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Lim et al.

(54) **NAVIGATION FOR A NON-TRADITIONALLY SHAPED LIQUID CRYSTAL DISPLAY FOR MOBILE HANDSET DEVICES**

(75) Inventors: **David Lim**, Vernon Hills, IL (US); **Mark Finney**, Chicago, IL (US); **Mark Oliver**, Mundelein, IL (US); **Paul Pierce**, Grayslake, IL (US); **Michael Sawadski**, Mount Prospect, IL (US); **Karl Voss**, Schaumburg, IL (US)

Correspondence Address:
PRASS LLP
2661 Riva Road, Bldg. 1000, Suite 1044
ANNAPOLIS, MD 21401 (US)

(73) Assignee: **Motorola, Inc.**, Schaumburg, IL (US)

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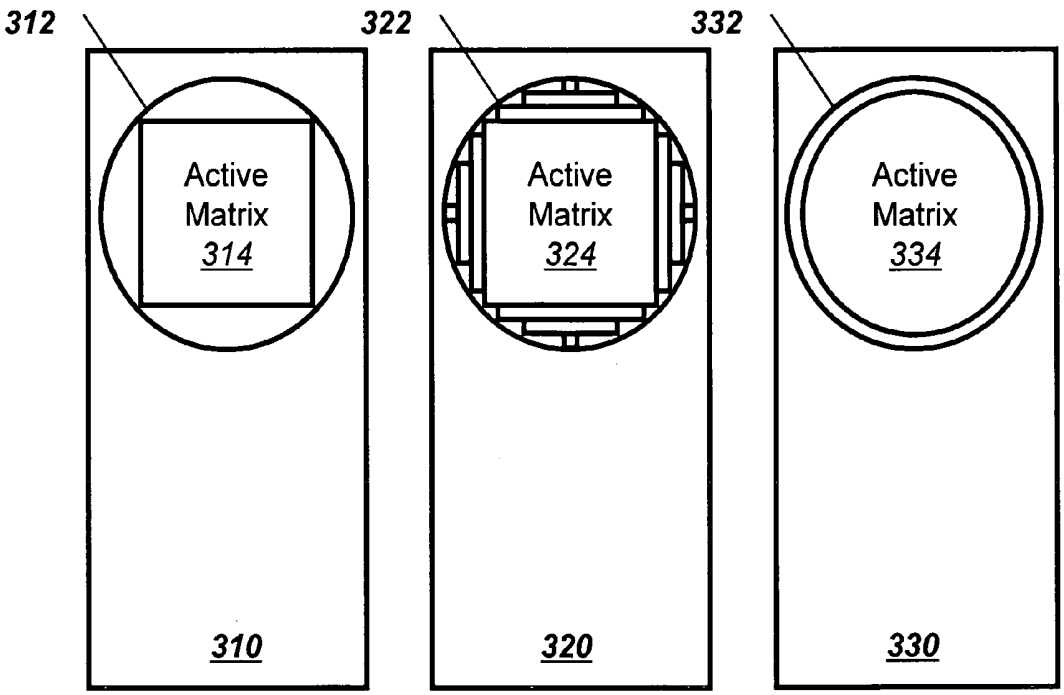
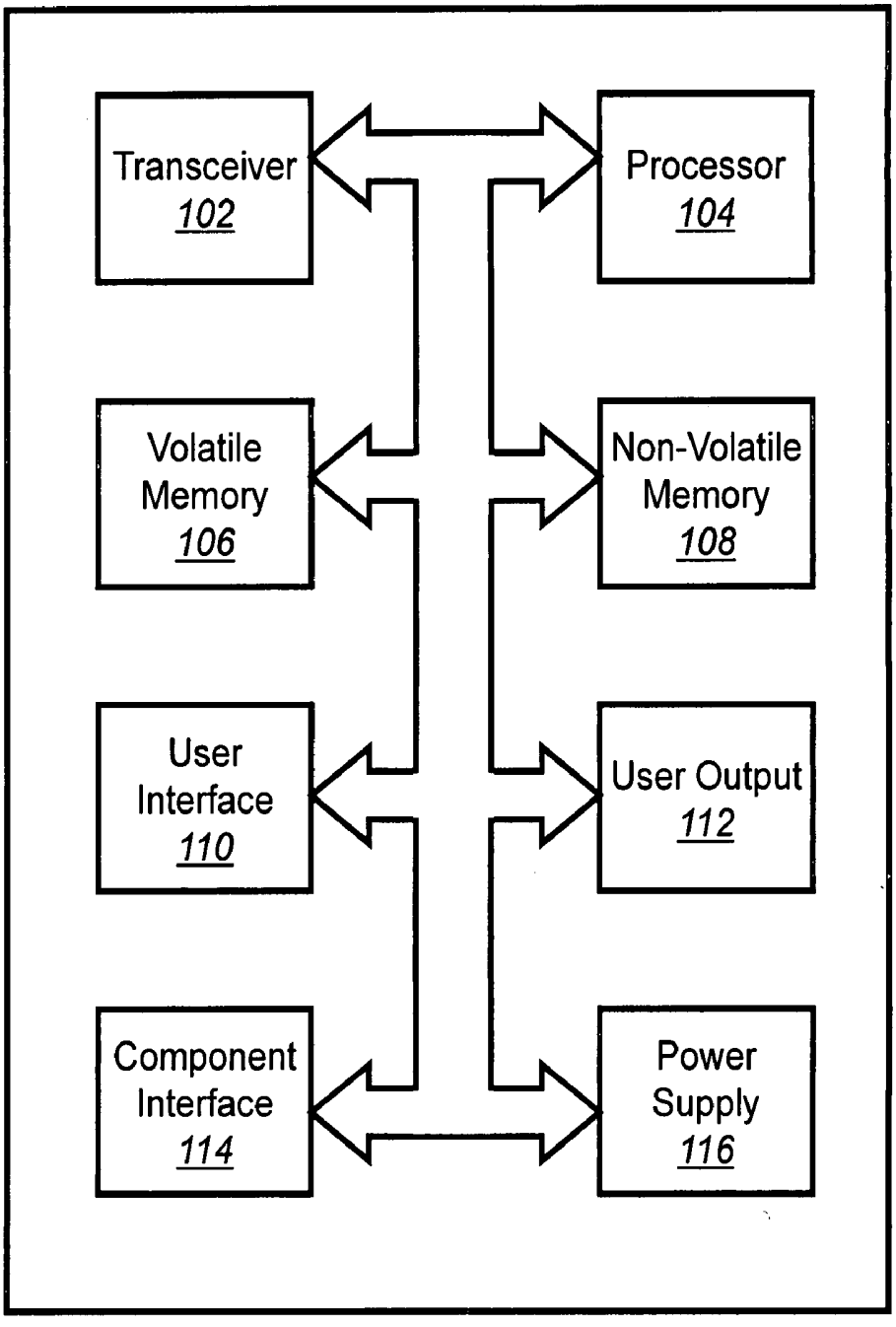
(57) **ABSTRACT**

