US008375336B2

(12) **United States Patent**
Matthews et al.

(10) **Patent No.: US 8,375,336 B2**
(45) **Date of Patent: Feb. 12, 2013**

(54) **PANNING CONTENT UTILIZING A DRAG OPERATION**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 727 days.

(21) Appl. No.: **12/245,306**

(22) Filed: **Oct. 3, 2008**

(65) **Prior Publication Data**

US 2009/0292989 A1 Nov. 26, 2009

Related U.S. Application Data

(60) Provisional application No. 61/055,962, filed on May 23, 2008.

(51) **Int. Cl.**
G06F 3/033 (2006.01)
G06F 3/14 (2006.01)

(52) **U.S. Cl.** **715/863**; 715/864

(58) **Field of Classification Search** 715/863, 715/864

See application file for complete search history.

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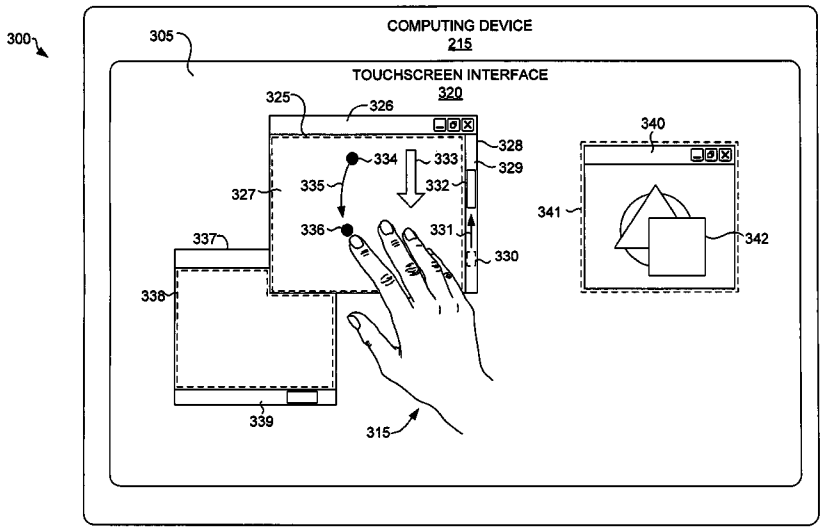
(57) **ABSTRACT**

Computer-readable media, computerized methods, and computer systems for intuitively invoking a panning action (e.g., moving content within a content region of a display area) by applying a user-initiated input at the content region rendered at a touchscreen interface are provided. Initially, aspects of the user-initiated input include a location of actuation (e.g., touch point on the touchscreen interface) and a gesture. Upon ascertaining that the actuation location occurred within the content region and that the gesture is a drag operation, based on a distance of uninterrupted tactile contact with the touchscreen interface, a panning mode may be initiated. When in the panning mode, and if the application rendering the content at the display area supports scrolling functionality, the gesture will control movement of the content within the content region. In particular, the drag operation of the gesture will pan the content within the display area when surfaced at the touchscreen interface.

18 Claims, 4 Drawing Sheets



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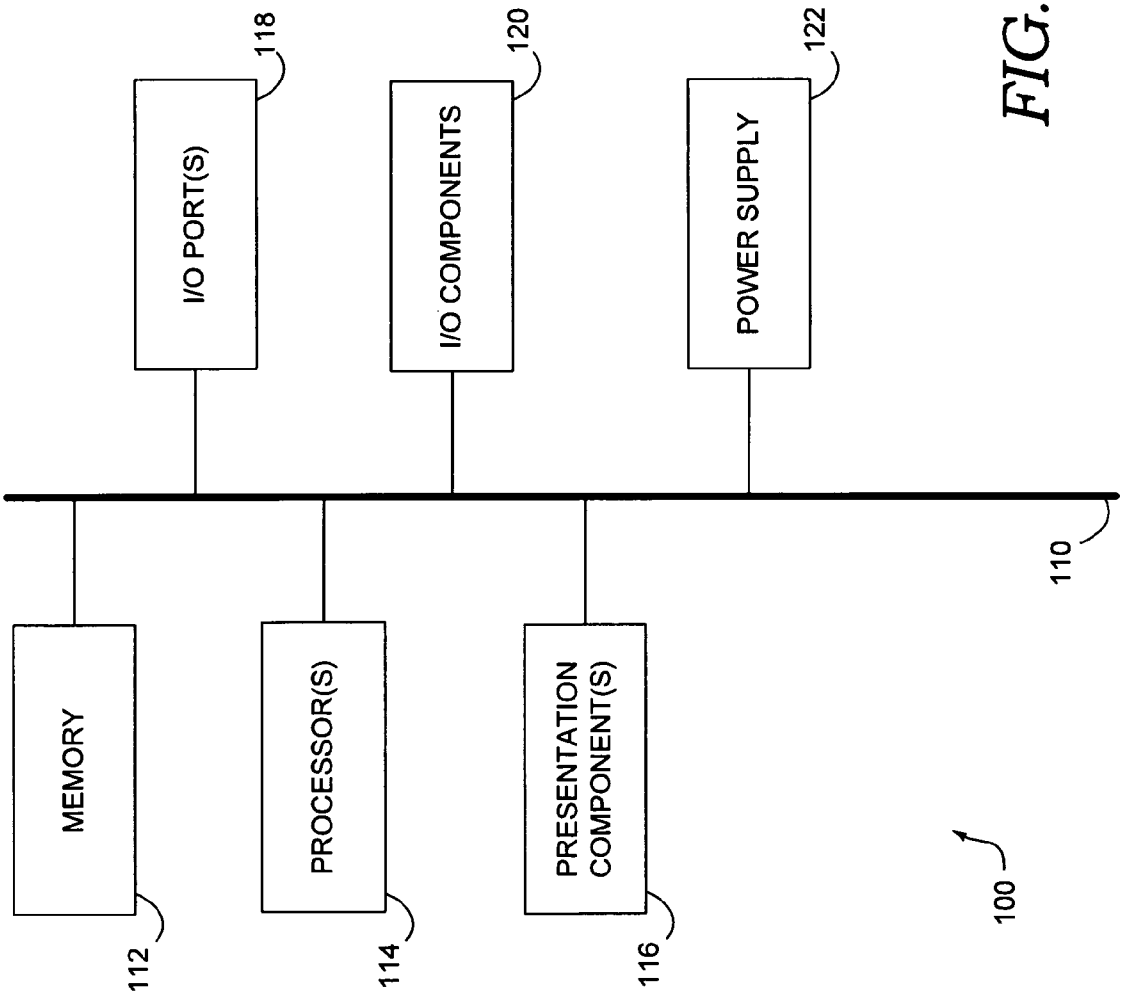

MEMORY
112
PROCESSOR(S)
114
PRESENTATION COMPONENT(S)
116
I/O PORT(S)
118
I/O COMPONENTS
120
POWER SUPPLY
122
110
100

FIG. 1.

