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(54) **NAVIGATING AMONG ACTIVITIES IN A COMPUTING DEVICE**

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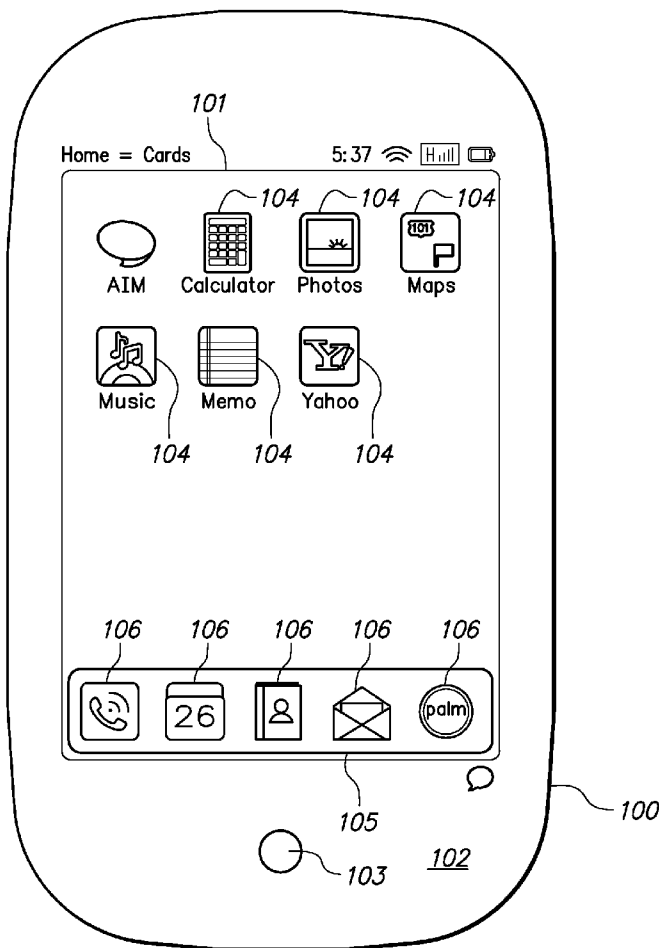
(57) **ABSTRACT**

(22) Filed: **Jul. 1, 2013**

A computing device runs multiple activities concurrently and provides at least two modes for interacting with the activities. The user may toggle between the modes as desired. In a full-screen mode, one activity occupies substantially an entire display screen. In a windowed mode, the activity is visible within a window, and a portion of at least one other window is also visible. In the windowed mode, the user can cause windows to move, thereby changing focus from one activity to another. For example, the window having focus can be moved off the screen, to be replaced by a new window that is then given focus. The windows are ordered in a sequence and move in concert with one another; pushing one window off one edge of the screen causes a new window to appear at the opposite edge. A persistent positional relationship can be established among windows.

Related U.S. Application Data

(60) Continuation of application No. 13/316,004, filed on Dec. 9, 2011, which is a division of application No. 12/126,145, filed on May 23, 2008, now Pat. No. 8,296,684.



