, the gesture interpreting device **402** can recognize the user's finger gesture and transmit such information to the controller **404** which may control the entire screen swapping process. As described above, a command may be sent from the controller **404** to the video generator **405** to swap the screens **510** and **510'** on the display unit **406**.

In another embodiment, the user can use simple finger gesture to close an unwanted application. Referring to FIGS. **6** and **6***a*, the user can spin the smaller spindle **530'** to select a different application by dragging down the screen **510'** with one finger, as previously shown in FIGS. **5***c* and **5***d*. As can be seen in FIG. **6***b*, two applications, Phone **434** and Navigation **431**, are located on the display segments **510'** and **510**, respectively. If the user wishes to close the Navigation **431** application, the user can simply slide the Phone **434** application on the display segment **510'** to the Navigation **431** on the display segment **510**, and the two display segments **510'** and **510** will be merged to the screen **410** with the Phone **434** application thereon, as shown in FIG. **6***c*. On the other hand, if the user wants to keep the Navigation application **431** and get rid of the Phone application **434**, the user can slide the Navigation application **431** to the left side where the Phone application **434** is located.

Likewise, the location detecting device **401** is adapted to detect the user's finger locations **601** and **6***b***1**, and the gesture interpreting device **402** is configured to interpret different finger gestures shown in FIGS. **6** and **6***b*, the former is to spin the spindle and the latter is to close an unwanted application. Upon receiving different gesture information from the gesture interpreting device **402**, the controller **404** is adapted to send different commands to the video generator **405** and the display unit **406** to generate different images, responding to the user's finger gestures.

Referring to FIGS. **7**, **7***a* and **7***b*, when two applications are shown simultaneously at the display segments **510** and **510'**, the display segment can be further split to multiple display portions. For example, as shown in FIG. **7***a* when the user drags the Audio panel **432** down and stops when the Phone panel **434** is close to the center line **440**, the display segment **510'** can be further split to two display portions **7***b***1** and **7***b***2**, which contain the applications of Phone **434** and Audio **432**, respectively. In one embodiment, if the Phone panel **434** is being dragged over the center line **440**, the Audio panel **432** may be replaced by the Phone panel **434**. As can be seen in FIG. **7***b*, the display unit **406** includes three applications, Navigation **431** on the display segment **510** on the right side, and Audio **432** and Phone **434** on the two display portions **7***b***1** and **7***b***2** on the left side. If the user decides to close the Navigation panel **431** on the display segment **510** and moves the Audio panel **432** thereto, the user can simply slide the Audio panel **432** to the display segment **510** where the Navigation panel **431** is located, in which the Audio panel **432** will replace the Navigation panel **431** on the display segment **510**, as shown in FIG. **7***c*.

According to another aspect illustrated in FIG. **8**, a display method includes the steps of generating a polygonal column including a plurality of polygonal units **810**; associating an application with each of the polygonal units **820**; displaying each application in the polygonal unit on a display screen **830**; and arranging the user interface to simultaneously display at least two applications **840**, in which the display screen is controlled by a user's finger gesture to split into at least two display segments to display at least two applications.

In step **810**, the polygonal column and units can be generated by the video generator **405** according to the information stored in the database **403**. Likewise, the information of each application can also be stored in the database **403**. In one embodiment; the step of displaying each application in the polygonal unit on a display screen **830** may include the step of grouping the plurality of applications hierarchically, such that the applications grouped in the same hierarchy can be simultaneously displayed. In another embodiment, the step of displaying each application in the polygonal unit on a display screen **830** may also include the step of searching for a specific application in the polygonal unit, which may further include a step of spinning the polygonal column around a central axis on the display screen **410**.

Referring to FIG. **8***a*, the step of arranging the display screen to simultaneously display at least two applications **840** includes the steps of detecting the user's finger location on the display screen **841**; detecting the user's finger gesture **842**; determining whether the user is splitting the display screen **843**; and splitting the display screen into at least two display segments to display at least two different applications if the user's gesture is recognized to split the display screen **845**. In step **844**, if the user's finger gesture is not recognized to split the screen, the finger gesture may be again interpreted or recognized in step **842**.

In one embodiment, the location detecting device **401** is adapted to detect the user's finger location on the display screen in step **841**, while the gesture interpreting device **402** is used to interpret the user's finger gesture in step **842**. If the user's finger gesture is interpreted to split the display screen, the controller **404** and the video generator **405**, as described above, are configured to split the display screen to simultaneously display at least two applications on the display unit **406**, as shown in step **845**.