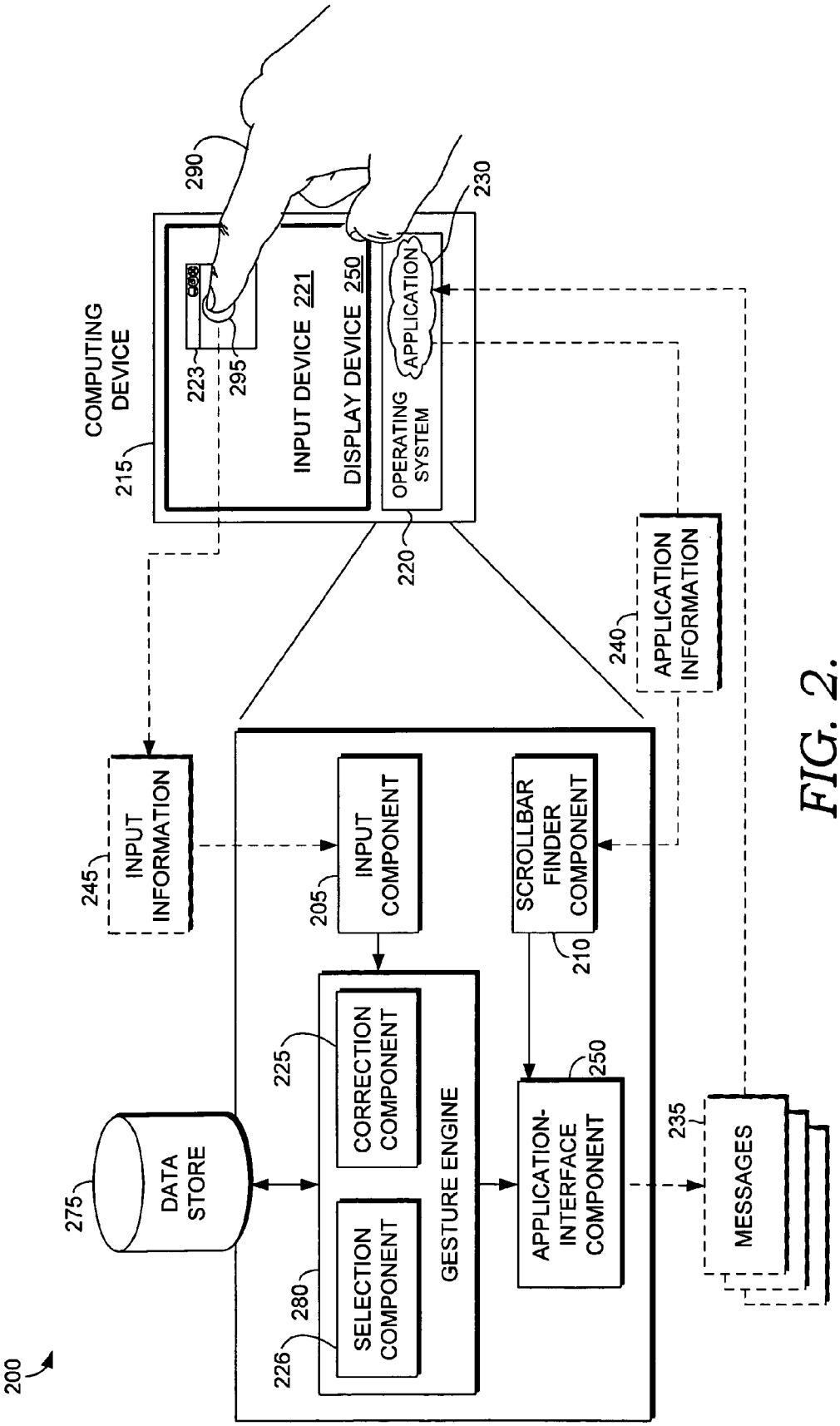
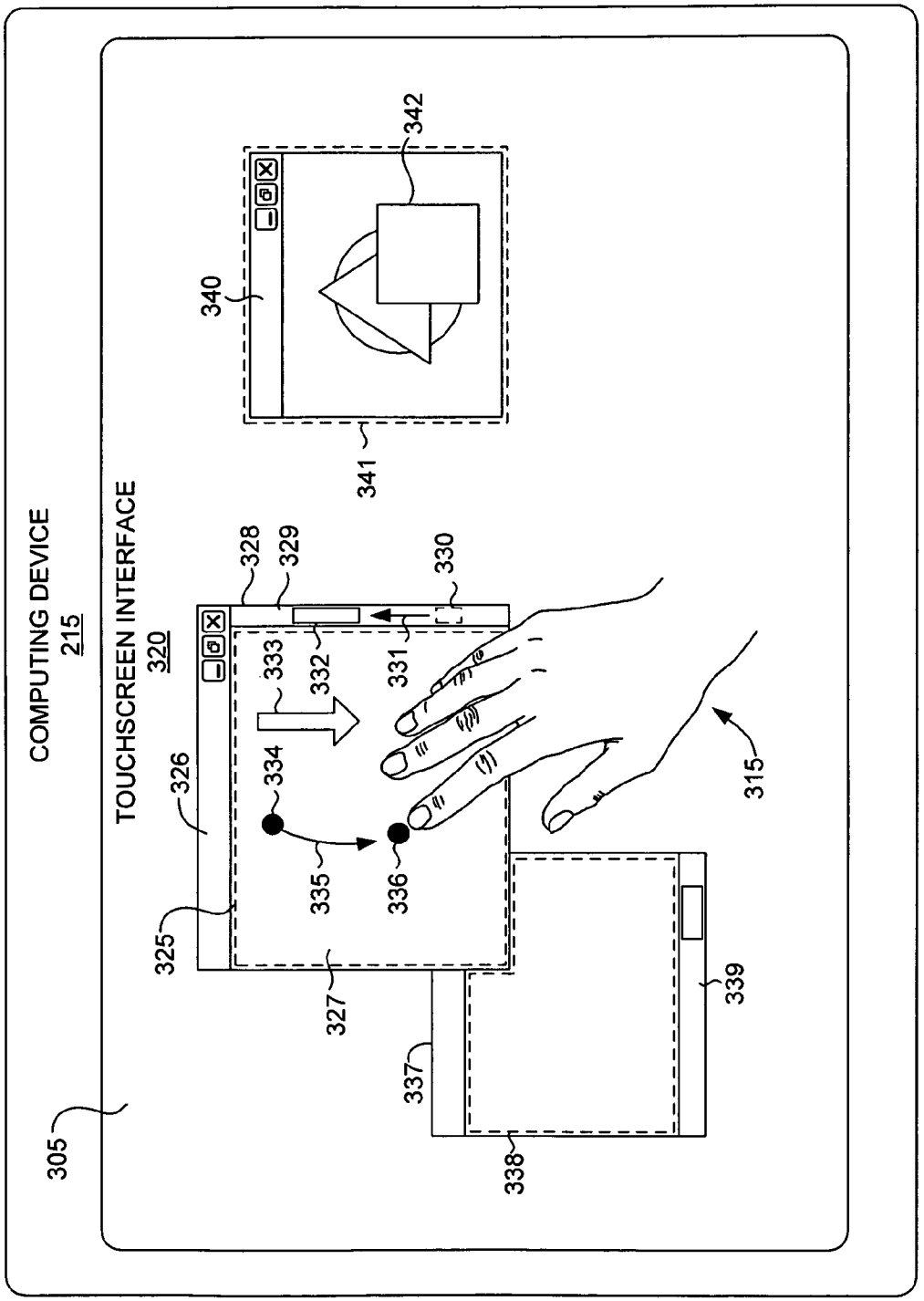

COMPUTING DEVICE
215
290
223
295
INPUT DEVICE 221
DISPLAY DEVICE 250
OPERATING SYSTEM
APPLICATION
230
220
240
APPLICATION INFORMATION
245
INPUT INFORMATION
205
INPUT COMPONENT
SCROLLBAR FINDER COMPONENT
210
225
CORRECTION COMPONENT
GESTURE ENGINE
250
APPLICATION-INTERFACE COMPONENT
235
MESSAGES
275
DATA STORE
280
SELECTION COMPONENT
226
200

FIG. 2.


COMPUTING DEVICE
215
TOUCHSCREEN INTERFACE
320
305
300
315
325
326
327
328
329
330
331
332
333
334
335
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337
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341
342

FIG. 3.

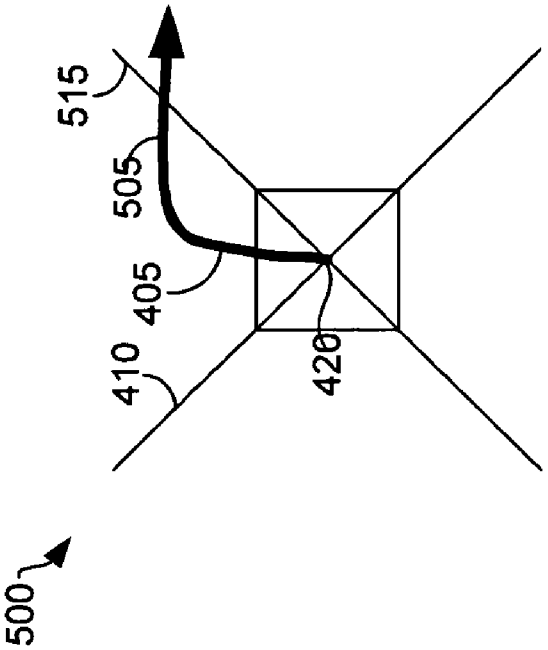

FIG. 5.

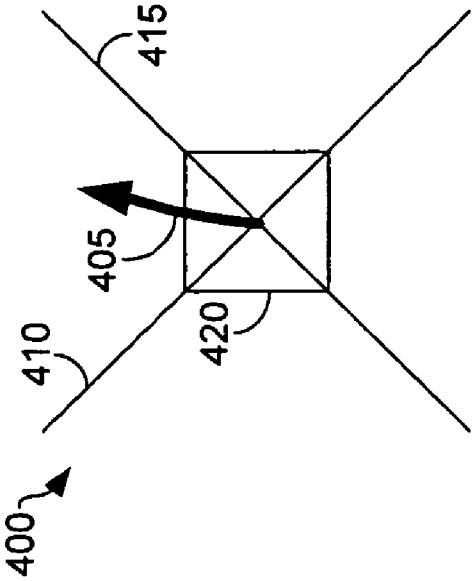

FIG. 4.