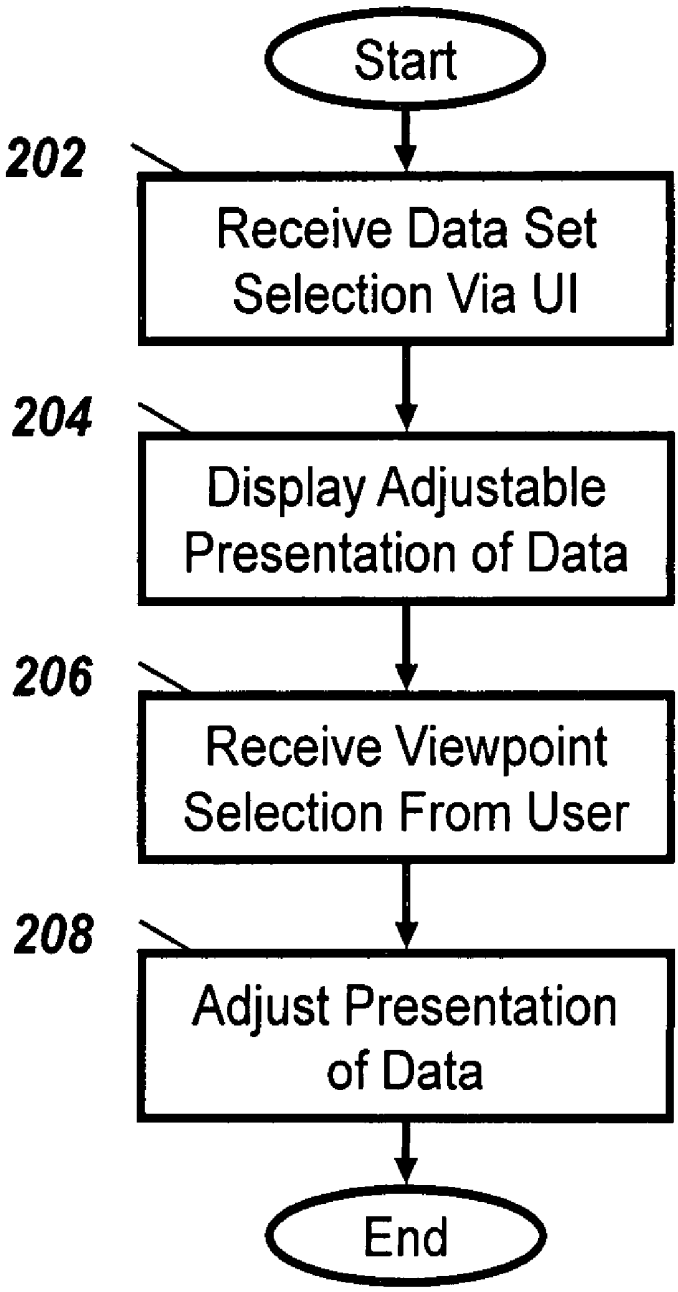
A method, apparatus, and electronic device for displaying data are disclosed. A non-rectangular addressable liquid crystal display **402** with a non-rectangular active area active matrix **334** may display an adjustable presentation of data. A display-integrated control key may control the presentation of data. A scrolling navigation control may scroll through the adjustable presentation of the data.