The step of determining whether the user is splitting the display screen **843** may include the steps of detecting a first touch location of at least one finger on the display screen **8431**, detecting a second touch location of at least one finger on the display screen **8432**, measuring the duration of the user's finger(s) touching on the display screen **8433**, and

measuring a split length between the first location and the second location on the display screen **8434**. The location detecting device **401** may be used to detect the location of the user's finger(s) in steps **8431** and **8432**. The gesture interpreting device **402** may further include a time measuring unit (not shown) and a length measuring unit (not shown) to measure the touch duration of the user's finger(s) and the length between the first and the second touch locations on the display screen. The controller **404** is configured to determine whether the user's finger gesture indicates to split the screen, according to the information collected in steps **8431** to **8434**.

FIG. **9** is a block diagram showing an example of structure of a navigation system **900** for implementing the present invention in another aspect. The navigation system **900** includes a user interface **901**, an input device **902** which includes a finger location detecting device **903** and a finger gesture interpreting device **904**, a video generating unit **905**, a VRAM **906** and a display controller **907**. The finger location detecting device **903** and the finger gesture interpreting device **904**, like the location detecting device **401** and the gesture interpreting device **402** in FIG. **4**, are adapted to provide information to the display controller **907** to determine the meaning of the user's finger gestures, and further manage the entire image display process.

The VRAM **906** is used for storing images generated by the display controller **907**, and the video generating unit **905**, like the video generator **405** in FIG. **4**, is configured to receive commands from the display controller **907** to generate different video images according to the user's finger gestures. All embodiments and examples described above in FIGS. **4**, **4***a* to **4***g*, **5**, **5***a* to **5***f*, **6**, **6***a* to **6***c*, **7**, **7***a* to **7***c* can also be applied in the navigation system **900**.

The system also includes a data storage device **909** such as a hard disc, CD-ROM, DVD or other storage means for storing the map data; a control unit **908** for controlling an operation for reading the information from the data storage device **909**; and a position and distance measuring device **912** for measuring the present vehicle position or user position. For example, the position and distance measuring device **912** has a speed sensor for detecting a moving distance, a gyroscope for detecting a moving direction, a microprocessor for calculating a position, a GPS (global positioning system) receiver for receiving GPS signals from satellites for calculating a current position of the user. In one embodiment, the input device **902** is communicatively coupled with the position and distance measuring device **912**, the display controller **907**, the video generator **905** and the user interface **901** to display a map with the vehicle's current position if the user's finger gesture indicates so. For example, as previously shown in FIGS. **4***b* and **4***c*, the user's finger gesture (tapping on the Navigation panel **431** twice) indicates that the user may need to view the navigation screen **431'**.

The block diagram of FIG. **9** further includes a map information memory **913** for storing the map information which is read from data storage **909**, a database memory **914** for storing database information such a point of interest (POI) information which is read out from the data storage device **909**. Still referring to FIG. **9**, the navigation system **900** includes a bus **911** for interfacing the above units in the system, a processor (CPU) **910** for controlling an overall operation of the navigation system **900**, a ROM **918** for storing various control programs such as a route search program and a map matching program necessary for navigation control, a RAM **917** for storing a processing result such as a guide route and an event notification, a wireless communication device **915** to retrieve data from a remote server, the Internet or other communication networks, and a buffer memory **916** for temporary storing data for ease of data processing.

The invention claimed is:

1. A user interface, comprising:

a controller for controlling an overall operation of the interface unit, the controller being configured to associate an application with each of a plurality of polygonal units;

a video generator operatively connected to the controller and configured to generate a polygonal column including said plurality of polygonal units;

a display screen operatively connected to the controller and video generator unit and configured to display each application in the polygonal unit thereon and

a gesture interpreting device operatively connected to the controller and configured to interpret a user's finger gesture on the display screen so as to display each application according to the user's finger gesture,

wherein the display screen is controlled by the controller based on the user's finger gesture to display one application or split into at least two display segments to simultaneously display at least two different applications which can be operated concurrently and/or independently, and

wherein the gesture interpreting device detects a user's finger location on the display screen, detects the user's finger gesture, determines whether the user is splitting the display screen, and splits the display screen into at least two display segments to display at least two different applications when the user's gesture is recognized to split the display screen by detecting a plurality of the user's fingers on the display screen.

2. The user interface of claim **1**,

wherein said controller is configured to group said applications hierarchically to display the applications in the same hierarchy simultaneously, wherein the application includes a source, a function, a music title and a medium title.

3. The user interface of claim **1**, further comprising a location detecting device operatively connected to the controller and gesture interpreting device and configured to detect the user's finger location on the display screen,

wherein the gesture interpreting device detects the user's finger gesture based on information from the location detecting device,

wherein the controller determines whether the user is splitting the display screen based on information from the gesture interpreting device, and

wherein the controller causes the display screen to split into at least two display segments to display at least two different applications if the user's gesture is recognized to split the display screen.