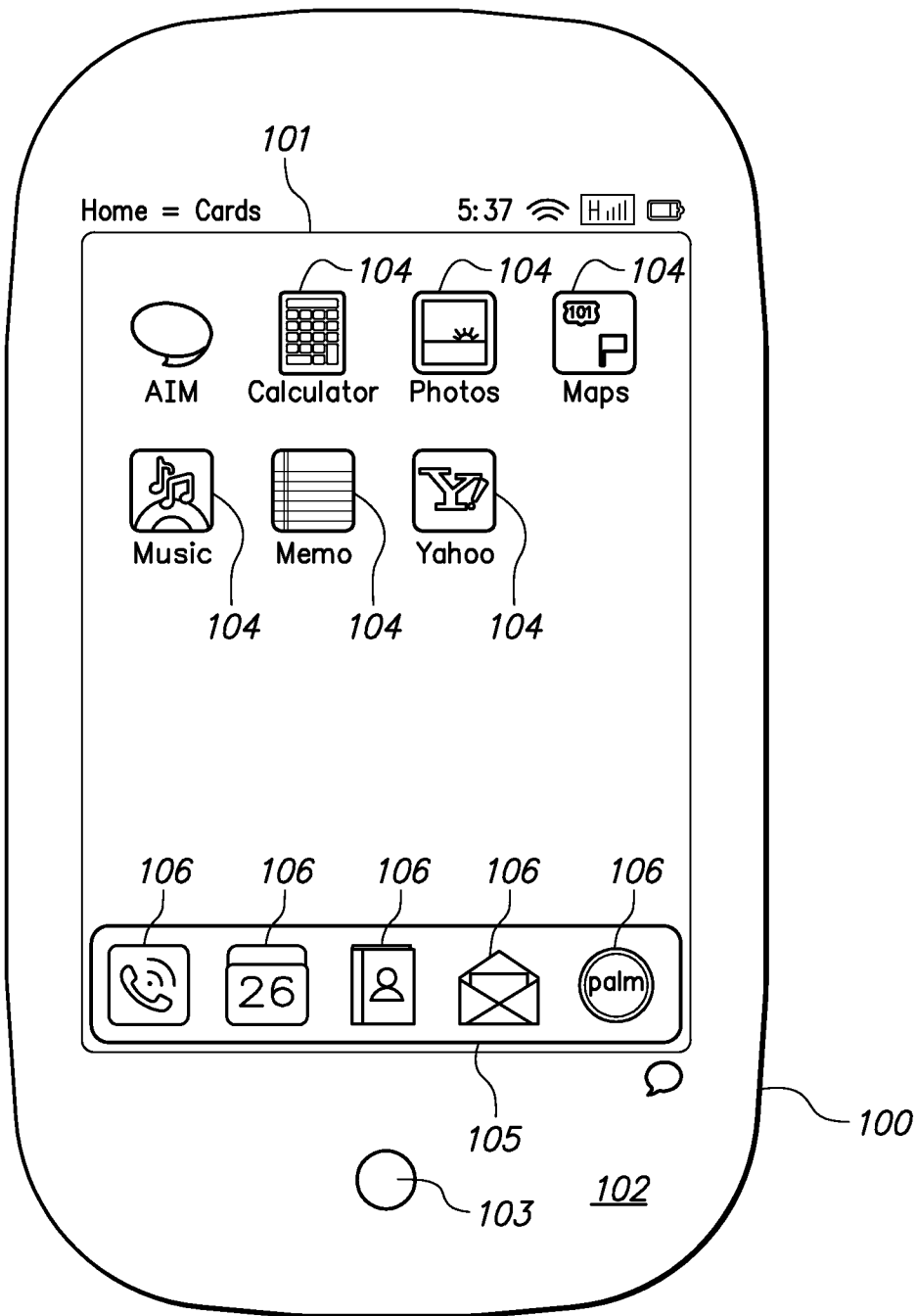


FIG. 1

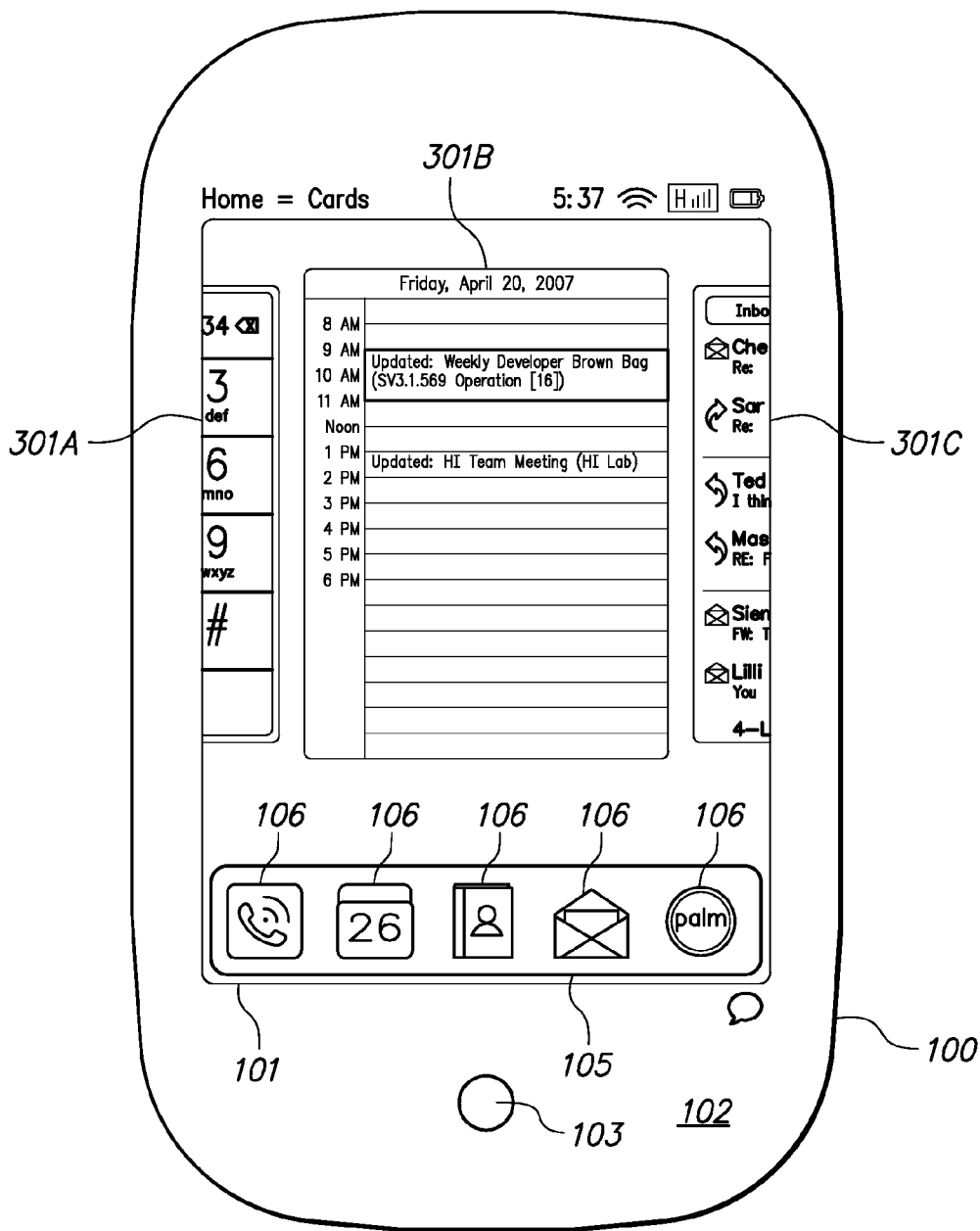


FIG. 3

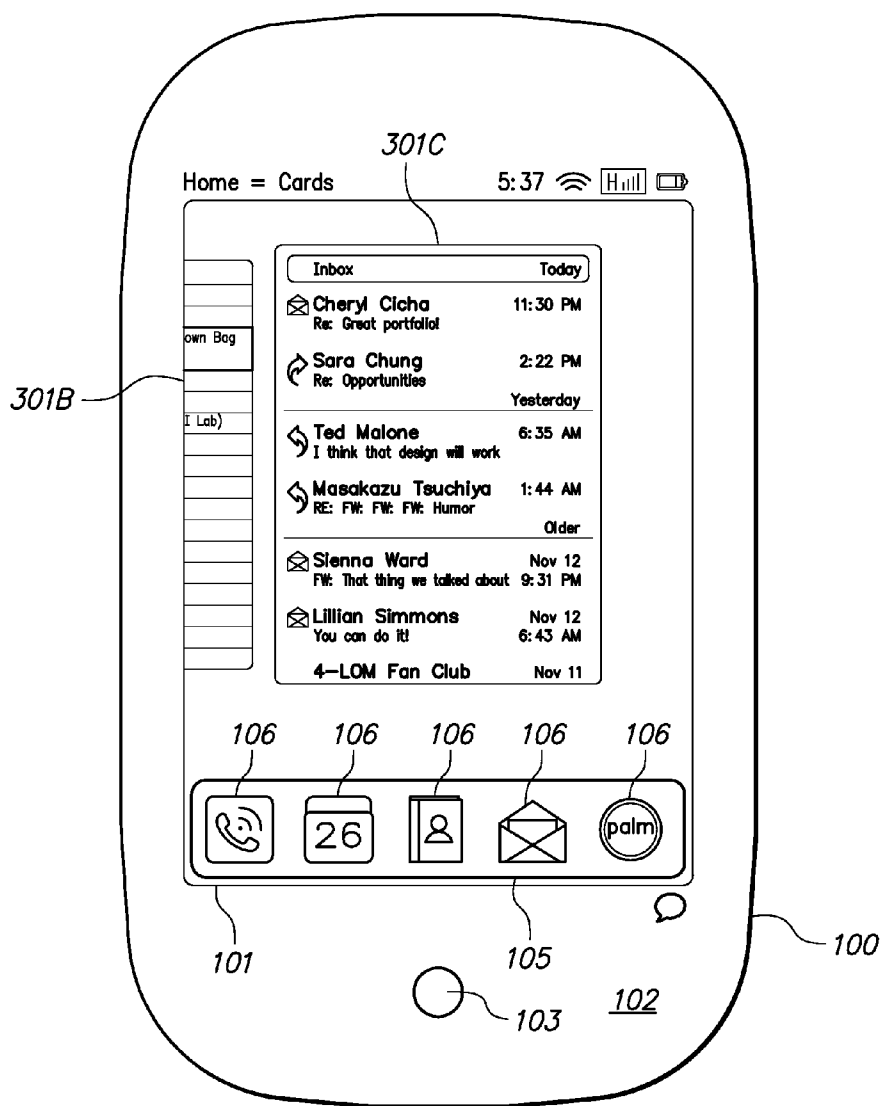


FIG. 4

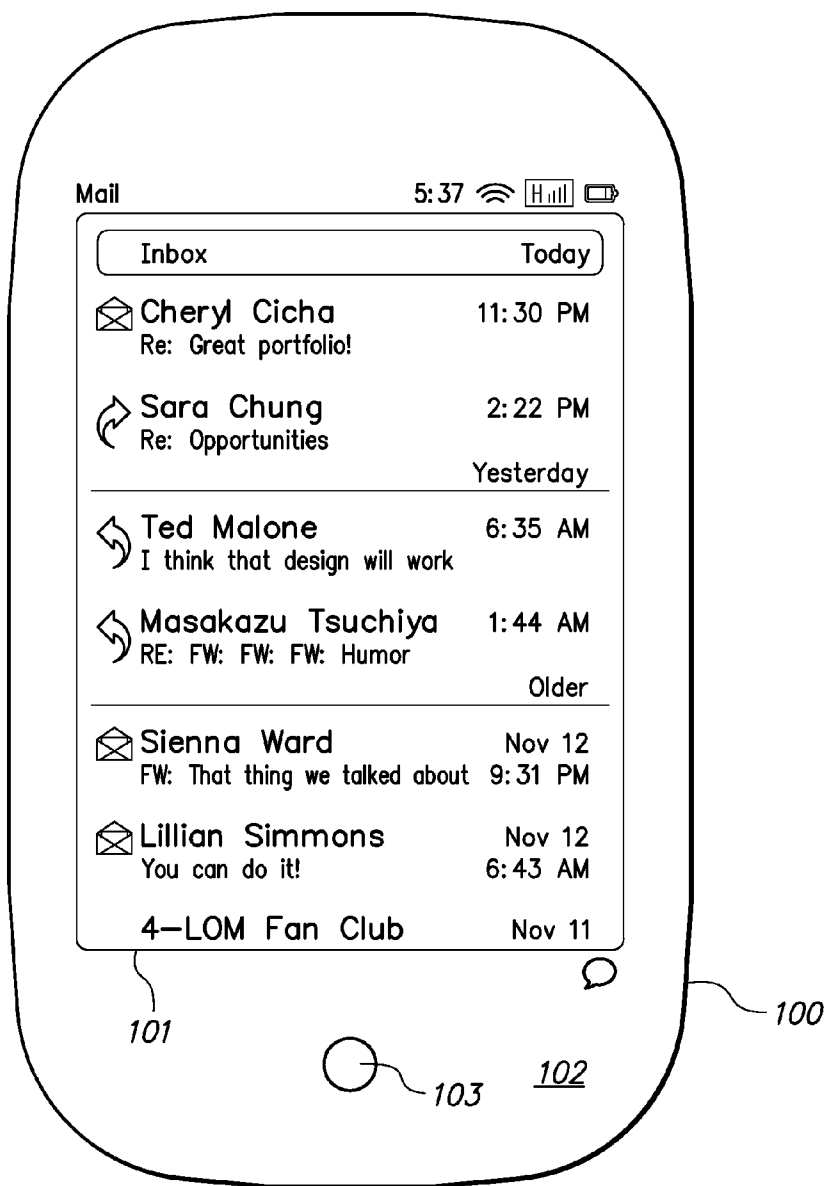


FIG. 5

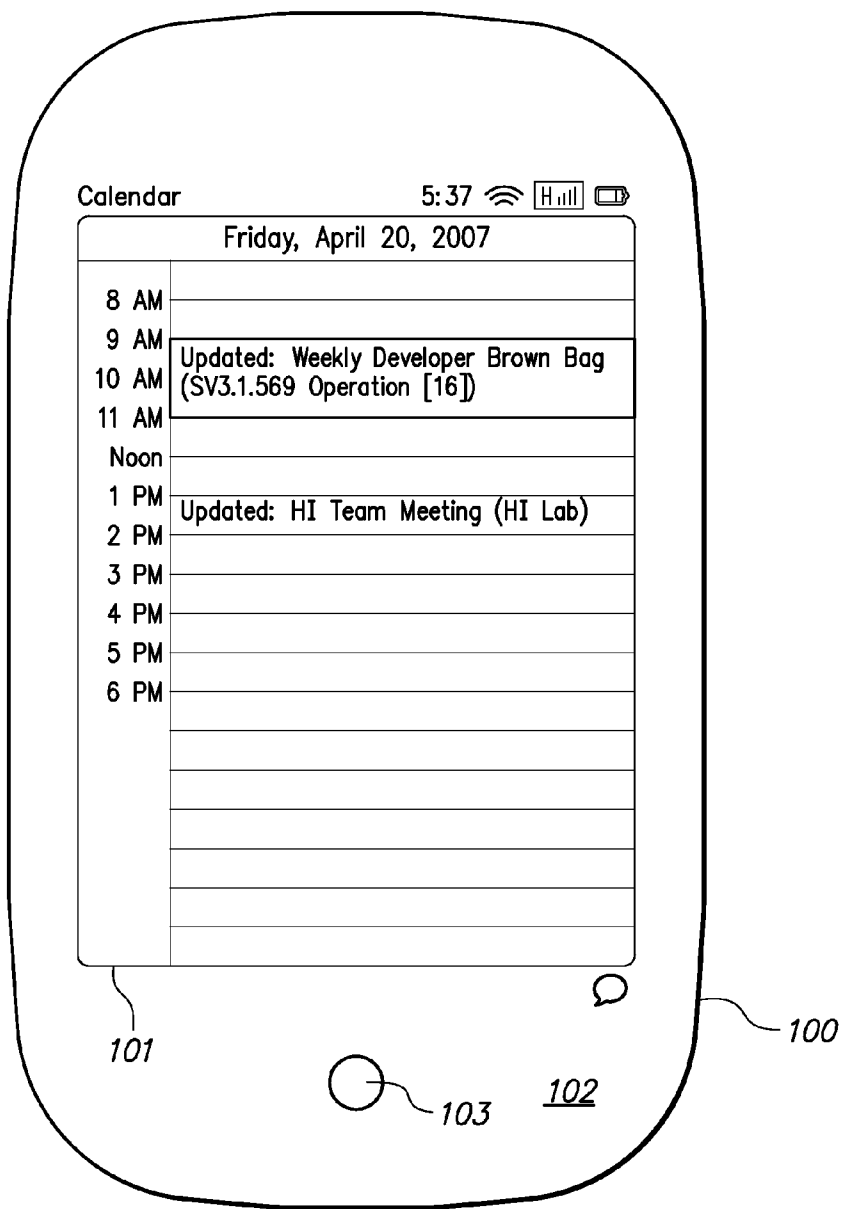


FIG. 6A

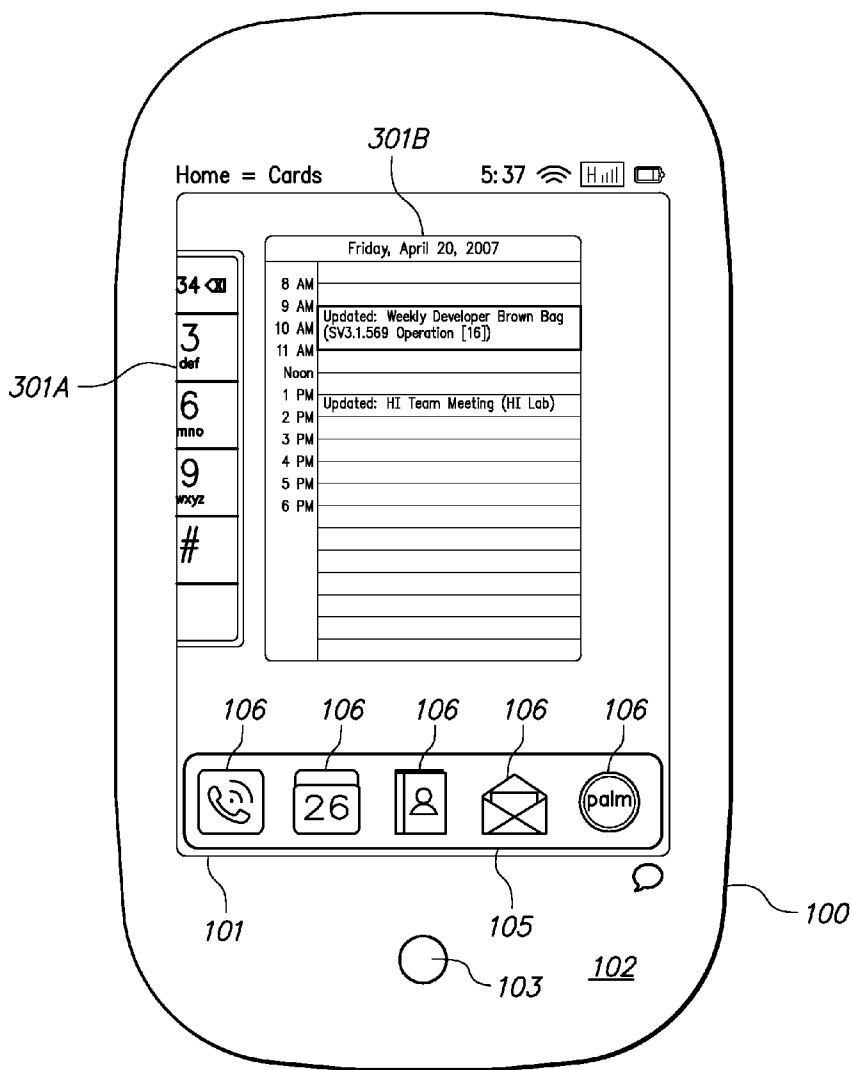


FIG. 6B

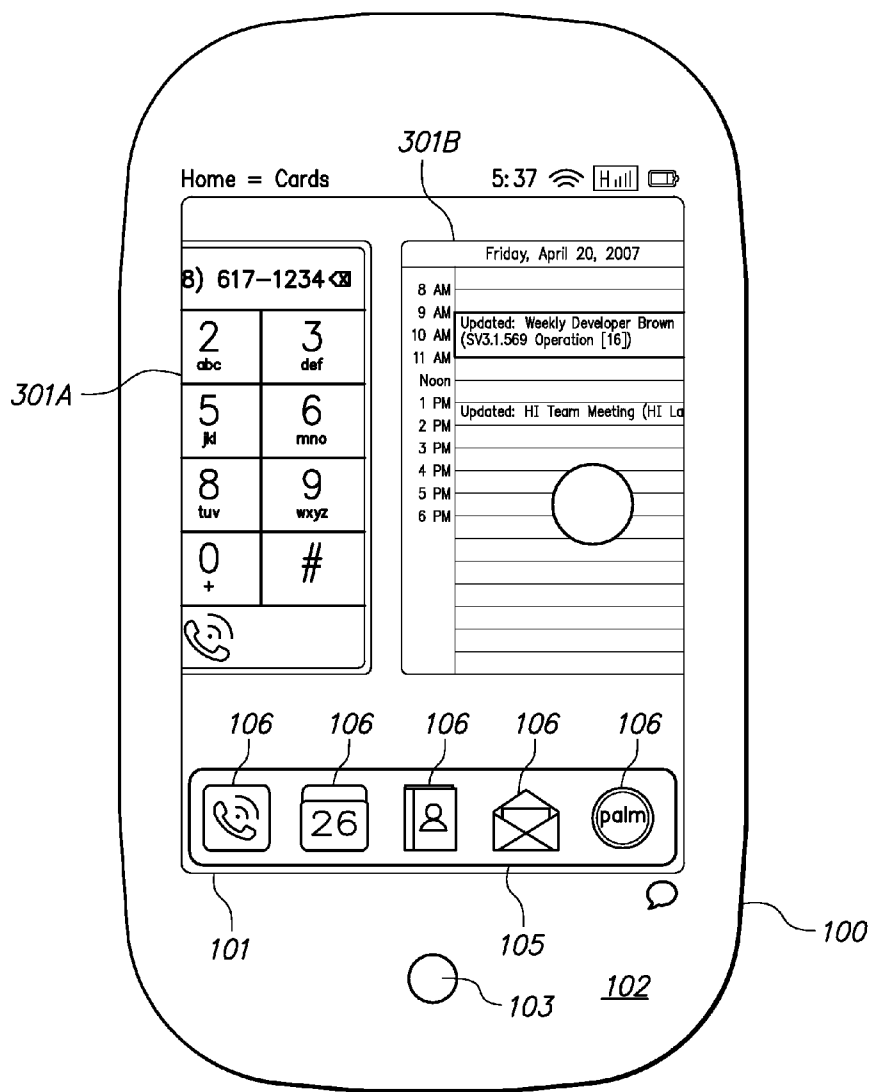


FIG. 6C

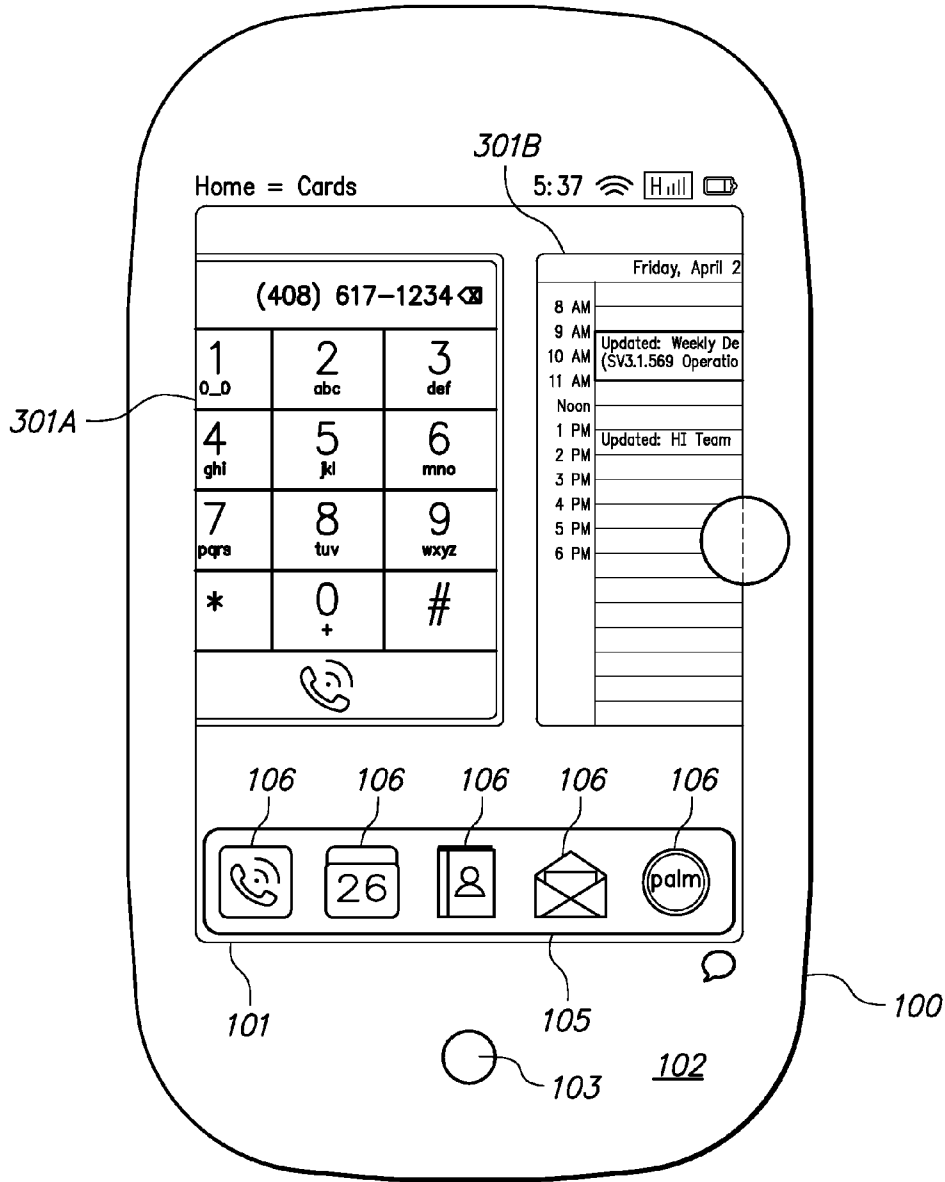


FIG. 6D

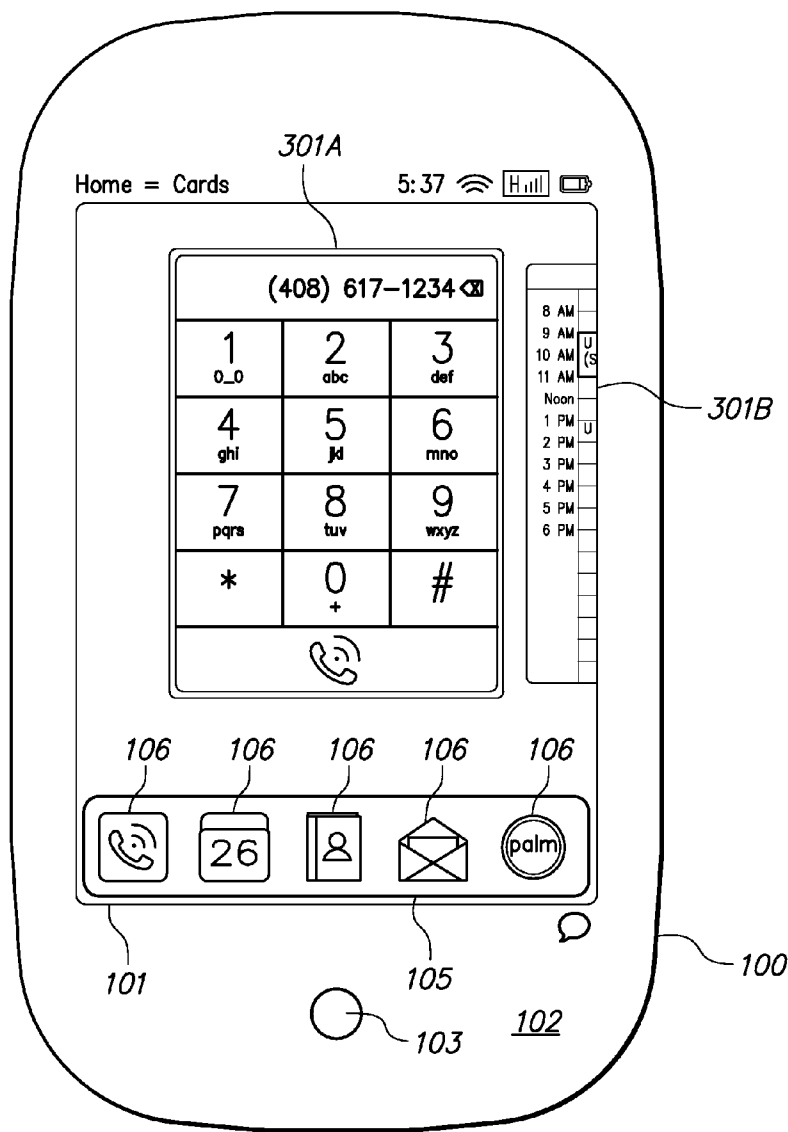


FIG. 6E

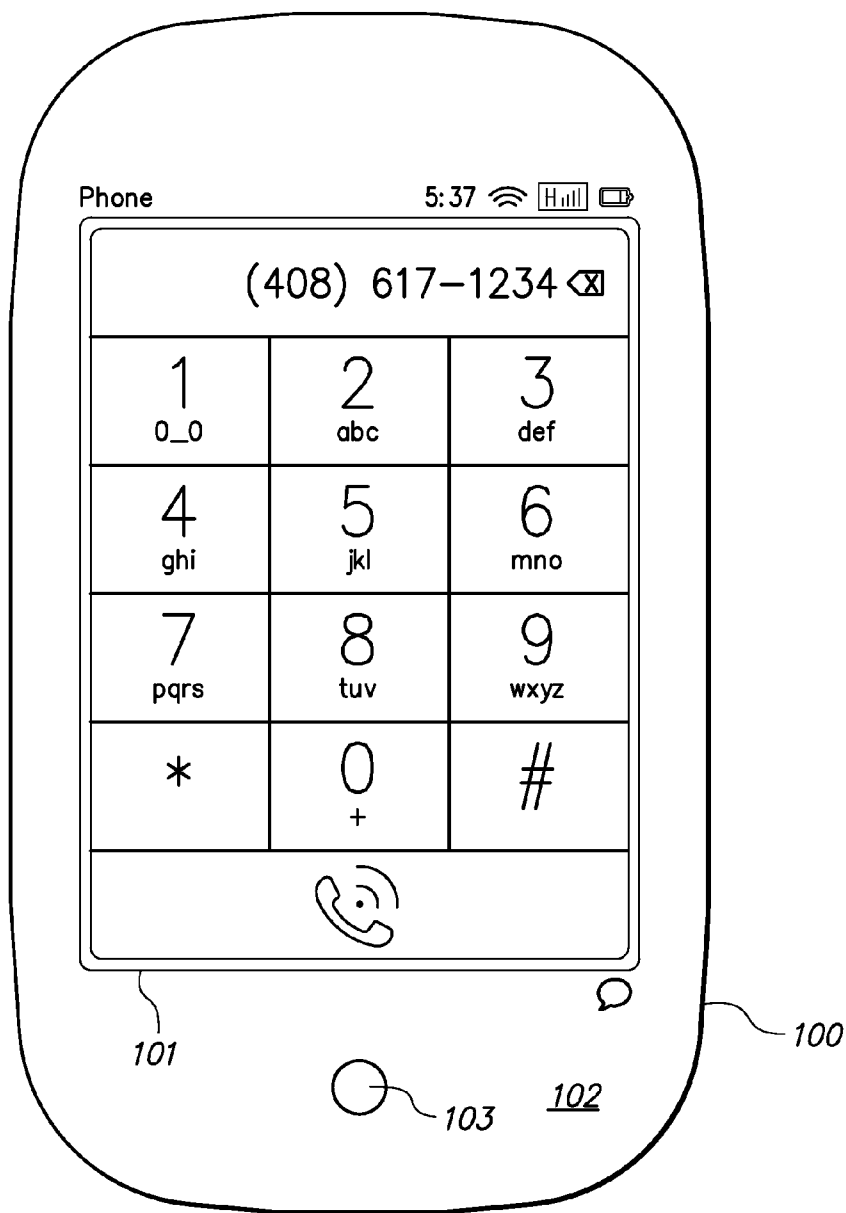


FIG. 6F

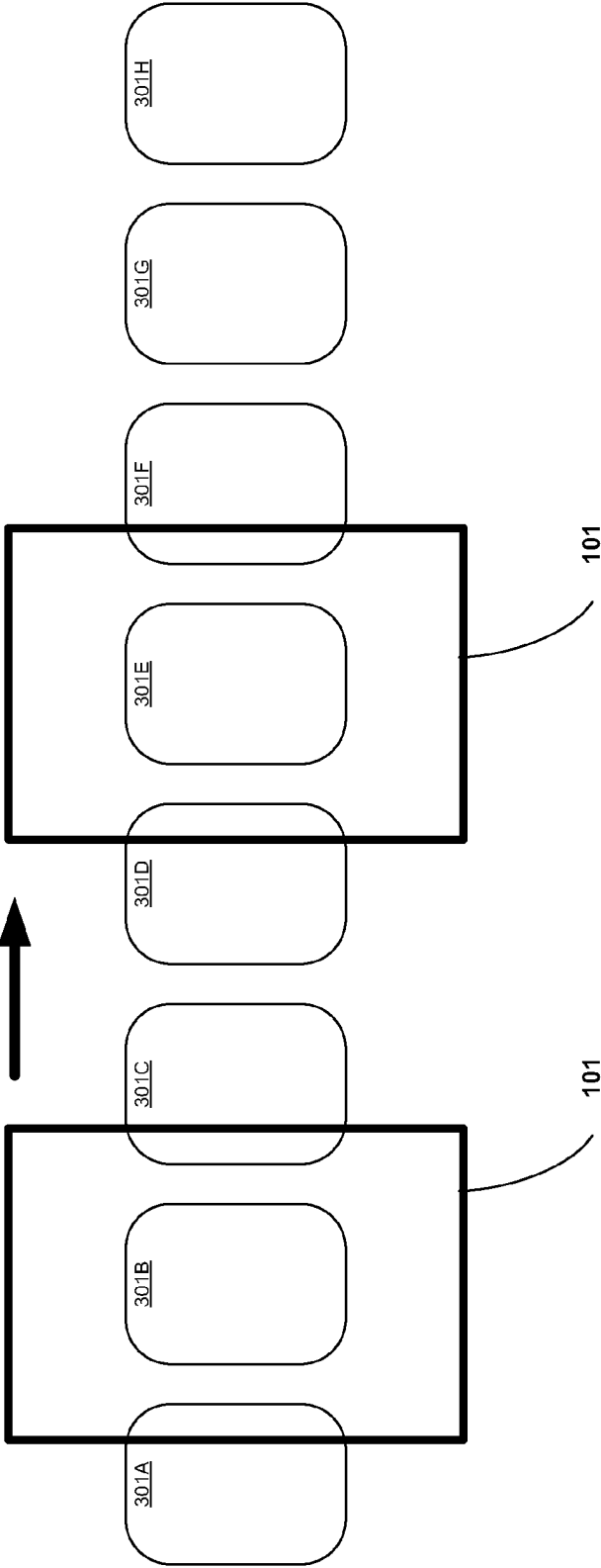


FIG. 7

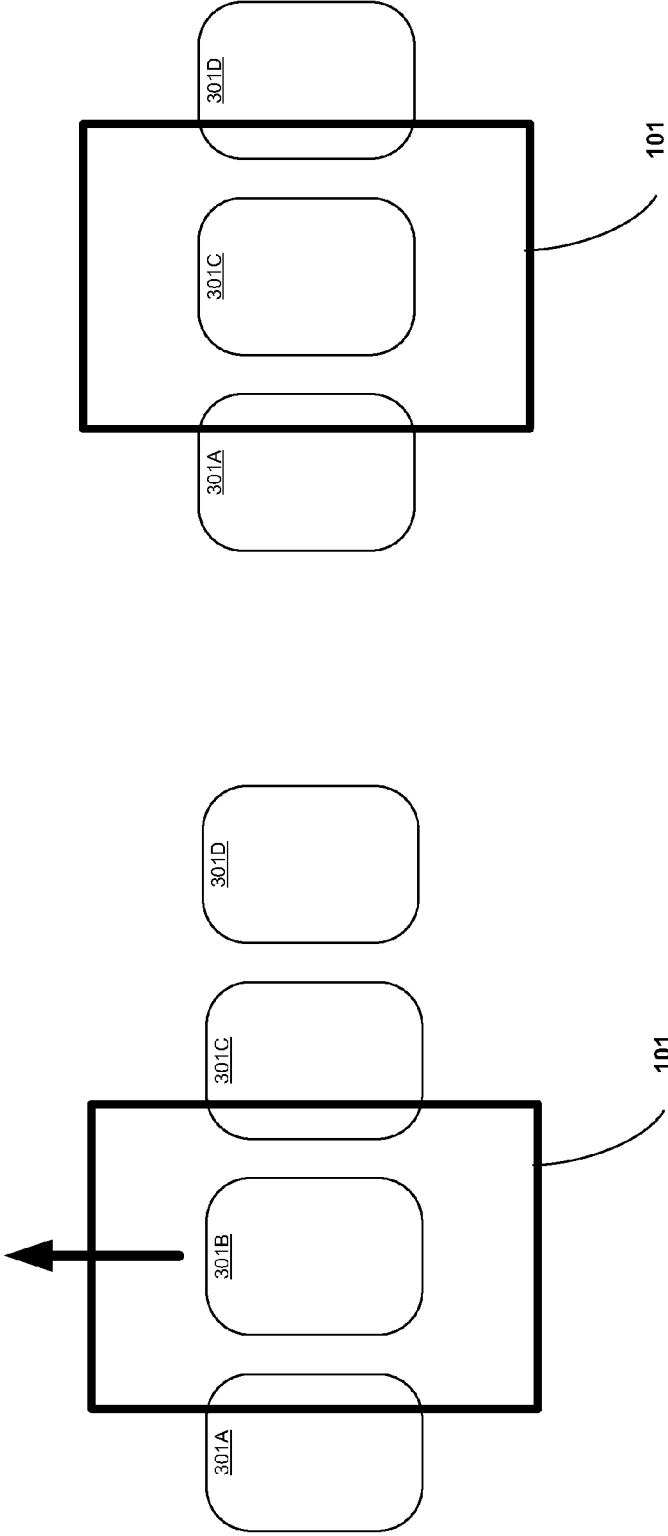


FIG. 8B

FIG. 8A

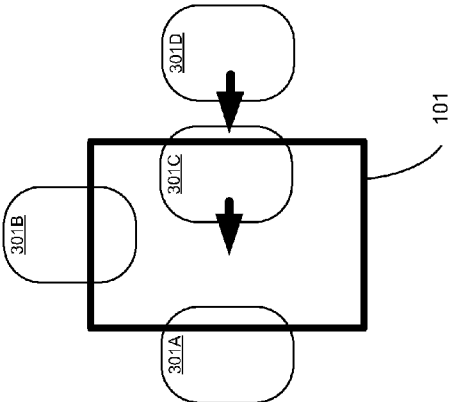


FIG. 9B

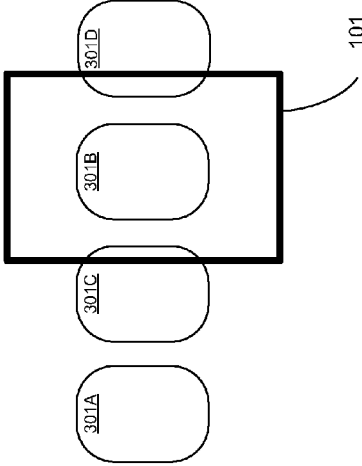


FIG. 9D

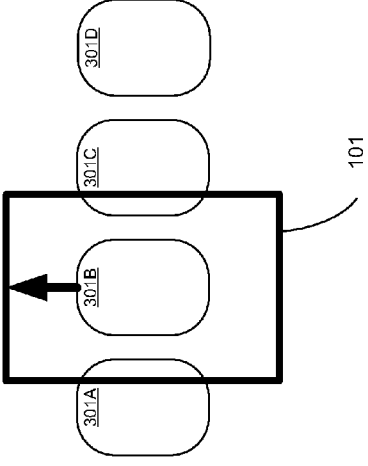


FIG. 9A

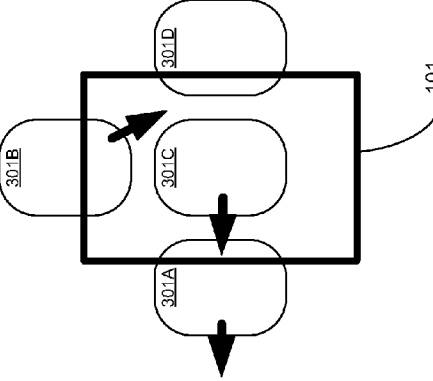


FIG. 9C

NAVIGATING AMONG ACTIVITIES IN A COMPUTING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application is a Continuation of U.S. patent application Ser. No. 13/316,004, filed Dec. 9, 2011, for “Navigating Among Activities in a Computing Device,” which is a Divisional of U.S. patent application Ser. No. 12/126,145, filed May 23, 2008, for “Navigating Among Activities in a Computing Device,” the disclosures of which are incorporated herein by reference in their entirety.

[0002] The present application is related to U.S. patent application Ser. No. 12/115,992, filed May 6, 2008, for “Extended Touch-Sensitive Control Area for Electronic Device,” the disclosure of which is incorporated herein in its entirety.