Transceiver
102
Processor
104
Volatile
Memory
106
Non-Volatile
Memory
108
User
Interface
110
User Output
112
Component
Interface
114
Power
Supply
116

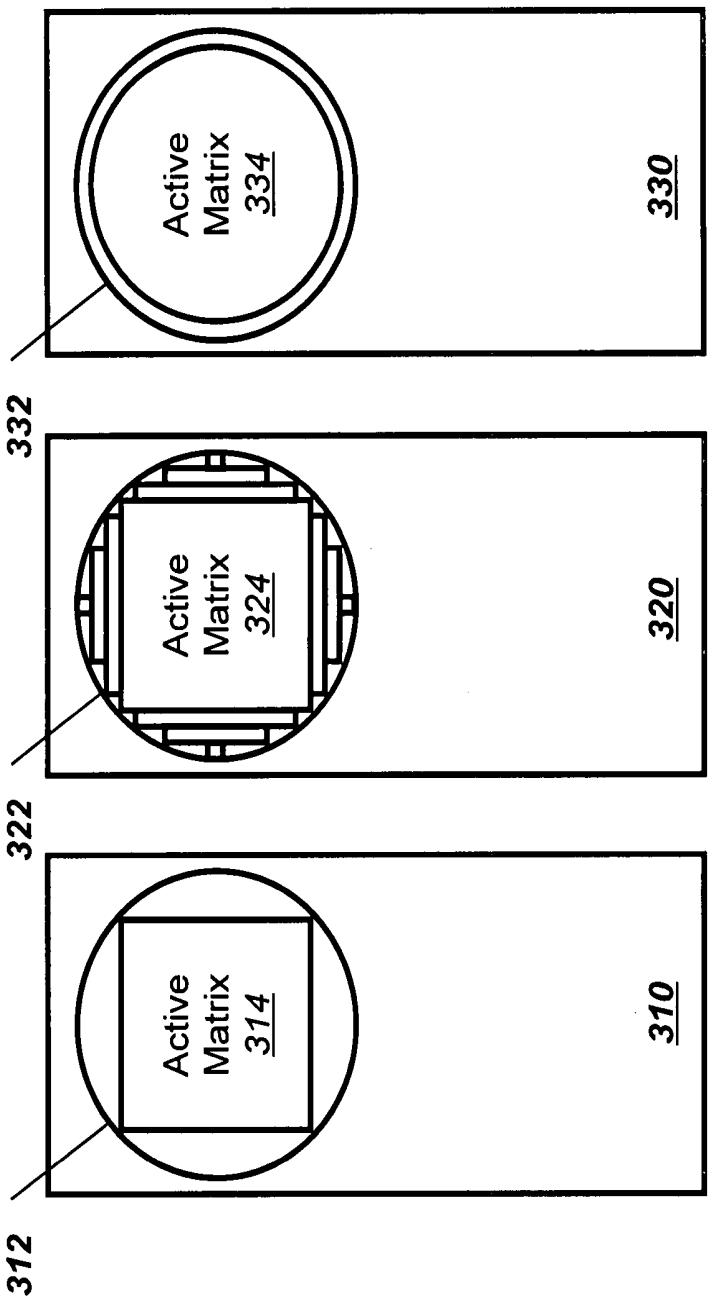
100

Figure 1

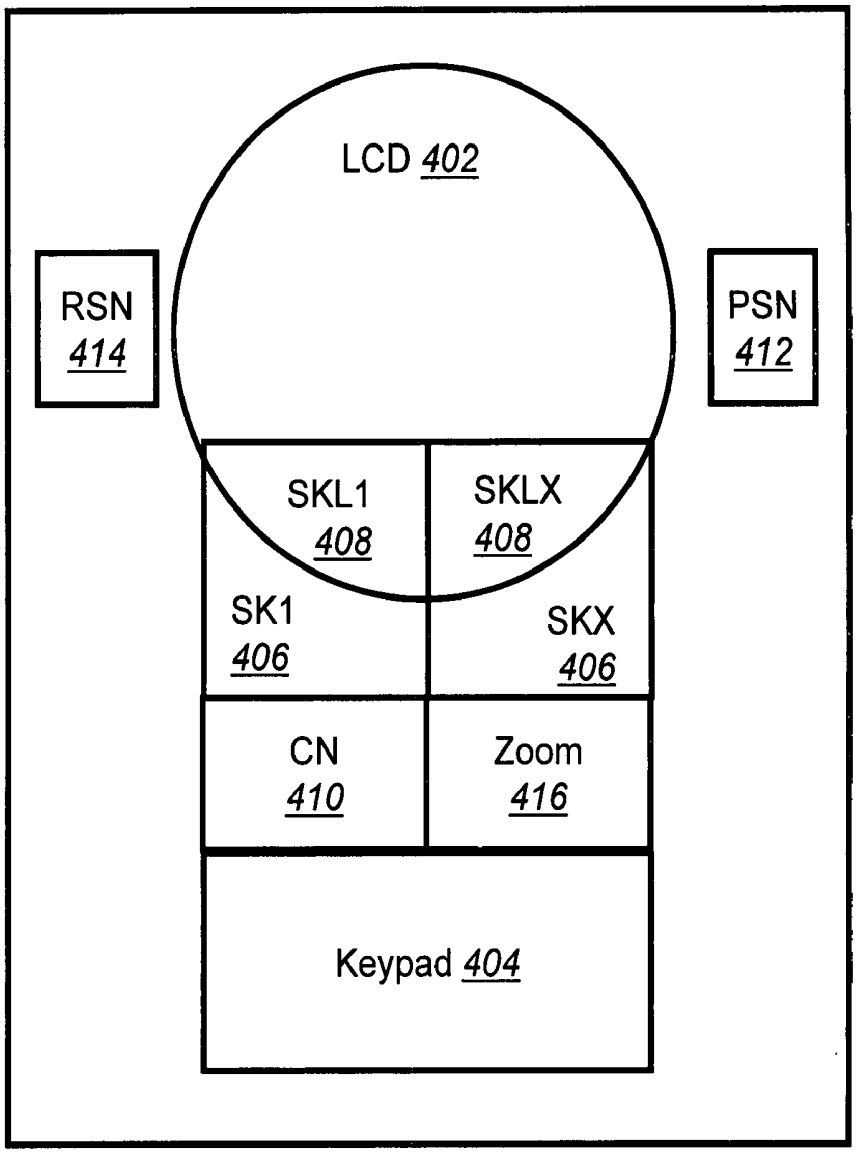

Start
202
Receive Data Set Selection Via UI
204
Display Adjustable Presentation of Data