PANNING CONTENT UTILIZING A DRAG OPERATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 61/055,962, filed May 23, 2008 entitled PANNING CONTENT UTILIZING A DRAG-OPERATION, herein incorporated by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

BACKGROUND

Increasingly, computing devices (e.g., PDA's, cell phones, laptops, wireless handheld devices, and the like) that implement touchscreen interfaces have become popular in commercial markets. These touchscreen interfaces are an important differentiating feature for computing devices and other electronics as they tend to offer intuitive interaction with software integrated therein. Optimally, touchscreen interfaces should provide a complete software experience that can manipulate the software to achieve all the functionality available to conventional input device. However, a significant amount of provided software has not been designed with touch in mind, referred to hereinafter as touch-naïve applications. For instance, in the case of touch-naïve applications that are configured for scrolling through content rendered in a display area at a user-interface (UI) display, the scrolling functionality is not entirely integrated with a touchscreen interface. That is, the ability to scroll through content by applying a drag operation on a content region within the display area is not available to a touchscreen interface. Instead, typically, mouse users scroll content via conventional mouse inputs applied to the scrollbar, and keyboard users either use page up or page down, a keyboard shortcut like ctrl-end, or switch to using the mouse. These keyboard methods do not corporate with a touch interface, and applying touch to a touch interface in the same manner as mouse users (i.e., trying to drive the scrollbar accurately with a pointing device) is difficult due to the precision and targeting issues users generally have with applying the touch.

So far, no solution for making accessible complete functionality of touch-naïve applications to users of touchscreen interfaces has been developed. Even further, no scheme exists that adapts gestures applied to a touchscreen interface, which may be different in movement than expected movements from conventional input devices, to commands that manipulate the display of content in a display area in an optimized intuitive manner. As such, employing gesture-interpretation techniques for controlling scrolling functionality of touch-naïve applications would enhance a user's experience in panning content upon applying particular gestures (e.g., a drag operation at the content region of a display area) to the touchscreen interface. Generally, if an area includes a feature that allows vertical scrolling, panning messages are generated in accordance with the touches detected at the touch interface. Otherwise, touch input at the touch interface generates mouse messages.

SUMMARY

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

Embodiments of the present invention provide computer-readable media having computer-executable instructions embodied thereon, and a computer system for making accessible scrolling functionality of touch-naïve applications to users of touchscreen interfaces. In particular, techniques for controlling scrolling functionality of touch-naïve applications upon receiving an indication of a particular gesture (e.g., a drag operation at the content region of a display area) at a touchscreen interface are provided.

Generally, a method for panning content within a display area presented on a UI display of a computing device is provided. Initially, a user-initiated input applied to the touchscreen interface is detected and actuation information from the touchscreen interface is provided to an operating system. Typically, the touchscreen information includes a touch location and a gesture. Substantially concurrently with, or prior to, receiving the user-initiated input, the application is identified as supporting scrolling functionality. The operating system invokes a gesture-interpretation procedure to determine whether to pan the content within the display area, to pan the display area within the UI display, or perform another operation. In one embodiment, the gesture-interpretation procedure includes, but is not limited to, ascertaining that the touch location occurred within a content region of the display area surfaced at the touchscreen interface, and recognizing the gesture as a drag operation by disambiguating the drag operation from a tap-type operation based on a distance of an uninterrupted drag-movement from the actuation location. Typically, the content within the content region is rendered by a touch-naïve application integrated within the computing device, where the touch-naïve application is not built to recognize drag operations within the content region as an indication to pan the content. Upon recognizing the gesture as a drag operation and determining that the application supports scrolling functionality, the content is panned within the content region of the display area according to the drag operation. An indication of panning the content may be presented to a user at the touchscreen interface or any other presentation component.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is described in detail below with reference to the attached drawing figures, wherein:

FIG. **1** is a block diagram of an exemplary computing environment suitable for use in implementing embodiments of the present invention;

FIG. **2** is a schematic diagram of an exemplary system architecture suitable for use in implementing embodiments of the present invention, in accordance with an embodiment of the present invention;

FIG. **3** is a diagrammatic view of a display area on a touchscreen interface illustrating a method for panning content therein, in accordance with an embodiment of the present invention; and

FIGS. **4** and **5** are progressive drag operation depictions illustrating stages of performing the drag operation that switches from panning content to invoking a secondary action, in accordance with embodiments of the present invention.

DETAILED DESCRIPTION

The subject matter is described with specificity herein to meet statutory requirements. However, the description itself

is not intended to limit the scope of this patent. Rather, the inventors have contemplated that the claimed subject matter might also be embodied in other ways, to include different steps or combinations of steps similar to the ones described in this document, in conjunction with other present or future technologies. Moreover, although the terms "step" and/or "block" may be used herein to connote different elements of methods employed, the terms should not be interpreted as implying any particular order among or between various steps herein disclosed unless and except when the order of individual steps is explicitly described.

Embodiments of the present invention provide computer-readable media having computer-executable instructions embodied thereon, a computer system, and computerized methods for panning content within a content region of a display area rendered by a touch-naïve application that supports scrolling functionality by applying a gesture (e.g., drag operation) at a touchscreen interface.

Accordingly, in one aspect, the embodiments of the present invention provide one or more computer-readable media having computer-executable instructions embodied thereon that, when executed, perform a method for panning content within a display area presented at a touchscreen interface disposed on a computing device. In embodiments, the method includes detecting a user-initiated input applied to the touchscreen interface, and receiving actuation information from the touchscreen interface. Typically, the actuation information comprises a touch location and a gesture (e.g., single-finger contact within the touchscreen interface, interaction of a stylus or pen with the touchscreen interface, and the like). The method may further include ascertaining that the touch location occurred within a content region of the display area surfaced at the touchscreen interface. In embodiments, the display area may be rendered by an application integrated within an operating system of the computing device. Often, the application is touch-naïve, that is, unable to interpret gestures applied at the touchscreen interface upon attempting to manipulate scrolling or selection of the surfaced content. In an exemplary embodiment, the gesture is recognized by the system as a drag operation by disambiguating the drag operation from a tap-type operation based on a distance of an uninterrupted movement of the gesture from the actuation location of the user-initiated input at the touchscreen interface. By way of example the uninterrupted movement includes a sweep of the touchscreen interface that overcomes a threshold distance in a predefined Cartesianal direction. By leveraging the scrolling functionality of the application, the gesture may facilitate panning the content within the content region of the display area according to the drag operation. An indication of panning the content may be presented at the touchscreen interface. By way of example, presenting an indication of panning content may include revealing a translation of content within the content region, or demonstrating a movement of the display area at the UI display.

Generally, embodiments of the present invention relate touch panning within a touchscreen interface environment. As discussed herein, "touch panning" is not meant to be limiting but may encompass any use action that initiates scrolling functionality of an application. In one instance, touch panning includes a user action of scrolling through a page or list by touching the content region and performing a drag operation in order to make the content move in substantial correspondence with a contact translation of the drag operation. In the case where scrolling functionality is not provided by the application, touch panning may invoke a mouse drag. That is, if the application includes content that is vertically or horizontally scrollable, panning messages are provided thereto. Otherwise, mouse messages are generated. In effect, in one instance, the mouse messages may trigger a drag action that moves the display area within the UI display, instead of panning content. This translation of the display area across the screen may be similar to a drag action implemented by a mouse message generated upon detecting a click+hold+drag operation of a convention mouse. As such, interference with applications that do not scroll is avoided.

In order to facilitate touch panning, a gesture-recognition procedure for recognizing gestures encompassed by a user-initiated input on a touchscreen display, or other tactile-input device, as either a drag operation or a tap-type operation may be implemented. As discussed above, in one instance, the drag operation is disambiguated from the tap-type operation based on a distance of an uninterrupted movement. As used herein, the phrase "uninterrupted movement" is not meant to be limiting and may encompass any constant sweep, quasi-continuous input, or recursive chain of inputs that replicate a dragged contact across a surface of a touchscreen interface. In one instance, the uninterrupted movement may include contact between a physical object (e.g., stylus, pen, portion or pad of a finger, and the like) and the touchscreen interface. Generally, if the location of actuation occurs within a content region of a display area (e.g., window surfaced at a UI display) and a drag operation is recognized, a panning mode is invoked. As discussed with more detail below, in the panning mode, the operating system provides panning messages to an application rendering the content, as opposed to mouse messages that often do not initiate panning of content with the content region.