[0003] The present application is related to U.S. patent application Ser. No. 11/379,552, filed Apr. 20, 2006, for “Keypad and Sensor Combination to Provide Detection Region that Overlays Keys,” the disclosure of which is incorporated herein in its entirety.

FIELD OF THE INVENTION

[0004] The present invention relates to application management in computing devices, and more particularly to systems and methods for navigating among activities such as applications in such devices.

DESCRIPTION OF THE RELATED ART

[0005] Many currently available computing devices run operating systems that offer users the opportunity to run several applications at the same time, and even to perform several activities simultaneously, within a single application and/or among two or more applications. For example, a user may open an e-mail application, a word processing application, an on-screen calculator, and a web browser, so that all of the applications are open concurrently. The user may open several documents within the word processing application, and may open several e-mail messages. Such an arrangement allows the user to easily move from one task to another by keeping these various applications and activities open at the same time.

[0006] Conventionally, such an operating paradigm is accomplished by the use of multiple overlapping windows within a graphical user interface. A desktop metaphor is often employed, wherein the user can move and resize windows on a display screen by direct manipulation. Thus, each application may have a window or several windows; at any given time, one window has focus (usually indicated as such by being situated on top of the other windows). Other windows may be visible, invisible, or partially visible (for example if they are partially or completely obscured by other windows). A user can switch from one task to another by causing a different window to have focus; this is commonly accomplished by clicking on a visible portion of the window being activated, or by clicking on a button or icon representing the window or application in a task bar, dock, or similar construct. In some operating systems, pop-up menus and/or keyboard shortcuts may be available for switching among applications or documents.

[0007] Overlapping windows are a highly effective mechanism for application management. They exploit the user’s

spatial memory by associating a particular area of the screen with a particular task being performed. A user may find it easier to return to a previously opened window when he or she remembers that the window was placed at a particular location on the screen, as compared with a list or menu of open windows that does not provide a model of spatial placement and stability.

[0008] One issue with conventional window-based mechanisms for application management is that a large screen size is usually needed. Users faced with limited screen space must choose between, on the one hand, making windows smaller and thus reducing available workspace within each application, and, on the other hand, stacking windows atop each other so that only one window (or very few) is visible at a time. Reducing workspace can make it very difficult to use an application, particularly for applications such as word processing, photo editing, drawing, and the like. Stacking windows reduces the ease with which the user can switch from one application or document to another, as it is more difficult to see what is currently open and to find the appropriate window to be activated. When windows are stacked, users usually resort to navigation via taskbar, dock, menu, keyboard shortcut, or the like, thereby reducing the advantages of the overlapping window paradigm.

[0009] Some systems, such as the Mac OS operating system offered by Apple, Inc. of Cupertino, Calif., offer a mechanism for navigating among open applications by temporarily moving and shrinking open windows, moving the windows apart from one another so that they do not overlap. The user can then activate one of the windows; the original window positions and sizes are then restored, with the activated window on top. This feature is effective in allowing users to quickly switch among open applications and documents, but still requires a relatively large amount of screen space so as to effectively show the temporarily shrunk windows when the user is to select among them.