206
Receive Viewpoint Selection From User
208
Adjust Presentation of Data
End

200

Figure 2

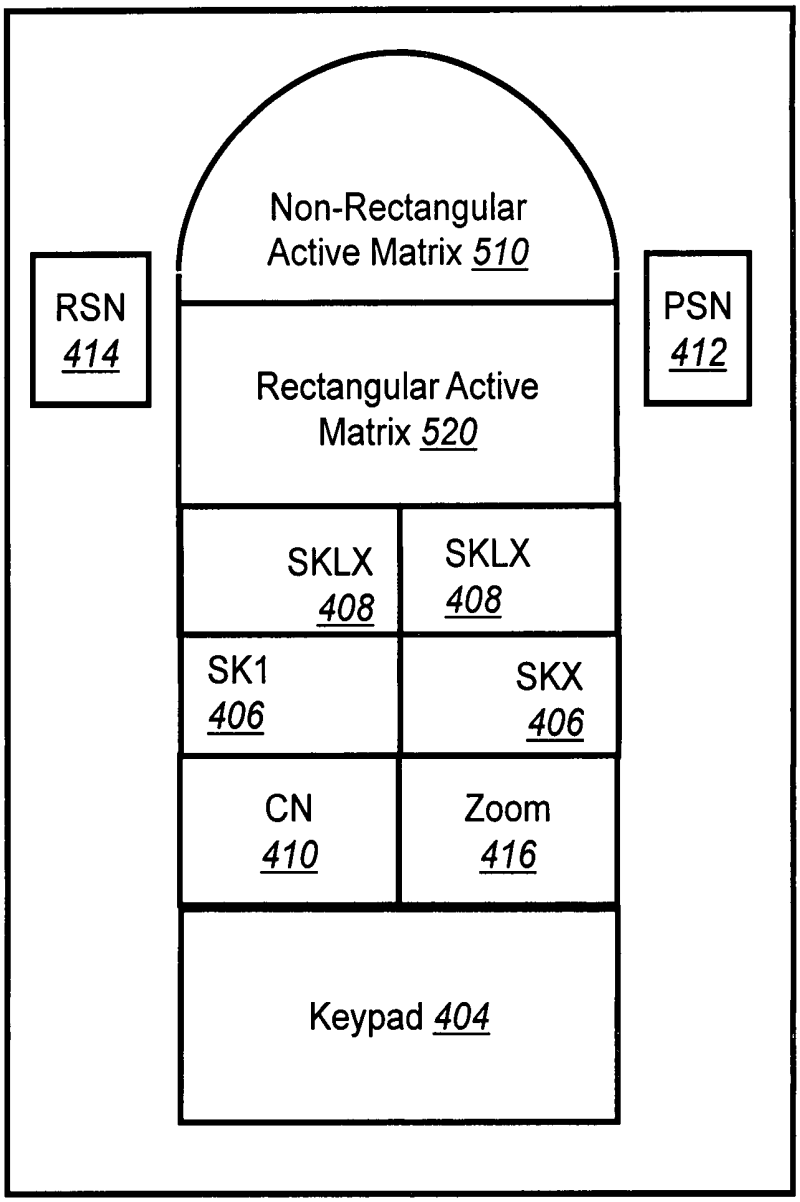

312
322
332
Active Matrix 314
310
Active Matrix 324
320
Active Matrix 334
330

300
Figure 3


LCD 402
RSN 414
PSN 412
SKL1 408
SKLX 408
SK1 406
SKX 406
CN 410
Zoom 416
Keypad 404