In an exemplary embodiment, if a drag operation in the vertical direction is recognized, a panning mode is invoked, regardless of whether the application supports vertical and/or horizontal scrolling. Horizontal drag movements would generate mouse messages, even if the application supported horizontal scrolling. Accordingly, a user could still achieve horizontal panning by starting with a vertical drag and then changing direction. In other words, vertical drags become pans, while horizontal drags become mouse drags. As such a consistent movement experience is introduced that triggers the panning mode for most applications.

In another embodiment, the gesture-recognition procedure is configured to perform the steps of ascertaining whether the touch location occurred within a content region of a display area surfaced at the touchscreen interface, where the display area is rendered by the application, and ascertaining whether the drag operation satisfies predefined system metrics in sequence or in parallel. If the touch location occurs within the content region and the drag operation satisfies predefined system metrics, the application enters a panning mode that supports scrolling functionality of content within the content region of the display area. Otherwise the application is retained in a default mode. In one aspect of the default mode, raw inputs associated with the gesture are allowed to flow from the touchscreen interface to the application as if it were a mouse input. In another aspect, the default mode induces the application to operate in a manner similar to the operation of a touch-naïve application. The application may be stored consistent with either the panning mode or the default mode.

Although several different methods for generating an uninterrupted movement have been described above, it should be understood and appreciated by those of ordinary skill in the art that various other drag-like inputs applied to a touchscreen component are contemplated herein as an uninterrupted movement, and that embodiments of the present invention are

not limited to those methods shown and described. For instance, other uninterrupted movements that of a gesture are depicted at FIGS. **4-7**.

In embodiments, the invention relates to interpreting gestures received at a touchscreen interface and providing messages to an application based on the interpretation. Use of the term "application" is not meant to be limiting but may include any software or program operably controlled by an operating system, where the operating system receives input information from the touchscreen interface upon detecting a user-initiated input. For instance, the application may be a third-party application that renders scrollable content at a presentation component and/or touchscreen interface. In this instance, the application is considered to support scrolling functionality. Also, scrolling functionality may be detected if a scrollbar tool is surfaced within the display area at the UI display.

In one embodiment, the application is gesture-aware. Gesture-aware applications are a class of applications designed with touch in mind and behave normally without interpreting gestures at a touchscreen interface and communicating the gestures in specific messages to the application. As such, gesture-aware applications are generally optimized with touch in mind, and can receive raw inputs from the touchscreen interface.

In another embodiment, the application is touch-naïve, which accounts for a majority of the applications existing in the current commercial marketplace. Generally, a touch-naïve application is one where panning features (e.g., accessing the scrolling functionality by inputs on the touchscreen interface within the content region) are not built, implemented, or written into the application. That is, the application is unaware that it is cooperating with touchscreen inputs, and, in particular, that the gestures performed at the touchscreen interface are attempting to pan content being rendered thereby. By way of example only, the naïve-touch application may be a legacy application (e.g., Notepad) in which the scrolling functionality for panning content is only invoked by providing an input at the scrollbar control.

Accordingly, aspects of the invention facilitate incorporating touch-panning capability into touch-naive applications, and is well suited for deployment in an operating system that comprises an ecosystem of touch-naïve applications. For instance, the operating system may function as an interface that interconnects the touchscreen interface and the touch-naive applications, thereby managing the communication therebetween. By managing the communication, appropriate commands, in the form of messages (e.g., mouse messages or scrolling messages), may be passed to the touch-naive applications in order to properly adjust the presentation of content. As such, managing via the operating system generally allows the operating system to make most existing touch-naïve applications touch friendly.

Having briefly described an overview of embodiments of the present invention and some of the window states featured therein, an exemplary operating environment suitable for implementing the present invention is described below.

Referring to the drawings in general, and initially to FIG. **1** in particular, an exemplary operating environment for implementing embodiments of the present invention is shown and designated generally as computing device **100**. Computing device **100** is but one example of a suitable computing environment and is not intended to suggest any limitation as to the scope of use or functionality of the invention. Neither should the computing device **100** be interpreted as having any dependency or requirement relating to any one or combination of components illustrated.

The invention may be described in the general context of computer code or machine-useable instructions, including computer-executable instructions such as program components, being executed by a computer or other machine, such as a personal data assistant or other handheld device. Generally, program components including routines, programs, objects, components, data structures, and the like, refer to code that performs particular tasks or implements particular abstract data types. Embodiments of the present invention may be practiced in a variety of system configurations, including handheld devices, consumer electronics, general-purpose computers, specialty computing devices, etc. Embodiments of the invention may also be practiced in distributed computing environments where tasks are performed by remote-processing devices that are linked through a communications network.

With continued reference to FIG. **1**, computing device **100** includes a bus **110** that directly or indirectly couples the following devices: memory **112**, one or more processors **114**, one or more presentation components **116**, input/output (I/O) ports **118**, I/O components **120**, and an illustrative power supply **122**. Bus **110** represents what may be one or more busses (such as an address bus, data bus, or combination thereof). Although the various blocks of FIG. **1** are shown with lines for the sake of clarity, in reality, delineating various components is not so clear and, metaphorically, the lines would more accurately be grey and fuzzy. For example, one may consider a presentation component such as a display device to be an I/O component. Also, processors have memory. The inventors hereof recognize that such is the nature of the art and reiterate that the diagram of FIG. **1** is merely illustrative of an exemplary computing device that can be used in connection with one or more embodiments of the present invention. Distinction is not made between such categories as "workstation," "server," "laptop," "handheld device," etc., as all are contemplated to be within the scope of FIG. **1** in reference to "computer" or "computing device."

Computing device **100** typically includes a variety of computer-readable media. By way of example, and not limitation, computer-readable media may comprise Random Access Memory (RAM); Read Only Memory (ROM); Electronically Erasable Programmable Read Only Memory (EEPROM); flash memory or other memory technologies; CDROM, digital versatile disks (DVDs) or other optical or holographic media; magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices; or any other medium that can be used to encode desired information and be accessed by computing device **100**.

Memory **112** includes computer-storage media in the form of volatile and/or nonvolatile memory. The memory may be removable, nonremovable, or a combination thereof. Exemplary hardware devices include solid-state memory, hard drives, optical-disc drives, etc. Computing device **100** includes one or more processors that read data from various entities such as memory **112** or I/O components **120**. Presentation component(s) **116** present data indications to a user or other device. Exemplary presentation components include a display device, speaker, printing component, vibrating component, etc. I/O ports **118** allow computing device **100** to be logically coupled to other devices including I/O components **120**, some of which may be built in. Illustrative components include a microphone, joystick, game pad, satellite dish, scanner, printer, wireless device, etc.

Turning now to FIG. **2**, a schematic diagram of an exemplary system architecture **200** suitable for use in implementing embodiments of the present invention is shown, in accordance with an embodiment of the present invention It will be

understood and appreciated by those of ordinary skill in the art that the exemplary system architecture **200** shown in FIG. **2** is merely an example of one suitable computing environment and is not intended to suggest any limitation as to the scope of use or functionality of the present invention. Neither should the exemplary system architecture **200** be interpreted as having any dependency or requirement related to any single component or combination of components illustrated therein.

Initially, a computing device **215** is provided. The computing device **215** may take the form of various types of computing devices. By way of example only, the computing device **215** may be a personal computing device (e.g., computing device **100** of FIG. **1**), handheld device (e.g., personal digital assistant), a mobile device (e.g., laptop computer, cell phone, media player, tablet pc), consumer electronic device, various servers, and the like. Additionally, the computing device may comprise two or more electronic devices configured to share information therebetween.

In embodiments, a presentation component **250**, an input device **221**, and a processor (e.g., hardware-based component) may be operably coupled with, and/or disposed on, the computing device **215**. Typically, an operating system **220** is installed on the processor. The computing device **215** is configured to present a UI display on the presentation component **250**. The presentation component **250**, which may be operably coupled to the processing component **225**, may be configured as any display device that is capable of presenting information to a user, such as a monitor, electronic display panel, touch-screen, liquid crystal display (LCD), plasma screen, one or more light-emitting diodes (LED), incandescent bulbs, a laser, an electroluminescent light source, a chemical light, a flexible light wire, and/or fluorescent light, or any other display type, or may comprise a reflective surface upon which the visual information is projected. In one exemplary embodiment, the UI display rendered by the presentation component **250** is configured to present a display area **223** with a content region (not shown), where content rendered by application **230** is surfaced within the content region. In another exemplary embodiment, the UI display is capable of providing a visual indication of content panning within the content region or translating the display area **223** across a portion of the UI display.