[0010] Mobile devices such as smartphones, personal digital assistants, music players, handheld computers, and the like are becoming increasingly powerful. Many are now able to run several applications concurrently, and to perform sophisticated functions that rival traditional computing devices. However, most such devices have extremely small screens, when compared to laptop or desktop computers. Thus, the conventional window-based techniques for navigating among open applications and documents do not function very well on mobile devices. There is insufficient screen space to display multiple overlapping windows. In fact, many such devices do not even have enough space to display a task bar or dock. Rather, the entire screen is often devoted to a single application, document, message, task, or activity, so as to make the most effective use of the extremely limited amount of space available.

[0011] What is needed is a system and method for application management that provides the advantages of multiple overlapping windows but is effective for a device having a small screen. What is further needed is a system and method that allows users to switch easily among activities, including applications, documents, and tasks, in a device having limited screen space. What is further needed is a system and method that is scalable to different screen sizes, and that provides solutions for all application and activity management, including starting activities, ending activities, and switching from one activity to another.

SUMMARY OF THE INVENTION

[0012] According to the present invention, a computing device runs two or more activities concurrently and provides at least two modes for interacting with the activities. The user may toggle between the modes as desired. A button or other control is provided for switching between full-screen mode and windowed mode.

[0013] In a full-screen mode, one activity occupies substantially an entire display screen.

[0014] In a windowed mode, the activity is visible within a window, and a portion of at least one other window is also visible. Thus, the window that has focus is visible in full, while at least one other window is only partially visible. The window occupied by the activity is referred to as having focus. In the windowed mode, the user can cause windows to move on the screen, so as to change focus from one activity to another. For example, the window having focus can be moved off the screen, to be replaced by a new window that is then given focus. In one aspect, the activities are ordered in a sequence and the windows appear in a corresponding sequence. In one aspect, the windows move in concert with one another; pushing one window off one edge of the screen causes a new window to appear at the opposite edge. A persistent positional relationship can be established among windows.

[0015] In response to a user command, the windows shift position on the screen, so that the window that currently has focus becomes only partially visible and one of the other windows becomes fully visible and has focus. The windows move in concert with each other, in response to user commands. Thus, for example, if the user indicates that the central window should move in a rightward direction, then the entire display shifts to the right, as follows:

[0016] The central window (which has focus) moves to the right, so that it is only partially visible along the right hand side of the display.

[0017] If any window was partially visible to the right of the window that has focus, it moves off the right edge of the screen so that it is no longer visible.

[0018] If any window was partially visible to the left of the window that has focus, it moves to the right so that it is now fully visible and has focus.

[0019] The user indicates such movement, for example, by direct manipulation of the displayed windows. This can be performed on a touch screen, for example, by dragging the central window to the left or to the right on the screen or by tapping on a window that is partially displayed. Alternatively, a trackball, touch-sensitive pad, or other input device can be provided for facilitating such direct manipulation.

[0020] In one embodiment, the window that currently has focus is always fully visible and displayed in a substantially central location on the screen with respect to partially displayed windows.

[0021] Window motion can be constrained to a single axis, for example horizontal or vertical but not both, so as to simplify the positional relationship among windows. Alternatively, two or more axes of movements can be made available.

[0022] Once the user has moved the desired window to the central position so that it has focus, he or she can indicate that the display should return to full-screen mode, so that the activity having focus occupies substantially the entire screen. Alternatively, the device can return to full-screen mode auto-

matically after a period of time elapses where no window movement takes place, or if the user starts to interact with the activity that has focus.

[0023] Thus, the full-screen display mode may be used for interacting with the activity, and the windowed mode may be used for switching from one activity to another. However, in one aspect the invention allows full interaction with the activity in windowed mode as well.

[0024] A persistent positional relationship can be established among windows. The positional relationship can be a one-dimensional sequence or some more complex two-dimensional relationship. The positional relationship is persistent in the sense that it does not change unless the user indicates that it should be changed, or some other event takes place that indicates a change is warranted (such as non-use of an application, or an application crashing or being dismissed).

[0025] Additional features and advantages will become apparent in the description provided below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The accompanying drawings illustrate several embodiments of the invention and, together with the description, serve to explain the principles of the invention. One skilled in the art will recognize that the particular embodiments illustrated in the drawings are merely exemplary, and are not intended to limit the scope of the present invention.

[0027] FIG. 1 depicts a display screen showing a launcher for initiating an activity such as an application.

[0028] FIG. 2 depicts a display screen in full-screen mode, wherein an activity occupies substantially the entire display screen, according to one embodiment of the present invention.

[0029] FIG. 3 depicts the display screen in windowed mode, including a window having focus and two partially displayed windows, according to one embodiment of the present invention.

[0030] FIG. 4 depicts the display screen in windowed mode after the user has moved the windows, according to one embodiment of the present invention.

[0031] FIG. 5 depicts the display screen in full-screen mode after the user has designated a new activity as having focus, according to one embodiment of the present invention.

[0032] FIGS. 6A through 6F depict a sequence for switching from one activity to another according to one embodiment of the present invention.

[0033] FIG. 7 is a conceptual depiction of a sequence switching from one activity to another according to one embodiment of the present invention.

[0034] FIGS. 8A and 8B depict a sequence for dismissing an activity according to one embodiment of the present invention.

[0035] FIGS. 9A through 9D depict a sequence for rearranging activities according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0036] In the following description, reference is made herein to “activities”. In the context of the present invention, an “activity” is intended to include a software application, a task, a document, a page, and/or any other activity that can be performed in connection with an electronic device. As

described herein, the present invention provides techniques for starting and ending activities, and for switching among activities.

System Architecture

[0037] The present invention can be implemented on any electronic device, such as a handheld computer, personal digital assistant (PDA), personal computer, kiosk, cellular telephone, and the like. For example, the invention can be implemented as a feature of an application management paradigm for a software application or operating system running on such a device. Accordingly, the present invention can be implemented as part of a graphical user interface for controlling software on such a device.

[0038] The invention is particularly well-suited to devices such as smartphones, handheld computers, and PDAs, which have limited screen space and which are capable of running several software applications concurrently. One skilled in the art will recognize, however, that the invention can be practiced in many other contexts, including any environment in which it is useful to switch easily and smoothly from one activity to another. Accordingly, the following description is intended to illustrate the invention by way of example, rather than to limit the scope of the claimed invention.

[0039] Referring now to FIG. 1, there is shown an example of an example of a device **100** including a display screen **101** showing a launcher including several icons **104** representing applications that can be opened by the user. A dock **105** is also shown, including additional icons **106** for launching commonly used applications and other functions. Dock **105** is not necessary for the present invention, but is shown for illustrative purposes only.

[0040] In one embodiment, screen **101** is touch-sensitive, so that a user can activate an application or function by touching a displayed icon **104**, **106**. In one embodiment, device **100** also includes a touch-sensitive gesture area **102** for entering gesture-based commands, as described in the above-referenced related application. In another embodiment, screen **101** and/or gesture area **102** is sensitive to user motion in proximity to the surface, so as to detect gestures and commands performed near the surface but without necessarily contacting the surface.

[0041] For illustrative purposes, device **100** as shown in FIG. 1 is a personal digital assistant or smartphone. Such devices commonly have telephone, email, and text messaging capability, and may perform other functions including, for example, playing music and/or video, surfing the web, running productivity applications, and the like. The present invention can be implemented in any type of device having a touch-sensitive screen, and is not limited to devices having the listed functionality. In addition, the particular layout shown in FIG. 1 is merely exemplary and is not intended to be restrictive of the scope of the claimed invention.

[0042] Touch-sensitive screen **101** and gesture area **102** can be implemented using any technology that is capable of detecting a location of contact and/or user motion proximate to the surface. Alternatively, the present invention can be implemented with other user input mechanisms, such as a keyboard, trackball, stylus, or the like. One skilled in the art will recognize that the techniques of the present invention are well suited to direct manipulation, but that any input technique can be used. In one embodiment, gesture area **102** provides a touch-sensitive control area extending beyond the edges of touch-sensitive screen **101**, as described in related

application Ser. No. 12/115,992, filed May 6, 2008, for "Extended Touch-Sensitive Control Area for Electronic Device," the disclosure of which is incorporated herein.

[0043] Device **101** as shown in FIG. 1 also has a physical button **103**. In one embodiment, physical button **103** can be used to toggle between full-screen mode and windowed mode, as described in more detail below. Physical button **103** is not needed for the present invention, and is shown for illustrative purposes only.

[0044] As described herein, at least two modes are available for interacting with device **101**: a full-screen mode in which an application or other activity occupies substantially the entire display screen **101**, and a windowed mode in which at least two windows are presented, at least one of which is only partially visible, with an application or other activity occupying each window. The full-screen mode is designed to devote a greater amount of screen space to the active activity, while the windowed mode provides a mechanism for navigating among activities and for rearranging, initiating, and terminating activities.

[0045] Referring now to FIG. 2, there is shown display screen **101** in full-screen mode. In the example, a calendar application occupies substantially the entire display screen **101**; however, one skilled in the art will recognize that any activity can be presented in this manner. As shown in FIG. 2, even in full-screen mode, certain portions of display screen **101** may be reserved for a title bar, battery indicator, clock, signal strength indicator, and the like. Accordingly, the term "full-screen mode" as used herein is intended to refer to any arrangement wherein the primary focus of the screen **101** is a single activity, even if other, smaller areas of screen **101** are reserved for other functions.

[0046] The user interacts with the active activity (such as the calendar application shown in FIG. 2) by conventional user interface methods, including manipulating on-screen elements, entering text, and the like. Such techniques are well known in the art.

[0047] Referring now to FIG. 3, there is shown an example of display screen **101** in windowed mode. In one embodiment, the user can toggle between full-screen mode and windowed mode by pressing physical button **103**. In another embodiment, the user can touch or double-tap an activity **301B** in windowed mode to initiate a switch to full-screen mode. In yet another embodiment, device **100** switches from windowed mode to full-screen mode after some period of inactivity. Other mechanisms can also be provided for toggling between the modes.