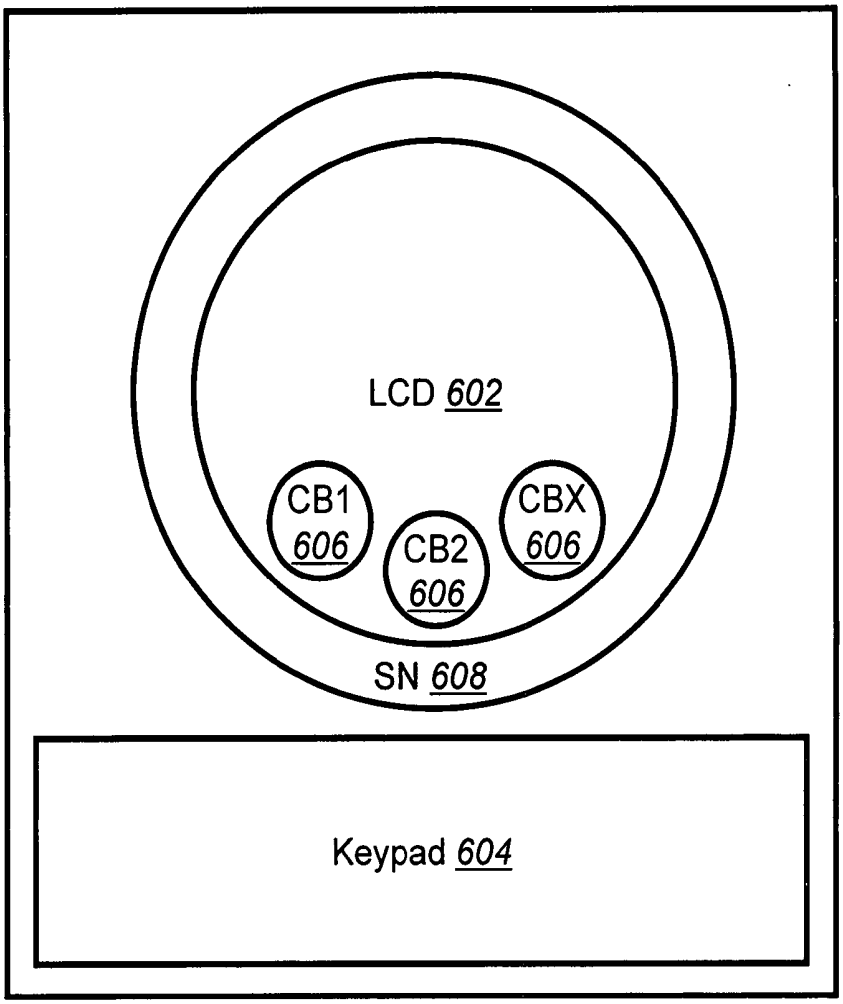
400

Figure 4


Non-Rectangular Active Matrix 510
RSN 414
PSN 412
Rectangular Active Matrix 520
SKLX 408
SKLX 408
SK1 406
SKX 406
CN 410
Zoom 416
Keypad 404

500

Figure 5



600

Figure 6

NAVIGATION FOR A NON-TRADITIONALLY SHAPED LIQUID CRYSTAL DISPLAY FOR MOBILE HANDSET DEVICES

1. FIELD OF THE INVENTION

[0001] The present invention relates to a method and system for displaying data. The present invention further relates to displaying data using non-traditional displays.

2. INTRODUCTION

[0002] Mobile computational devices may present data in a visual manner. One mechanism used to present visual data is a liquid crystal display (LCD). A traditional liquid crystal display (LCD) may be a thin, flat, rectangular display device. The LCD may have multiple color or monochrome pixels arranged before a light source, the pixels being activated or deactivated to create an image projected on the LCD screen.

[0003] Most mobile telecommunications devices that have displays have rectangular displays. These displays may be rectangular to more efficiently fit the casing of the mobile telecommunications devices. Further, most visual data is presented in the format in which it was originally created, as if on paper. Paper is two-dimensional. Paper is cut into rectangles to prevent waste, among other reasons. Thus, photos on paper and writing on paper also took a two-dimensional and rectangular form to match the medium. This form carried over to the electronic visual displays used by computational devices.

SUMMARY OF THE INVENTION

[0004] A method, apparatus, and electronic device for displaying data are disclosed. A non-rectangular liquid crystal display with a non-rectangular active area active matrix may display an adjustable presentation of data. A display-integrated control may control the presentation of data. A scrolling navigation control may scroll through the adjustable presentation of the data.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] In order to describe the manner in which the above-recited and other advantages and features of the invention can be obtained, a more particular description of the invention briefly described above will be rendered by reference to specific embodiments thereof which are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments of the invention and are not therefore to be considered to be limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

[0006] FIG. **1** illustrates in a block diagram one embodiment of a handheld device.

[0007] FIG. **2** illustrates in a flowchart one embodiment of a method for displaying data with a mobile device.

[0008] FIG. **3** illustrates in a block diagram multiple embodiments of a mobile device with a non-rectangular liquid crystal display.

[0009] FIG. **4** illustrates in a block diagram one embodiment of a mobile device with a non-rectangular display and addressable controls.

[0010] FIG. **5** illustrates in a block diagram one embodiment of a mobile device.

[0011] FIG. **6** illustrates in a block diagram one embodiment of a mobile device that uses a non-rectangular touch screen display.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The features and advantages of the invention may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. These and other features of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth herein.

[0013] Various embodiments of the invention are discussed in detail below. While specific implementations are discussed, it should be understood that this is done for illustration purposes only. A person skilled in the relevant art will recognize that other components and configurations may be used without parting from the spirit and scope of the invention.

[0014] The present invention comprises a variety of embodiments, such as a method, an apparatus, and an electronic device, and other embodiments that relate to the basic concepts of the invention. The electronic device may be any manner of computer, mobile device, or wireless communication device.