In embodiments, the computing device **215** is operably coupled with an input device **221** and a presentation component **250**. As such, communication between the input device **221**, the presentation component **250**, and the operating system **220** may be supported by a distributed computing environment, such as a remote server (not shown), or any combination thereof. In embodiments of the invention that are practiced in distributed computing environments, the communication is linked through appropriate connections. These connections may be wired or wireless. Examples of particular wired embodiments, within the scope of the present invention, include USB connections and cable connections. Examples of particular wireless embodiments, within the scope of the present invention, include a near-range wireless network and radio-frequency technology. It should be understood and appreciated that the designation of "near-range wireless network" is not meant to be limiting, and should be interpreted broadly to include at least the following technologies: negotiated wireless peripheral (NWP) devices; short-range wireless air interference networks (e.g., wireless personal area network (wPAN), wireless local area network (wLAN), wireless wide area network (wWAN), Bluetooth™, and the like); wireless peer-to-peer communication (e.g., Ultra Wideband); and any protocol that supports wireless communication of data between devices. Additionally, persons familiar with the field of the invention will realize that a near-range wireless network may be practiced by various data-transfer methods (e.g., satellite transmission, telecommunications network, etc.). Therefore it is emphasized that embodiments of the connections between the computing device **215** other remote components operably coupled thereto are not limited by the examples described, but embrace a wide variety of methods of communications.

The input device **221** is provided to accept user-initiated input(s) **295** affecting, among other things, panning of content within the content region. In an exemplary embodiment, the input device **221** receives the user-initiated inputs **295** directed at the display area **223** rendered on the UI display. Illustrative devices include a touchscreen interface (e.g., contemporaneously employed as the presentation component **250**), the I/O components **120** of FIG. **1**, touch digitizers, or any other component capable of receiving the user-initiated input **295** that includes a gesture and communicating an indication of that input to the operating system **220**. By way of example only, the input device **221** may determine a coordinate location of where the user-initiated input **295** initiates contact therewith (e.g., location of actuation) and a coordinate location of where the user-initiated input **295** terminates contact therewith (e.g., location of release), with reference to items rendered at the GUI. These coordinate locations may be compared to determine a distance of an uninterrupted movement and a direction thereof, as discussed more fully below. Accordingly a drag operation may be distilled from a gesture applied at the input device **221**. In embodiments, the input is pre-processed by a screen driver that derives input information from the raw input data prior to passing it on to the operating system **220**.

Although several differing configurations of the input device **221** have been described above, it should be understood and appreciated by those of ordinary skill in the art that various types of input devices that receive inputs from physical contact **290**, or otherwise (e.g., "touch" systems that interact/respond upon bringing an object within proximity to the screen without actually making contact), may be employed as the input device **221**, and that embodiments of the present invention are not limited to those input devices **221** that are shown and described as being incorporated into the presentation component **250**. For instance, the presentation component **250** may be a monitor operably coupled to a computer (e.g., computing device **215**), while the input device **221** may be a stand-alone capacitive touchscreen that is in wireless communication (discussed above) with the computing device. However, for the sake of brevity and clarity, the input device **221** and the presentation component **250** will hereinafter be referred to jointly as a touchscreen interface, which is a touchscreen that offers the functionality of both a display and an input element as a single unit.

The operating system (OS) **220** refers generally to the software that manages the sharing of the resources of the processing component and provides programmers with an interface used to access those resources. In operation, the operating system **220** interprets system data and detects the user-initiated inputs **295** (e.g., via the input device **210**), and responds by executing such processes as the following, in no particular order: receiving an input **295** from a physical object **290** (e.g., single-finger gesture, pen stroke, and the like) at the touchscreen interface, determining which gesture the input **295** performed, determining that the application **230** supports scrolling functionality, and filtering a communication of the input **295** to the application **230** if the gesture is mapped to drag operation in a scrollable direction. As used herein, the

phrase "scrollable direction" is not meant to be limiting, but generally relates to a direction in which the content is allowed to move within the content region, as governed by the application **230**. In one instance, scrollable direction is substantially parallel to an alignment (e.g., horizontal or vertical) of a scrollbar tool.

In an exemplary embodiment, the operating system **220** runs on the processor and supports execution of one or more of applications, including the application **230**. In other embodiment, the operating system **220** and/or the application **230** may partially or fully reside on a remotely located computing device (e.g., on another operating system, on a server located via a web address, etc.). In various embodiments, the operating system **220** determines whether to provide panning messages to the application **230** based on input information **245** received from the input device **221**. Although the user-initiated input **295** is received from the touchscreen interface, illustrated in FIG. **2**, it should be understood and appreciated that other inputs from various other input devices (e.g., a remote tactile-input panel) may be received and interpreted by the operating system **220**; accordingly, the scope of the present invention is not limited to the inputs and input devices described herein. If the distance and/or direction of a gesture included within the input **295** satisfies system metrics for evaluating whether to initiate panning mode, the operating system **220** may provide scrolling messages to the application **230** causing the content to be panned in correspondence with the gesture. In such case, panning functionality of the application **230** mapped to a drag operation of the gesture is automatically invoked.

Generally, the application **230** is any program that may be launched and manipulated by the operating system **220**. As discussed above, the application **230** manages content published on the UI display. In addition, the application **230** may be touch-naïve, as discussed above, or, alternatively, may be able to accept raw input from the touchscreen interface.

This operating-system structure of the operating system **220** is but one example of a suitable structure that may be run on the processor, and is not intended to suggest any limitation as to the scope of use or functionality of the invention. Neither should the illustrated operating system **220** be interpreted as having any dependency or requirement relating to any one or combination of receiving the user-initiated input **295** in the form of the input information **245** or providing the messages **235** as illustrated. Further, the application **230** may be integrated into the operating system **220** and is exemplary in nature and in number, and should not be construed as limiting.

In an exemplary embodiment, the operating system **220** includes an input component **205**, a gesture engine **280** that includes a correction component **225** and a selection component **226**, a scrollbar finder **210**, and an application-interface component **235**.

In addition, the operating system **220** may include a data store **275**. In embodiments, the data store **275** may reside on the computing device **215**, or on a remotely-located computing device (e.g., on another operating system, on a server located via a web address, etc.). The data store **275** may be configured to store information including messages mapped to particular gestures, system metrics (such as a trigger boundaries) for switching from panning content to selection of content, and any other data to relevant panning. Further, though illustrated as a single, independent component, the data store **275** may, in fact, be a plurality of databases, for instance, a server cluster.

This operating-system structure of the operating system **220** is but one example of a suitable structure that may be run on the computing device **215**, and is not intended to suggest any limitation as to the scope of use or functionality of the invention. Neither should the illustrated operating system **220** be interpreted as having any dependency or requirement relating to any one or combination of the components **205**, **210**, **225**, **226**, **280**, or **250** as illustrated. In some embodiments, one or more of the components **205**, **210**, **225**, **226**, **280**, or **250** may be implemented as stand-alone applications. In other embodiments, one or more of the components **205**, **210**, **225**, **226**, **280**, or **250** may be integrated directly into the display device **221** of the computing device **215**, the application **230**, or a combination thereof. By way of example only, the application-interface component **250** may be housed in association with the display device **221**. It will be understood by those of ordinary skill in the art that the components **205**, **210**, **225**, **226**, **280**, or **250** illustrated in FIG. **2** are exemplary in nature and in number and should not be construed as limiting.

Any number of components may be employed to achieve the desired functionality within the scope of embodiments of the present invention. Although the various components of FIG. **2** are shown with lines for the sake of clarity, in reality, delineating various components/elements is not so clear, and metaphorically, the lines would more accurately be grey or fuzzy. Further, although some components and devices of FIG. **2** are depicted as single blocks, the depictions are exemplary in nature and in number and are not to be construed as limiting (e.g., although only one display device **215** is shown, many more may be operably coupled to the computing device **210**, thereby functioning in conjunction to present the UI display **225**).