[0048] As can be seen in FIG. 3, in windowed mode, window **301B** having focus is fully visible. Other windows **301A**, **301C** are only partially visible and do not have focus. Usually, window **301B** having focus represents the same activity that was displayed in full-screen mode immediately before the switch to windowed mode. Any number of partially displayed windows **301A**, **301C** can be presented. In the example of FIG. 3, two such windows **301A**, **301C** are shown, one on either side of window **301B** having focus. Typically, in an arrangement where windows **301** are presented along a linear axis, one or two partially displayed window(s) **301** can be displayed adjacent to the window **301** that has focus. Also, as shown in FIG. 3, in one embodiment, partially displayed windows **301A**, **301C** are shown slightly smaller than window **301B** having focus, so as to further emphasize the fact that window **301B** has focus.

[0049] Partially displayed windows **301A**, **301C** provide a positional context for window **301B**, and provide a mechanism for navigating to other activities. In one embodiment, the user can designate a window **301A**, **301C** to have focus by touching any area within the window; this causes the designated window **301** to move to the central portion of display screen **101**, and causes other windows to move as well, so that the same positional sequence is maintained. In one embodiment, the user can designate a window **301A**, **301C** to have focus by dragging any displayed window **301** to cause the desired window **301** to move to the central portion of display screen **101**; again, other windows **301** move as well, so that the same positional sequence is maintained. In one embodiment, the user can move windows **301** left and right by dragging a finger along gesture area **102**. In one embodiment, such a gesture can be performed even in full-screen mode, causing windows **301** to move left and right in the same manner as described above for windowed mode.

[0050] As described in more detail below, when the user drags a window **301** to the left or right within display screen **100**, other windows **301** move in concert with the dragged window **301**. Thus, for example, if the user drags window **301B** to the right, windows **301A** and **301C** move to the right as well. This would cause window **301C** to move off the screen, and window **301A** would move to the central position of display screen **100**. The same result would occur if the user drags window **301A** to the right.

[0051] In one embodiment, if the user drags windows **301** so as to place a window **301** sufficiently close to the central position to make it clear that the intention is to give the window **301** focus, the window **301** snaps into the central position upon completion of the drag operation. Other windows **301** snap into place accordingly to maintain the same positional sequence. Thus, the user need not drag the window **301** all the way to the central position. If, on the other hand, the user drags windows **301** a small amount that does not cause a new window **301** to be sufficiently close to the central position, all windows **301** snap back to their previous positions upon completion of the drag operation.

[0052] In one embodiment, windows **301** show applications or other activities in operation. Thus, as the user navigates among windows **301**, he or she can see the actual live application or other activity within each window **301**.

[0053] Referring now to FIG. 4, there is shown an example of display screen **101** in windowed mode, after the user has caused window **301C** (representing an email application) to become centrally located and to have focus. As can be seen in FIG. 4, window **301B** that previously had focus is now partially visible to the left of window **301C**. Window **301A** is no longer visible.

[0054] The user can touch or double-tap window **301C** to re-enter full-screen mode with the new activity having focus and being active, as shown in FIG. 5. Alternatively, the user can press button **103** to toggle between full-screen mode and windowed mode. Thus, in FIG. 5 the user has completed the switch from the calendar application of FIG. 2 to the email application.

[0055] In the examples described herein, windows **301** are arranged in a horizontal row. The user moves windows **301** along a horizontal axis to navigate from one activity to another. One skilled in the art will recognize that other arrangements are possible. For example, windows **301** could

be arranged vertically instead of horizontally. Alternatively, a two-dimensional arrangement of windows **301** can be provided.

[0056] Referring now to FIG. 7, there is shown a conceptual depiction of a sequence switching from one activity to another according to one embodiment of the present invention. A number of activities are open, each represented by a window **301A** through **301H**. Screen **101** only shows a subset of the windows **301** at any given time. As can be seen in the Figure, a positional sequence is maintained even though most of the windows **301** are not visible at any given time. FIG. 7 depicts movement of the display screen **101** from an initial position where window **301B** has focus (and windows **301A** and **301C** are partially visible) to a second position where window **301E** is has focus (and windows **301D** and **301F** are partially visible).

[0057] The movement of display screen **101** is conceptual. In actual operation, the switch from window **301B** to window **301E** is accomplished by moving windows **301** in a leftward direction on screen **101**. For example, the user can repeatedly drag windows **301** in a leftward direction to cause windows **301C**, **301D**, and **301E** to successively occupy the central position. Alternatively, the user can click on partially displayed window **301C** to move it to the central position and to cause window **301D** to be partially displayed, then on partially displayed window **301D** to move it to the central position and to cause window **301E** to be partially displayed, and then on partially displayed window **301E** to move it to the central position. Either mechanism operates to shift focus from the activity represented by window **301B** to the activity represented by window **301E**.

[0058] In one embodiment, a transition effect is performed to enhance the smoothness of the transition as windows **301** move and/or snap into place. In one embodiment, the window **301** that is centrally displayed at any given time is shown slightly larger than other windows **301**.

[0059] In one embodiment, more than one window **301** can be completely visible within screen **101**. For example, three windows **301** might be completely visible, with additional partially-visible windows **301** on either side. The above-described techniques for moving windows **301** in concert with one another to maintain positional sequence still apply in such a variation.

[0060] In general, the sequence of windows **301** is persistent, even when the user moves from one window to another **301**. In one embodiment, the sequence is circular, so that the rightmost window **301** is considered to be to the left of the leftmost window **301**. Thus, moving off one end of the sequence takes the user back to the other end of the sequence.

[0061] In one embodiment, windows **301** may be moved within the sequence automatically in some circumstances. For example, frequently used windows **301** can be moved to more prominent locations in the sequence, while less frequently used windows **301** can remain in less prominent locations.

[0062] Referring now to FIGS. 6A through 6F, the operation of the invention is further illustrated by way of an example of a sequence for switching from one activity to another; specifically, the user switches from a calendar application to a telephone application. FIG. 6A shows an initial state in which device **100** shows a calendar application in full-screen mode. In FIG. 6B, the user has switched to windowed mode, for example by pressing button **103**. Now, the calendar application is visible in window **301B**, and the tele-

phone application is partially visible in window 301A. FIGS. 6C through 6E show the effect of the user dragging window 301B in a rightward direction. As the user drags window 301B, window 301A also moves in a rightward direction, until it is centrally located in display screen 101, as shown in FIG. 6E. As discussed above, this motion can also be initiated in response to the user touching the visible portion of window 301A in FIG. 6B, or by dragging in a horizontal rightward direction in gesture area 102.

[0063] Once the telephone application is in the central position in window 301A as shown in FIG. 6E, the user can tap on window 301A or press button 103 to switch to full screen mode, as shown in FIG. 6F. In one embodiment, the user can also interact with the telephone application directly in windowed mode as shown in FIG. 6E.

[0064] The user can launch additional activities by returning to the launch screen as shown in FIG. 1. In one embodiment, this is performed by performing a gesture or other command. In one embodiment, the user can also launch additional activities by touching an icon 106 in dock 105. In one embodiment, newly launched activities generate new windows that are added to the end of the sequence of windows shown in FIG. 7. In one embodiment, the window for the newly launched activity is, by default, given focus and presented in the central position on screen 101.

[0065] The user can dismiss applications, for example by closing a window 301. In one embodiment, a window 301 can be closed by clicking on a control within the window. In another embodiment, a window 301 can be closed by dragging the window upward off screen 101. Referring now to FIGS. 8A and 8B, there is shown an example of a sequence where the user drags window 301B upward off screen 101, causing window 301B to be dismissed.

[0066] As can be seen in FIGS. 8A and 8B, dismissing window 301B causes 301C to move leftward to fill in the gap caused by window 301B being dismissed. In general, when a window 301 is dismissed, other windows 301 move to fill the gap.

[0067] In one embodiment, dismissing a window 301 causes the application associated with the window to close. In another embodiment, the application remains open even when window 301 is closed.

[0068] In one embodiment, a window 301 might close automatically in certain circumstances. For example, if a task associated with an application is completed, or if an application crashes or terminates, the window 301 for the application can close automatically.

[0069] The user can also rearrange windows 301 manually when desired, by dragging a window 301 from one position to another. An example is shown in FIGS. 9A through 9D. The user drags window 301B upward, causing windows 301C and 301D to move to fill the gap. The user does not release window 301B however; instead, he or she moves window 301B into a position between windows 301C and 301D, as shown in FIG. 9C. The result is the sequence shown in FIG. 9D, where window 301B is now positioned between windows 301C and 301D.

[0070] In one embodiment, the user can resize windows 301 as desired. For example, the user can drag a corner of a window 301 to resize it, or can use two fingers to pinch the edges or corners of a window 301 to resize it.

[0071] To summarize, then, any or all of the following actions may be enabled for displayed windows 301:

[0072] Press button 103: toggle between full-screen and windowed modes

[0073] Drag window 301 left or right: cause windows to move left or right, and change focus

[0074] Horizontal gesture in gesture area 102: cause windows to move left or right, and change focus

[0075] Touch partially displayed window 301: cause window 301 to gain focus and move to center

[0076] Touch (or double-tap) window 301 having focus: switch to full-screen mode

[0077] Drag window 301 upward: dismiss window

[0078] Drag window 301 downward: zoom out, causing more windows 301 to be shown concurrently on screen 101; the user can zoom back in by tapping any empty space

[0079] The present invention has been described in particular detail with respect to one possible embodiment. Those of skill in the art will appreciate that the invention may be practiced in other embodiments. First, the particular naming of the components, capitalization of terms, the attributes, data structures, or any other programming or structural aspect is not mandatory or significant, and the mechanisms that implement the invention or its features may have different names, formats, or protocols. Further, the system may be implemented via a combination of hardware and software, as described, or entirely in hardware elements, or entirely in software elements. Also, the particular division of functionality between the various system components described herein is merely exemplary, and not mandatory; functions performed by a single system component may instead be performed by multiple components, and functions performed by multiple components may instead be performed by a single component.