[0015] A method, apparatus, and electronic device for displaying data are disclosed. A non-rectangular addressable liquid crystal display with a non-rectangular active area active matrix may display an adjustable presentation of data. A display-integrated control key may control the presentation of data. A scrolling navigation control may scroll through the adjustable presentation of the data.

[0016] A major function of modern computation devices is presenting a set of data to a user in a format that allows the user to easily grasp how different data points in the set of data relate to one and other. Most modern computation devices still present data in a traditional way, indistinguishable from how the data was originally presented on paper. Few modern computation devices take advantage of the expanded presentation capability to provide data in a more efficient and informative manner. For example, a circular display device may more efficiently present certain types of data, such as time, geography, holographic three-dimensional images of objects, or other items of information that are ill-server by a rectangular presentation. A non-traditional display may also show a data list in both a conventional manner or in a new manner, such as in a dial list format, having the data presented in a circular arrangement.

[0017] Further, to better observe the connections between the data points in a dataset, a user may need the ability to manipulate the presentation being shown. A pie chart may need to be rotated to bring a particular segment into greater focus. A global map may need to be scrolled to a different portion of the world. A clock display may need to be rotated to bring a time of import into focus. A holographic image of an object may need to be rotated or magnified to get a better view of the object. A data list may be rotated to allow a user to scroll through data presented in a dial list format. Having the ability to manipulate the presentation of data may greatly increase the efficacy of the circular display.

[0018] FIG. **1** illustrates in a block diagram one embodiment of a mobile device **100** which may use a circular display to present a set of data to a user. While a handheld device is described, any computing device, such as a desktop computer or a server, may use the circular display. The handheld device **100** may access the information or data stored in a network. The handheld device **100** may support one or more applications for performing various communications with the network. The handheld device **100** may implement any operating system, such as Windows or UNIX, for example. Client and server software may be written in any programming language, such as C, C++, Java or Visual Basic, for example. The handheld device **100** may be a mobile phone, a laptop, a personal digital assistant (PDA), or other portable device. For some embodiments of the present invention, the handheld device **100** may be a WiFi capable device, which may be used to access the network for data or by voice using voice over internet protocol (VOIP). The handheld device **100** may include a transceiver **102** to send and receive data over the network.

[0019] The handheld device **100** may include a controller or processor **104** that executes stored programs. The controller or processor **104** may be any programmed processor known to one of skill in the art. However, the decision support method may also be implemented on a general-purpose or a special purpose computer, a programmed microprocessor or microcontroller, peripheral integrated circuit elements, an application-specific integrated circuit or other integrated circuits, hardware/electronic logic circuits, such as a discrete element circuit, a programmable logic device, such as a programmable logic array, field programmable gate-array, or the like. In general, any device or devices capable of implementing the decision support method as described herein can be used to implement the decision support system functions of this invention.

[0020] The handheld device **100** may also include a volatile memory **106** and a non-volatile memory **108** to be used by the processor **104**. The volatile **106** and nonvolatile data storage **108** may include one or more electrical, magnetic or optical memories such as a random access memory (RAM, cache, hard drive, or other memory device. The memory may have a cache to speed access to specific data. The memory may also be connected to a compact disc-read only memory (CD-ROM), digital video disc-read only memory (DVD-ROM, DVD read write input, tape drive or other removable memory device that allows media content to be directly uploaded into the system.

[0021] The handheld device **100** may include a user input interface **110** that may comprise elements such as a keypad, display, touch screen, or any other device that accepts input. The handheld device **100** may also include a user output device **112** that may comprise a display screen and an audio interface that may comprise elements such as a microphone, earphone, and speaker. The handheld device **100** also may include a component interface **114** to which additional elements may be attached, for example, a universal serial bus (USB) interface or an audio-video capture mechanism. Finally, the handheld device **100** may include a power supply **116**.

[0022] Client software and databases may be accessed by the controller or processor **104** from the memory, and may include, for example, database applications, word processing applications, video processing applications as well as components that embody the decision support functionality of the present invention. The user access data may be stored in either a database accessible through a database interface or in the memory. The handheld device **100** may implement any operating system, such as Windows or UNIX, for example. Client and server software may be written in any programming language, such as ABAP, C, C++, Java or Visual Basic, for example.

[0023] FIG. **2** illustrates in a flowchart one embodiment of a method **200** for displaying a presentation of data with a mobile device **100**. A mobile device **100** may receive a data set selection from a user via a user interface (UI) **110** (Block **202**). The mobile device **100** may display a presentation of data via the user output device **112** (Block **204**). The presentation of data may be adjustable, as well as the viewpoint of the presentation of data. The mobile device **100** may receive a viewpoint selection of the presentation of data from the user via the UI **110** (Block **206**). The viewpoint selection may represent an indication of the preferred presentation of the dataset. A viewpoint selection may be a selection of a degree of magnification, selection of a portion of the presentation of data to be displayed, rotation of the portion of the presentation of data being displayed, or other viewpoint selections. The mobile device **100** may adjust the presentation of data to the user (Block **208**).