Initially, the input component **205** is configured to receive the input information **245** from the touchscreen interface. In an exemplary embodiment, the input information **245** may be derived from an input **290**. By way of example, the input **290** may comprise a user-initiated physical contact when a user touches (e.g., single-finger gesture touch) the touchscreen interface. In other embodiments, the input information **245** includes a location of an actuation at the touchscreen interface (e.g., Cartesian coordinate position) and data related to a gesture (e.g., distance of uninterrupted movement, direction of movement, duration of actuation, and the like). This input information **245** may be pre-processed by a screen driver (not shown) that passes data to the input component **205**. The input component **205** may then process the input information **205** before sending to the gesture engine **280**.

The scrollbar finder component **210** makes the determination of whether the application **230** supports scrolling functionality. In one instance the determination is preformed by sniffing the application in order to recognize if a scrollbar tool exists within the display area **223**. If the application **230** supports scrolling functionality, then scrolling messages may be sent to the application to perform panning movements of content based on a drag operation of a received gesture. Otherwise, standard "mouse messages" are provided to the application **230**. The mouse messages are the unfiltered input **295** provided to a touch-naïve application (i.e., not configured for accepting gestures at a touchscreen interface) that controls the application in a similar fashion to what would be expected from using a mouse tool.

Although a method for determining whether the application **230** exhibits scrolling functionality at the UI display is discussed above, other methods for making this determination are encompassed by the scope of the scroll bar finder component **210** and may be applied to various different scrollbar implementations.

The gesture engine **280** is configured to determine tells which gesture is being performed by the user at the computing device **215**. For instance, the gesture engine **280** is capable of

processing a continuous, uninterrupted movement of a gesture and/or a duration of the gesture utilizing a timer. If the duration of the gesture does not comprise a distance of uninterrupted movement above a predefined distance or does not meet a predefined threshold time period, the gesture is considered a tap-type operation (e.g., tap simulating a mouse click). Otherwise, the gesture is considered a drag operation.

In embodiments, the gesture engine **280** disambiguates between a pan and a standard action. For instance, if the gesture is considered a drag operation, the gesture engine **280** looks at the UI display of the application **230** to determine if the user is dragging within a scrollable content region. In embodiments, techniques and approaches to identify whether the actuation location, or touch point that contacts the touchscreen interface, occurs within a scrolling content region are employed. If the actuation location is within the content region and a drag operation is recognized, instead of sending mouse messages, scrolling messages are sent to the application **230**. In a particular embodiment, where the application **230** supports vertical scrolling, and the actuation location is detected within the content region, a vertical drag operation may invoke pan messages that trigger panning up or down, while a horizontal drag operation may invoke mouse messages that select text within the content region, slide the window on the screen, cut and/or paste, etc. In another embodiment, where the where the application **230** supports horizontal scrolling, and the actuation location is detected within the content region, a horizontal drag operation may invoke pan messages that trigger panning side-to-side, while a vertical drag operation may invoke mouse messages.

Accordingly, the content in the content region scrolls with the user's finger as s/he performs a drag. Accordingly, this approach allows users to drag their finger on a content area to pan, and use a different gestures to drag or select within the content regions. For instance, users can pan through a list of items in a file explorer menu by dragging a finger over a surface file list, and then perform a different gesture to select and move a file (e.g., perform a touch point on the title bar or border of the display area **230**).

If the user is dragging over a non-scrollable content region (e.g., title bar, border, scrollbar tool, and the like) rendered by the application **230**, mouse messages are sent to the application, utilizing the application interface component **250**, such that dragging with the finger acts the same as clicking and dragging with the mouse. This allows users to drag or pan the display area **223** around screen (e.g., UI display), drag a slider of the scrollable content region, rearrange desktop icons, etc.

Generally, the gesture engine **280** filters the input by providing appropriate messages **235** to the application **230**. The scrollable content, when dragged in scrollable direction, will move with a contact point on the touchscreen interface. In embodiments, an averaging mechanism is applied to erratic, or unintentional, movements within a gesture in order to smooth the movements of the content. The user is provided with an indication that panning content is available upon viewing a scrollbar tool rendered at the display area **223**. As such, the user will intuitively drag with one finger to pan the content (e.g., page within a document, or map within a viewer). When the user drags their finger on a scrollable content region in a direction substantially parallel to the scrollbar control, the content pans in the appropriate direction. Panning continues until the user lifts their finger, or interrupts a continuous movement of the drag operation. In addition, panning the content may drive the slider of the scrollbar control in order to provide visual feedback that panning is being performed (e.g., automatically moves the scroll bar for the user). In an exemplary embodiment, this management of the input **295** to control the panning of content rendered by the application **230** is capable of interacting with various implementations of scrollbars.

In operation, the gesture engine **280** deciphers what type of gesture is occurring, where the gesture is originating, and whether other attributes of the gesture are available. Upon interpreting this information, the selection component **226** is configured to recognize an appropriate action, mapped to the deciphered gesture. This appropriate action is provided to the application interface component **250**, which sends an appropriate message **235** to the application **230**. For instance, if the gesture engine determines that the user is dragging on a non-scrollable portion of the display area, a normal left mouse drag action is invoked via the mapping. If the user drags in a direction that does not scroll (e.g., perpendicular to the scrollbar control), a left mouse drag, typically becoming selection or drag and drop in an application, occurs. Alternately, a user may select content by performing a hold then drag gesture in order to invoke a conventional left mouse drag action.

In embodiments, when a user drags a finger, or physical object **290**, in a content region of the display area **223** (e.g., window generated by Internet Explorer, a media player, a notepad document, Word, Outlook, a start menu, a control panel, or other application-surfaced UI) in the same general direction as a scrollbar tool (e.g., up and down for a vertical scrollbar tool), the content (e.g., folder list, email list, grouped email list, scrolling font list) should pan under the finger. In addition, only the content of the selected display area **223**, where the drag initiated, should be affected. As such, no other content in other panes should scroll or show hover states regardless where the drag travels. Again, dragging in display areas **223** that do not allow scrolling (e.g., static images on youtube.com) will cause the entire display area **223** to pan on the page. In order to effect these actions, the gesture engine **280** feeds a stream of communication to the application **223** to ensure that the application **223** treats the input **295** in a special way.

The selection component **226** is configured to select an appropriate action to send to the application-interface component **250** based on the input information **245**. In addition, the selection component **226** is configured to determine when the user pans past the end of a scrolling region and provide an over-panning action that provides visual feedback to let the user know the s/he has reached the limit on available scrollable content. In one embodiment, the over-panning action moves the entire window in the direction that the user is sliding their finger on the touchscreen interface. Advantageously, this visual feedback of causing the entire display area **223** to move may be implemented, or scaled, to manipulate a legacy application. Specifically, because the operating system **220** has the capability of sliding a window on a screen, the over-panning action of moving the display area on the UI display can be implemented without cooperation from, or reciprocation by, the application **230**. Accordingly, the over-panning action provides a clear indication that the scrolling functionality is available, but that the end of the page has been reached.

Because new users will often make the mistake of dragging in the wrong direction, the over-panning action provides an assistive behavior for alerting a user no further content is located in the direction of the drag operation. Also, the over-panning action provides a teaching behavior that is able to teach a user how to control content movement when panning. The mistake of panning in the opposite direction as a user intended occurs because dragging a finger in the content region typically moves the content in a direction opposite to

pulling a slider of a scrollbar tool in that same direction. Specifically, when at the top of a document, new users will often drag their finger in a downward direction because they are used to that applying a downward motion when operating the scrollbar tool. But, when the panning mode is invoked, the entire window, or display area **223**, will slide downward when user drags their finger downward in this situation. Thus, the over-panning action clearly and visually communicates that the panning is available, and that user is dragging in the wrong direction. However, as touch panning is a "direct manipulation system," where the content substantially moves in the direction of the drag, dragging content, or a page in a document, in an upward direction is fundamental to moving the page upward. Accordingly, if no over-panning action or other feedback is provided to a user, the user will often believe that the scrolling functionality is not available or not working.

Although one embodiment of an over-panning action is described, it should be understood and appreciated by those of ordinary skill in the art that other types of suitable over-panning actions that provide visual or audio feedback to a user that communicates the scrolling functionality is available may be employed, and that embodiments of the present invention are not limited to those over-panning actions described herein. In addition, the use of an over-panning action uniquely fits into a windowing multitasking system (i.e., ability to have many windows on the screen) where each running application lives within one or more display areas surfaced on the UI display. Further, this over-panning action may be triggered if the user "tosses" a page (i.e., applies a dramatic drag operation) such that the page scrolls to the end of the scrollable content in the content region. Tossing, in embodiments, provides the user with the ability to initially move the content under the control of the drag operation and then, upon cessation of the drag operation, automatically continuing panning the content and/or sliding the display area **223** as if the content had mass and was moving with inertia.