[0080] Reference herein to “one embodiment,” “an embodiment,” or to “one or more embodiments” means that a particular feature, structure, or characteristic described in connection with the embodiments is included in at least one embodiment of the invention. Further, it is noted that instances of the phrase “in one embodiment” herein are not necessarily all referring to the same embodiment.

[0081] Some portions of the above are presented in terms of algorithms and symbolic representations of operations on data bits within a computer memory. These algorithmic descriptions and representations are the means used by those skilled in the data processing arts to most effectively convey the substance of their work to others skilled in the art. An algorithm is here, and generally, conceived to be a self-consistent sequence of steps (instructions) leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical, magnetic or optical signals capable of being stored, transferred, combined, compared and otherwise manipulated. It is convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers, or the like. Furthermore, it is also convenient at times, to refer to certain arrangements of steps requiring physical manipulations of physical quantities as modules or code devices, without loss of generality.

[0082] It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated otherwise as apparent from the following discussion, it is appreciated that

throughout the description, discussions utilizing terms such as “processing” or “computing” or “calculating” or “displaying” or “determining” or the like, refer to the action and processes of a computer system, or similar electronic computing module and/or device, that manipulates and transforms data represented as physical (electronic) quantities within the computer system memories or registers or other such information storage, transmission or display devices.

[0083] Certain aspects of the present invention include process steps and instructions described herein in the form of an algorithm. It should be noted that the process steps and instructions of the present invention can be embodied in software, firmware or hardware, and when embodied in software, can be downloaded to reside on and be operated from different platforms used by a variety of operating systems.

[0084] The present invention also relates to an apparatus for performing the operations herein. This apparatus may be specially constructed for the required purposes, or it may comprise a general-purpose computer selectively activated or reconfigured by a computer program stored in the computer. Such a computer program may be stored in a computer readable storage medium, such as, but is not limited to, any type of disk including floppy disks, optical disks, CD-ROMs, magnetic-optical disks, read-only memories (ROMs), random access memories (RAMs), EPROMs, EEPROMs, magnetic or optical cards, application specific integrated circuits (ASICs), or any type of media suitable for storing electronic instructions, and each coupled to a computer system bus. Further, the computers referred to herein may include a single processor or may be architectures employing multiple processor designs for increased computing capability.

[0085] The algorithms and displays presented herein are not inherently related to any particular computer, virtualized system, or other apparatus. Various general-purpose systems may also be used with programs in accordance with the teachings herein, or it may prove convenient to construct more specialized apparatus to perform the required method steps. The required structure for a variety of these systems will be apparent from the description above. In addition, the present invention is not described with reference to any particular programming language. It will be appreciated that a variety of programming languages may be used to implement the teachings of the present invention as described herein, and any references above to specific languages are provided for disclosure of enablement and best mode of the present invention.

[0086] While the invention has been described with respect to a limited number of embodiments, those skilled in the art, having benefit of the above description, will appreciate that other embodiments may be devised which do not depart from the scope of the present invention as described herein. In addition, it should be noted that the language used in the specification has been principally selected for readability and instructional purposes, and may not have been selected to delineate or circumscribe the inventive subject matter. Accordingly, the disclosure of the present invention is intended to be illustrative, but not limiting, of the scope of the invention, which is set forth in the claims.

What is being claimed is:

1. A mobile computing device comprising:

a touch-sensitive display screen; and

a processor, coupled to the display screen, to concurrently operate at least two activities and operate the display screen in at least a full-screen mode and a windowed mode;

wherein in the full-screen mode, the processor (i) provides, on the display screen, an interface for a single one of the activities, and (ii) enables a user to interact with the single one of the activities that is provided on the display screen so that subsequent user inputs on the display screen are received by the single one of the activities;

wherein in the windowed mode, the processor provides, on the display screen:

a first window having focus and corresponding to a first activity of the at least two activities; and

linearly adjacent to the first window, a first portion of a second window corresponding to a second activity so that a second portion of the second window is not visible on the display screen, the second activity being different from the first activity;

wherein in the windowed mode, responsive to a directional user gesture with the display screen, the processor (i) causes the first window and the second window to move in concert with one another to reposition the first window and the second window in a direction of the directional user gesture, and (ii) changes focus from the first window to the second window on the display screen so that a first portion of the first window is provided on the display screen and a second portion of the first window is not visible on the display screen.

2. The mobile computing device of claim 1, wherein the at least two activities includes one or more applications.

3. The mobile computing device of claim 1, wherein in the windowed mode, the processor provides, on the display screen, the first window having focus by providing the first window in a position substantially centrally with respect to the middle of the display screen.

4. The mobile computing device of claim 1, wherein in the windowed mode, at least the first window displays at least one of (i) an output from an application, (ii) a task, (iii) a message, (iv) a document, or (v) a web page.

5. The mobile computing device of claim 1, further comprising:

a physical button; and

wherein in the full-screen mode, responsive to an input provided by the user via the physical button, the processor changes operation from the full-screen mode to the windowed mode.

6. The mobile computing device of claim 5, wherein in the windowed mode, responsive to a tap input on the first window or the second window provided on the display screen, the processor changes operation from the windowed mode to the full-screen mode so that an interface for either the first window or the second window is provided on the display screen.

7. The mobile computing device of claim 6, wherein the processor causes a transition effect to be displayed when changing operation from the windowed mode to the full-screen mode.

8. The mobile computing device of claim 1, wherein in the windowed mode, the processor further provides, on the display screen, linearly adjacent to the first window, a first portion of a third window corresponding to a third activity so that a second portion of the third window is not visible on the display screen.

9. The mobile computing device of claim 1, wherein in the windowed mode, the processor further provides, on the display screen, a plurality of icons positioned beneath at least the first window, the plurality of icons including an icon corresponding to an application.

10. A method for navigating among a plurality of activities operated on a mobile computing device, the method being performed by a processor and comprising:

concurrently operating at least two activities; and providing for display, on a touch-sensitive display screen of the mobile computing device, output for at least one of the two activities in a full-screen mode or a windowed mode, wherein in the full-screen mode, an interface for a single one of the activities is displayed on the display screen so that subsequent user inputs on the display screen are received by the single one of the activities, and wherein in the windowed mode, (i) a first window having focus is displayed on the display screen, the first window corresponding to a first activity, and (ii) linearly adjacent to the first window, a first portion of a second window corresponding to a second activity is displayed on the display screen so that a second portion of the second window is not visible on the display screen, the second activity being different from the first activity;

wherein in the windowed mode: receiving a directional user gesture provided on the display screen, and responsive to receiving the directional user gesture, (i) causing the first window and the second window to move in concert with one another to the first window and the second window in a direction of the directional user gesture, and (ii) changing focus from the first window to the second window on the display screen so that a first portion of the first window is provided on the display screen and a second portion of the first window is not visible on the display screen.

11. The method of claim 10, wherein the at least two activities includes one or more applications.

12. The method of claim 10, wherein in the windowed mode, the first window having focus is displayed on the display screen by being displayed in a position substantially centrally with respect to the middle of the display screen.

13. The method of claim 10, wherein in the windowed mode, at least the first window displays at least one of (i) an output from an application, (ii) a task, (iii) a message, (iv) a document, or (v) a web page.

14. The method of claim 10, further comprising: in the full-screen mode: receiving an input provided by the user via a physical button of the mobile computing device; and responsive to the input provided by the user via the physical button, changing operation from the full-screen mode to the windowed mode.

15. The method of claim 14, further comprising: in the windowed mode: receiving a tap input on the first window or the second window provided on the display screen; and responsive to the tap input provided by the user, changing operation from the windowed mode to the full-screen mode so that an interface for either the first window or the second window is provided on the display screen.

16. A non-transitory computer-readable medium storing instructions that, when executed by a processor, causes the processor to perform operations comprising:

concurrently operating at least two activities; providing for display, on a touch-sensitive display screen of a mobile computing device, output for at least one of the two activities in a full-screen mode or a windowed mode, wherein in the full-screen mode, an interface for a single one of the activities is displayed on the display screen so that subsequent user inputs on the display screen are received by the single one of the activities, and wherein in the windowed mode, (i) a first window having focus is displayed on the display screen, the first window corresponding to a first activity, and (ii) linearly adjacent to the first window, a first portion of a second window corresponding to a second activity is displayed on the display screen so that a second portion of the second window is not visible on the display screen, the second activity being different from the first activity;

wherein in the windowed mode: receiving a directional user gesture provided on the display screen, and responsive to receiving the directional user gesture, (i) causing the first window and the second window to move in concert with one another to the first window and the second window in a direction of the directional user gesture, and (ii) changing focus from the first window to the second window on the display screen so that a first portion of the first window is provided on the display screen and a second portion of the first window is not visible on the display screen.

17. The non-transitory computer-readable medium of claim 16, wherein the at least two activities includes one or more applications.

18. The non-transitory computer-readable medium of claim 16, wherein the instructions cause the processor to provide, on the display screen, the first window having focus by providing the first window in a position substantially centrally with respect to the middle of the display screen.

19. The non-transitory computer-readable medium of claim 16, wherein the instructions cause the processor to: in the full-screen mode: receive an input provided by the user via a physical button of the mobile computing device; and responsive to the input provided by the user via the physical button, change operation from the full-screen mode to the windowed mode.

20. The non-transitory computer-readable medium of claim 19, wherein the instructions cause the processor to: in the windowed mode: receive a tap input on the first window or the second window provided on the display screen; and responsive to the tap input provided by the user, change operation from the windowed mode to the full-screen mode so that an interface for either the first window or the second window is provided on the display screen.

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