[0024] FIG. **3** illustrates in a block diagram multiple embodiments **300** of a mobile device with a non-rectangular addressable liquid crystal display LCD). An LCD may include a screen, a set of pixels to create an image, and a backing lights source. The set of pixels may be organized into an active matrix of pixels, shaped to produce an image behind the screen. In one embodiment, a mobile device **310** may project an image on a non-rectangular LCD **312** using a rectangular active matrix **314**. In this embodiment, while the screen of the LCD **312** is non-rectangular, the pixels are arranged in a rectangular matrix **314** under the screen, wasting portions of the available screen. In an alternate embodiment, a mobile device **320** may project an image on a non-rectangular LCD **322** using multiple contiguous rectangular active matrices **314**. In this embodiment, while the screen of the LCD **322** is non-rectangular, the pixels are arranged in a series of rectangular matrices **324** under the screen, wasting portions of the available screen. In a different embodiment, a mobile device **330** may project an image on a non-rectangular LCD **332** using a non-rectangular active matrix **334**. In this embodiment, the screen of the LCD **332** and the arrangement of the pixels in the matrix **334** are non-rectangular, most efficiently using the LCD screen.

[0025] A non-rectangular LCD may be used to display a presentation of data not normally presentable in a rectangular display, such as pie charts, maps, clocks, holographic images of objects, and other presentations of data. The presentation of data may be controlled by a display-integrated control, such as a display integrated control key. A display-integrated control may be a control that incorporates some aspect of the display to control the data presented on the display. A display integrated control key may be partially integrated, having both display elements and non-display elements, such as an addressable "soft key" control key. An addressable "soft key" control key is a blank key whose function is assigned by a processor. The function of the soft key may be displayed to the user on the display above the addressable blank key. A display integrated control key may be fully integrated, having only display elements, such as a touch screen key. A touch screen key presents the image of a key to a user, the image

identifying the function of the key. A user may select the function by touching the image. A pressure sensitive touch screen receives the touch and alerts the processor to initiate the identified function.

[0026] FIG. **4** illustrates in a block diagram one embodiment of a mobile device **400** with a non-rectangular display and soft key controls. The mobile device **400** may have a non-rectangular LCD **402** to display a presentation of data. The mobile device **400** may have a keypad **404** for entering and controlling data stored in the mobile device. The mobile device **400** may have a set of addressable soft keys (SK) **406** for selecting, building, and controlling the presentation of the data. The LCD **402** may display a soft key label (SKL) **408** for each of the SKs **406** in use. The SKL **408** may describe the function of the SK **406**.

[0027] A cursor navigation (CN) control **410** may be used to select data points in the set of data in the presentation of data. A page scrolling navigation (PSN) control **412** may be used to move the presentation of data to show a portion of the presentation of data not shown in the display **402**. A rotational scrolling navigation (RSN) control **414** may be used to change the orientation of the portion of the presentation of data shown in the display **402**. The scrolling navigation controls may be located on the perimeter of the display **402**, elsewhere on the device, or connected as a separate control unit. A zoom control **416** may be used to increase the magnification of the portion of the presentation of data shown in the display **402**.

[0028] While a circular LCD with a circular active matrix is shown, any shape may be used that efficiently displays the presentation of data. Multiple matrices may be arranged contiguously to best support the shape of the LCD. FIG. **5** illustrates in a block diagram one embodiment of a mobile device **500** with an LCD with multiple matrices. The LCD may have a non-rectangular active matrix **510** and a rectangular active matrix **520**.

[0029] FIG. **6** illustrates in a block diagram one embodiment of a mobile device **600** that uses a touch screen display. The touch screen display may be a display screen that responds to contact, providing a further user control. The mobile device **600** may have a non-rectangular LCD **602** to display a presentation of data. The mobile device **600** may have a keypad **604** for entering and controlling data stored in the mobile device. The non-rectangular LCD **602** may be a touch screen, allowing data points to be selected by receiving touch inputs to the presentation of data. The non-rectangular LCD **602** may present a set of touch control buttons (CB) **606** for controlling the presentation of data. A user may control a cursor on the screen by touching a point and dragging along the touch screen **602**. The non-rectangular LCD **602** may present a scrolling navigation (SN) control **608** to the user. The SN control **608** may be positioned on the perimeter of the touch screen, or elsewhere on the touch screen. The SN control **608** may be present on the entire screen, dependant on the input to register as a scrolling navigation. For instance, a user may drag one finger across the screen to signal cursor control and two fingers across the screen to signal scrolling navigation. The SN control **608** may be toggled between a PSN control, RSN control, a zoom control, and other controls affecting the viewpoint of the presentation of data.

[0030] Although not required, the invention is described, at least in part, in the general context of computer-executable instructions, such as program modules, being executed by the electronic device, such as a general purpose computer. Generally, program modules include routine programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that other embodiments of the invention may be practiced in network computing environments with many types of computer system configurations, including personal computers, hand-held devices, multi-processor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, and the like.

[0031] Embodiments may also be practiced in distributed computing environments where tasks are performed by local and remote processing devices that are linked (either by hardwired links, wireless links, or by a combination thereof) through a communications network.

[0032] Embodiments within the scope of the present invention may also include computer-readable media for carrying or having computer-executable instructions or data structures stored thereon. Such computer-readable media can be any available media that can be accessed by a general purpose or special purpose computer. By way of example, and not limitation, such computer-readable media can comprise RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code means in the form of computer-executable instructions or data structures. When information is transferred or provided over a network or another communications connection (either hardwired, wireless, or combination thereof) to a computer, the computer properly views the connection as a computer-readable medium. Thus, any such connection is properly termed a computer-readable medium. Combinations of the above should also be included within the scope of the computer-readable media.