The correction component **225** is configured to provide a tolerance for drift in dragging when a direction substantially aligned with the scrollbar tool. For instance, when the user starts panning (e.g., by dragging upward within a scrollable content area), the selection component **226** will pan the page in the up and down direction, even if the user drifts slightly left or right a small amount when attempting to scroll vertically. Stated another way, users are able to pan vertically (i.e., directly up/down), or horizontally (e.g., directly to the left/right) even when the drag motion of their finger does not move exactly in those directions as the drag operation is performed. This feature may be turned off if the user-preference is such that panning diagonally is more efficient. However, typically the correction component **225** is active because panning content in the content region either directly up or down, or laterally, is less distracting and a more conventional/intuitive movement for viewing.

Due to friction during dragging and the general ergonomics of moving an entire arm to create an input, it is difficult for users to achieve to precise drag on the touchscreen interface. As a result, there is drift and/or wiggle inherent in a drag interaction. In operation, the correction component **225** notices the wiggle and/or drift of the drag and dampens these inputs such that the content pans in a straight line, that is, as if on rails. In one embodiment, dampening is performed by determining a principle axis of the direction of the drag operation. The ancillary movement in the non-principle axis is then filtered to assist in scrolling the particular direction of the drag operation. Accordingly, users are provided with a degree of tolerance when dragging, which facilitates panning in an intuitive and appeasing fashion.

In embodiments, as discussed with reference to FIGS. **4** and **5**, threshold boundaries may be associated with the principle axis which are defined such that a significant ancillary movement (e.g., a perpendicular drag when the principle axis is vertical) will trigger a secondary action, such as selecting content located proximate to the touch point. That is, if the user drags far enough from the principle axis, a secondary action may be invoked. Accordingly, by directionally controlling the drag in a non-principle axis, a user is able to impose direction-specific behaviors, such as selecting text.

In the situation where a substantial amount of drag occurs in a direction that is not expected (e.g., against the principle axis), the dampening applied by the correction component **225** to the drag operation may be deactivated such that the user may freely pan in the direction that corresponds with their actual gesture. That is, the correction component **225**, upon detection a threshold amount of drift, may switch the action from controlled panning to panning based on actual gesture movement. Or, a user may override the panning behavior (i.e., exit the panning mode) by overcoming a threshold amount of drift when applying a gesture. Upon the user to overriding the panning behavior, s/he can perform "normal drag operations," such as mouse-drag type operations. In other embodiments, without overriding the correction component **225**, users are still able perform the secondary actions discussed above. In embodiments, a user may perform at least the following operations on a touchscreen interface to execute the secondary actions: press and hold for a predetermined duration of time, then drag; perform a double tap-type operation (within a particular time frame), then drag; or provide a multi-touch input, such as a two-finger drag. Other operations that a user may perform inside a scrollable content region to invoke the secondary actions may include dragging from left to right in display area that is limited to upward and downward scrolling. Upon processing the secondary action, the application **230** will behave as if a user was clicking and dragging with a mouse. Generally, this secondary action is useful for selecting text within an application. Upon receiving an indication of this secondary action, the application interface component may send mouse messages rather than scrolling messages to the application **230**.

As discussed above, a user can press and hold, and then drag in order to temporarily disable the panning behavior. Once disabled, the user is free to use drag operations to perform secondary actions instead without invoking the panning mode. For instance, an input interpreted as press+hold+drag may invoke a secondary action that facilitates a selection gesture while temporarily stopping panning. In another embodiment, a received input gesture that is interpreted as a press+hold+release may disable the scrolling functionality (i.e., temporarily or permanently deactivating the panning mode), and allow the user to perform mouse drags (e.g., triggering a selection), such as copying an address in a webpage or moving a file into a folder.

Turning now to FIG. **3**, a diagrammatic view **300** of a display area **328** on a touchscreen interface **320** that illustrates a method for panning content therein is shown, in accordance with an embodiment of the present invention. Initially, the computing device **215**, or another computing device (e.g., computing device **100**), is provided with the touchscreen interface **320**. The touchscreen interface **320** is configured for surfacing display areas **328**, **337**, and **341** on a UI display **305**. A drag operation **335** is shown being applied by a physical object **315** (e.g., a single-finger gesture) within a content region **325**. Typically the drag operation **335** will pan content **327** in the direction **333** that the drag operation **335** is traveling (e.g., translating substantially downward as illustrating).

The drag operation includes a point of origination **334**, or a location of actuation as described above, and a touch point **336**. In addition, the scrollbar tool **329** may provide visual feedback of the panning operation.

In the illustrated example, the drag operation **335** is a gesture moving in a generally downward direction. Accordingly, the content **327** will correspondingly pan in the downward direction **333**, thus moving with the physical object **315**. The scrollbar tool **329** may provide visual feedback that downward panning is occurring by automatically moving a slider **332** in an upward direction **331** from a previous location **330**. In the case that an end of the content **327** occurs during the downward drag operation **335**, an over-panning action may be invoked. In one instance, the over-panning action may include translating the display area **328** downward within the UI display **305**. Further, in an exemplary embodiment, if the corrective component **225** of FIG. **2** is active, the content **327** may scroll in a substantially vertical direction **333** even when the drag operation **335** includes a slight drift.

Upon providing an input at the display area **328**, the underlying application is activated. Because the application underlying the display area **328** is active, while the application underlying display areas **337** and **341** are dormant, the display areas **337** and **341** are unreceptive to inputs during panning in the display area **328**. For instance, if the drag operation **335** continued from touch point **336** into a content region **338** of the display area **337**, content within the display area **338** would not pan. Instead, panning in the vertical direction **333** may cease as the physical object **315** overruns the lower edge of the content region **325**. Or, the entire display area **328** may slide downward across the UI display **305** to indicate the occurrence of an overrun.

The display area **337** includes a horizontal scrollbar tool **339**. As such, in contrast to the vertical scrollbar tool **329** of the display area **328**, a horizontal drag operation in the content region **338** will cause a panning action, while a vertical drag operation in the content region **338** invokes a secondary action, such as a selection function to highlight text in the content region **338**.

The display area **340** does not include a scrollbar. Accordingly, the user is visually notified that the application underlying the display area **340** does not support scrolling functionality. Accordingly, a drag operation within a boundary **341** of the display area **340** will cause the display area **340** to translate across the UI display **305** in connection with a movement of the physical object **315**. Alternatively, to initiate a translation of the display area **328**, an actuation location of a gesture should occur outside the content region **325**, such as within a border/title bar **326** of the display area **328**.

Turning now to FIGS. **4** and **5**, progressive drag operation depictions are illustrated that demonstrate stages of performing the drag operation that switches from panning content to invoking a secondary action, in accordance with embodiments of the present invention. Initially, with reference to FIG. **4**, a predetermined set of threshold borders **420** are established to disambiguate between a tap-type operation and a drag operation. That is, if the gesture, such as initial drag **405**, extends beyond any of the set of threshold borders **420**, the gesture is considered a drag operation. In another embodiment, if the gesture is applied and held at the touchscreen interface for longer than a predefined window of time, the gesture is considered a drag operation.

As illustrated in FIG. **4**, the initial drag **405** is moving into an upper quadrant; thus the gesture is considered a vertical drag operation in the upward direction. Accordingly, if the application supports scrolling functionality in the vertical direction, the content may move in connection with the initial drag **405**. In the case where the correction component **225** of FIG. **2** is active, any drift or wiggle in the initial drag **405** is dampened if it does not cross either of the threshold boundary **410** and **415**. Turning, to FIG. **5**, a secondary drag **505** crosses the threshold boundary **515**. In one embodiment, crossing the threshold boundary **515** pauses the panning functionality. In another embodiment, the secondary drag **505** crossing the threshold boundary **515** may invoke a secondary action, or deactivate the correction component **225** of FIG. **2** such that the dampening functionality is ceased. Accordingly, the content follows the drag operation instead of moving along a direction of the principal axis.

The present invention has been described in relation to particular embodiments, which are intended in all respects to be illustrative rather than restrictive. Alternative embodiments will become apparent to those of ordinary skill in the art to which the present invention pertains without departing from its scope.

From the foregoing, it will be seen that this invention is one well-adapted to attain all the ends and objects set forth above, together with other advantages which are obvious and inherent to the system and method. It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of the claims.