4. The user interface of claim **3**,

wherein when determining whether the user is splitting the display screen, the location detecting device detects a first touch location of at least one finger on the display screen, and a second touch location of at least one finger on the display screen,

and wherein the gesture interpreting device measures a duration of the user's finger(s) touching on the display screen, and a split length between the first location and the second location on the display screen detected by the location detecting device.

5. The user interface of claim **4**,

wherein when measuring a split length between the first location and the second location on the display screen, the gesture interpreting device determines whether the

split length is longer than a predetermined reference length and across a center line of the display screen, and

wherein the controller causes the display screen to spilt if the split length is longer than the predetermined reference length and across the center line of the display screen.

6. The user interface of claim **3**,

wherein the controller causes the display screen to display at each application according to a user's finger gesture and to move at least one application to a desirable position on the display screen.

7. A display method comprising the following steps of:

generating a polygonal column including a plurality of polygonal units;

associating an application with each of said polygonal units;

displaying each application in the polygonal unit on a display screen; and

arranging the user interface to display each application according to a user's finger gesture,

wherein the display screen is controlled by the user's finger gesture to display one application or split into at least two display segments to simultaneously display at least two different applications which can be operated concurrently and/or independently, and

wherein said step of arranging the user interface to display each application according to a user's gesture comprises steps of detecting a user's finger location on the display screen, detecting the user's finger gesture, determining whether the user is splitting the display screen, and splitting the display screen into at least two display segments to display at least two different applications when the user's gesture is recognized to split the display screen by detecting a plurality of the user's fingers on the display screen.

8. The display method of claim **7**, wherein said step of displaying each application in the polygonal unit on a display screen comprises the step of grouping said applications hierarchically to display the applications in the same hierarchy simultaneously, wherein the application includes a source, a function, a music title and a medium title.

9. The display method of claim **8**, wherein the display method further comprises the step of searching for a specific application by spinning the polygonal column.

10. The display method of claim **7**, wherein said step of arranging the display screen to display each application according to a user's gesture comprises the steps of detecting the user's finger location on the display screen, detecting the user's finger gesture, determining whether the user is splitting the display screen, and splitting the display screen into at least two display segments to display at least two different applications if the user's gesture is recognized to split the display screen.

11. The display method of claim **10**, wherein said step of determining whether the user is splitting the display screen comprises the steps of detecting a first touch location of at least one finger on the display screen, detecting a second touch location of at least one finger on the display screen, measuring the duration of the user's finger(s) touching on the display screen, and measuring a split length between the first location and the second location on the display screen.

12. The display method of claim **11**, wherein said step of measuring a split length between the first location and the second location on the display screen comprises the step of determining whether the split length is longer than a predetermined reference length and across a center line of the display screen, wherein the screen is spilt if the split length is longer than the predetermined reference length and the across the center line of the display screen.

13. The display method of claim **10**, wherein said step of arranging the display screen to display each application according to a user's finger gesture further comprises the step of moving at least one application to a desirable position on the display screen.

14. A display apparatus, comprising:

a display screen to display at least one application thereon,

a location detecting unit configured to detect a location of at least one finger from a starting point to an ending point on the display screen;

a gesture interpreting unit communicatively coupled with the location detecting unit to recognize and interpret the user's finger gesture on the display screen; and

an application managing unit,

wherein if the user's finger gesture is interpreted to split the display screen to at least two display segments to simultaneously display at least two different applications which can be operated concurrently and/or independently, the application managing unit is programmed to enable at least one application displayed on one display segment, and

wherein the gesture interpreting unit detects the user's finger location on the display screen, detects the user's finger gesture, determines whether the user is splitting the display screen, and the display screen splits the display screen into at least two display segments to display at least two different applications when the user's gesture is recognized to split the display screen by detecting a plurality of the user's fingers on the display screen.

15. The display apparatus of claim **14**, wherein the gesture interpreting unit comprises a length measuring unit to determine a split length between the starting and ending points of the finger(s) on the display screen and if the split length is longer than a predetermined length, the display screen is split into at least two display segments.

16. The display apparatus of claim **14**, further comprises a control unit, which is communicatively connected with the location detecting unit and the gesture interpreting unit and adapted to control the entire screen splitting and displaying process.

17. The display apparatus of claim **16**, further comprises a video generating unit which is configured to receive a command from the control unit to generate corresponding video image according to the user's finger gesture.

18. The display apparatus of claim **17**, wherein the display apparatus is communicatively coupled with a vehicle navigation system to display a route guidance and a vehicle's current location on either the display screen or the display segment.

19. The display apparatus of claim **18**, wherein a vehicle driver is allowed to move the display segment displaying the route and the vehicle's current position on the display screen where a passenger is allowed to operate the navigation system.

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