[0033] Computer-executable instructions include, for example, instructions and data which cause a general purpose computer, special purpose computer, or special purpose processing device to perform a certain function or group of functions. Computer-executable instructions also include program modules that are executed by computers in stand-alone or network environments. Generally, program modules include routines, programs, objects, components, and data structures, etc. that perform particular tasks or implement particular abstract data types. Computer-executable instructions, associated data structures, and program modules represent examples of the program code means for executing steps of the methods disclosed herein. The particular sequence of such executable instructions or associated data structures represents examples of corresponding acts for implementing the functions described in such steps.

[0034] Although the above description may contain specific details, they should not be construed as limiting the claims in any way. Other configurations of the described embodiments of the invention are part of the scope of this invention. For example, the principles of the invention may be applied to each individual user where each user may individually deploy such a system. This enables each user to utilize the benefits of the invention even if any one of the large number of possible applications do not need the functionality described herein. In other words, there may be multiple instances of the electronic devices each processing the content in various possible ways. It does not necessarily need to be one system used by all end users. Accordingly, the

appended claims and their legal equivalents should only define the invention, rather than any specific examples given.

We claim:

1. A method of displaying data in a mobile device comprising:

displaying an adjustable presentation of data on a non-rectangular addressable liquid crystal display with a non-rectangular active area active matrix; and

controlling display of the presentation of data with a display-integrated control key.

2. The method of claim **1**, wherein the display-integrated control key is a soft key.

3. The method of claim **1**, wherein the display-integrated control key is a touch screen key.

4. The method of claim **1**, wherein the non-rectangular active area active matrix is a circular active area active matrix.

5. The method of claim **1**, further comprising displaying data on the non-rectangular liquid crystal display with a rectangular active area active matrix contiguous with the non-rectangular active area active matrix.

6. The method of claim **1**, further comprising:

scrolling through the adjustable presentation of the data with a scrolling navigation control.

7. The method of claim **6**, wherein the scrolling navigation control is a perimeter touch screen scrolling navigation control.

8. A non-rectangular addressable liquid crystal display apparatus for displaying data comprising:

a non-rectangular active area active matrix that displays an adjustable presentation of data; and

a display-integrated control key that controls the presentation of data.

9. The non-rectangular addressable liquid crystal display apparatus of claim **8**, wherein the display-integrated control key is a soft key.

10. The non-rectangular addressable liquid crystal display apparatus of claim **8**, wherein the display-integrated control key is a touch screen key.

11. The non-rectangular addressable liquid crystal display apparatus of claim **8**, wherein the non-rectangular active area active matrix is a circular active area active matrix.

12. The non-rectangular addressable liquid crystal display apparatus of claim **8**, further comprising a rectangular active area active matrix contiguous with the non-rectangular active area active matrix.

13. The non-rectangular addressable liquid crystal display apparatus of claim **8**, further comprising a scrolling navigation control for scrolling through the adjustable presentation of the data.

14. The non-rectangular addressable liquid crystal display apparatus of claim **13**, wherein the scrolling navigation control is a perimeter touch screen scrolling navigation control.

15. An electronic device for displaying data comprising:

a non-rectangular addressable liquid crystal display with a non-rectangular active area active matrix that displays an adjustable presentation of data; and

a scrolling navigation control for scrolling through the adjustable presentation of the data.

16. The electronic device of claim **15**, further comprising a display-integrated control key that controls the presentation of data.

17. The electronic device of claim **16**, wherein the display-integrated control key is a soft key.

18. The electronic device of claim **16**, wherein the display-integrated control key is a touch screen key.

19. The electronic device of claim **15**, wherein the scrolling navigation control is a perimeter touch screen scrolling navigation control.

20. The electronic device of claim **15**, further comprising a rectangular active area active matrix contiguous with the non-rectangular active area active matrix.

* * * * *

专利名称(译)	用于移动手持设备的非传统形状的液晶显示器的导航		
公开(公告)号	US20090085851A1	公开(公告)日	2009-04-02
申请号	US11/863965	申请日	2007-09-28
[标]申请(专利权)人(译)	摩托罗拉公司		
申请(专利权)人(译)	MOTOROLA，INC.		
当前申请(专利权)人(译)	Google技术控股有限责任公司		
[标]发明人	LIM DAVID FINNEY MARK OLIVER MARK PIERCE PAUL SAWADSKI MICHAEL VOSS KARL		
发明人	LIM, DAVID FINNEY, MARK OLIVER, MARK PIERCE, PAUL SAWADSKI, MICHAEL VOSS, KARL		
IPC分类号	G09G3/36		
CPC分类号	G06F3/03547 G06F3/041 G09G3/3648 G06F3/04886 G06F2203/0339 G06F3/0485		
其他公开文献	US8094105		
外部链接	Espacenet USPTO		

摘要(译)

公开了一种用于显示数据的方法，装置和电子设备。具有非矩形有源区有源矩阵334的非矩形可寻址液晶显示器402可以显示可调节的数据表示。集成显示器的控制键可以控制数据的呈现。滚动导航控件可以滚动数据的可调节呈现。