What is claimed is:

1. One or more computer storage media having computer-executable instructions embodied thereon that, when executed, perform a method for panning content within a display area presented on a computing device, the method comprising:

detecting a user-initiated input applied the touchscreen interface;

receiving at the operating system actuation information from the touchscreen interface, wherein the touchscreen information comprises touch locations;

ascertaining that the touch location occurred within a content region of the display area surfaced at the touchscreen interface, wherein the display area is rendered by a touch-naïve application in communication with the operating system of the computing device, wherein the touch-naïve application is unequipped to recognize drag operations within the content region as an indication to pan content therein;

identifying whether the touch-naïve application supports scrolling functionality with respect to the content of the content region;

deriving a gesture from the touchscreen information, wherein deriving comprises recognizing the gesture as a drag operation by disambiguating the drag operation from a tap-type or other operation;

when the touch-naïve application is identified as supporting scrolling functionality, generating panning messages that function to pan the content within the content region of the display area according to the drag operation; and

when the touch-naïve application is identified as not supporting scrolling functionality, generating mouse messages to be delivered from the operating system to the touch-naïve application and causing the touchscreen interface to translate the content region within the display area without panning the content therein.

2. The one or more computer-readable media of claim **1**, wherein identifying the touch-naïve application supports scrolling functionality further comprises determining whether the display area rendered at the touchscreen interface includes a scrollbar control.

3. The one or more computer-readable media of claim **2**, wherein the method further comprises presenting an indication at the touchscreen interface that the panning messages

are consumed by the touch-naïve application, wherein the indication of panning-message consumption includes comprises driving a slider of the scroll bar control in a direction based on a direction of the panning at the touchscreen interface.

4. The one or more computer-readable media of claim **2**, wherein recognizing the gesture as a drag operation by disambiguating the drag operation from a tap-type operation based on a direction of an uninterrupted drag-movement comprises:

detecting a direction of an uninterrupted drag-movement of the drag operation;

identifying a scrollable direction of the content region, wherein the scrollable direction refers to a direction in which the content is allowed to pan within the content region as governed by the touch naïve application; and

ascertaining that the direction of the uninterrupted drag-movement is substantially parallel to the scrollable direction of the content region.

5. The one or more computer-readable media of claim **1**, wherein the distance of an uninterrupted drag-movement is derived from comparing a Cartesianal coordinate representation of the actuation location of the user-initiated input at the touchscreen interface with a Cartesianal coordinate representation of a location of release of the drag-movement.

6. The one or more computer-readable media of claim **1**, wherein, upon generating the mouse messages, the method further comprises conveying the mouse messages from the operating system to the touch-naïve application, and wherein the mouse messages, upon consumption by the touch-naïve application, trigger a drag action of the content region.

7. A computer system capable of providing touch-panning capability to a touch-naïve application, the computer system comprising:

an input device to receive a user-initiated input that includes a location of actuation applied to a display area presented at a touchscreen interface disposed on the input device, wherein the touchscreen interface accepts physical contact associated with the user-initiated input;

the touch-naïve application component to render content within a content region of the display area, wherein the touch-naïve application is unequipped to recognize the user-initiated input applied the touchscreen interface as an indication to invoke panning the rendered content;

an operating system for interacting between the touchscreen interface and the touch-naïve application, wherein interacting comprises sending one or more messages to control over the scrolling functionality of the touch-naïve application in response to the user-initiated input applied the touchscreen interface, wherein the operating system comprises:

(a) a scrollbar finder component for inspecting the touch-naïve application to detect whether the touch-naïve application provides scrolling functionality of the content within the content region; and

(b) an application interface component for providing the one or more messages to the touch-naïve application, wherein the application interface generates at least one panning message upon receiving an indication that the touch-naïve application supports scrolling functionality, wherein, upon consumption by the touch-naïve application, the at least one panning message causes the content to translate within the content region, otherwise the application interface component generates at least one mouse message to the touch-naïve application upon detecting the user-initiated input applied the touchscreen interface, wherein the at least one panning message is generated by adapting the user-imitated input to cause a scrolling action, while the at least one mouse message is generated to cause a drag action without adaptation of the user-initiated input by the operating system; and

a presentation component to reveal an indication of the scrolling functionality to a user, wherein the presentation component is integrated with the input device.

8. The computer system of claim **7**, wherein the operating system further comprises an input component to receive input information from a screen driver at the input device, wherein the input information comprises the touch locations associated with timestamps.

9. The computer system of claim **8**, wherein the operating system further comprises a gesture engine for deriving gestures and an actuation location from the touch locations assembled by the timestamps, for ascertaining whether the actuation location occurred within the content region, and for ascertaining whether the gesture is a drag operation based on a direction and a distance of a substantially uninterrupted drag-movement originating from the actuation location, wherein the application interface component is configured for providing panning messages to the touch-naïve application upon detecting that the actuation location originates within the content region.

10. The computer system of claim **9**, wherein providing panning messages to the touch-naïve application comprises:

interpreting the input information from a screen driver;

mapping the interpreted input information to the scrolling functionality of the touch-naïve application; and

conveying the touch-naïve application the panning messages that reflect the mapped scrolling functionality.

11. A computerized method for implementing scrolling functionality of a touch-naïve application upon receiving a gesture at a touchscreen interface, the method comprising:

detecting a user-initiated gesture applied to the touchscreen interface, wherein the gesture includes a location of actuation with the touchscreen interface and a drag operation associated therewith, and wherein the touch-naïve application is capable of presenting a content region within a display area surfaced at the touchscreen interface, and wherein the touch-naïve application is unequipped to recognize drag operations within the content region as an indication to pan content therein;

determining whether the drag operation satisfies predefined system metrics, wherein determining comprises:

(a) identifying that the drag operation includes a substantially uninterrupted drag-movement originating from the actuation location that persists for a distance greater than a predefined threshold distance; and

(b) identifying that a direction the drag operation substantially aligns with a predefined scrollable direction of the touch-naïve application;

when the touch-naïve application is identified as supporting scrolling functionality and the drag operation satisfies the predefined system metrics, causing the touch-naïve application to enter a panning mode that allows for performing scrolling actions directed to the content within the content region of the display area; and

otherwise, maintaining the application in a default mode, wherein, in default mode, the operating system passes raw inputs associated with the gesture from the touchscreen interface to the touch-naïve application.

12. The computerized method of claim **11**, wherein passing raw inputs associated with the gesture to flow from the touchscreen interface to the touch-naïve application comprises

conveying the user-initiated gesture to the touch-naïve application as mouse messages that are recognizable by touch-naïve applications, wherein the touch-naïve applications represent applications that are unaware they are cooperating with a touchscreen interface.

13. The computerized method of claim **11**, wherein causing the touch-naïve application to enter a panning mode comprises providing panning messages to the touch-naïve application to initiate scrolling the content within the content region of the display area, wherein scrolling the content comprises translating the content in correspondence with a location of contact between a physical object and the touchscreen interface.

14. The computerized method of claim **11**, wherein ascertaining whether the drag operation satisfies predefined system metrics comprises recognizing the drag operation includes a substantially uninterrupted drag-movement originating from the actuation location that persists for a distance greater than a predefined threshold distance, wherein the uninterrupted drag-movement is generated by a physical object in substantial contact with the touchscreen interface.

15. The computerized method of claim **14**, wherein ascertaining whether the drag operation satisfies predefined system metrics comprises:

utilizing a timer to determine an amount of time that the drag operation consumes when completing the substantially uninterrupted drag-movement; and

based on the amount of time consumed, and the distance of the drag operation, distinguishing the drag operation from a tap-type operation.

16. The computerized method of claim **15**, wherein determining that a direction the drag operation substantially aligns with a predefined scrollable direction of the touch-naïve application comprises:

identifying a principle axis of the drag operation based on an average direction of the substantially uninterrupted drag-movement;

comparing the principle axis against one or more directions of scrolling enabled by the scrolling functionality of the content region of the display area; and

determining that the principle axis is comparable, within a predefined tolerance, to one or more of the enabled directions of scrolling.

17. The computerized method of claim **14**, further comprising:

receiving an indication that, while performing the drag operation, the substantially uninterrupted drag-movement being generated by the physical object is overrunning one or more boundaries that enclose the content region; and

invoking an over-panning action that provides an operator with visual feedback indicating that a limit on scrollable content is reached, wherein the visual feedback comprises translating the display area on the touchscreen interface in a general direction of the substantially uninterrupted drag-movement.

18. The computerized method of claim **17**, further comprising:

receiving an indication that, while performing the drag operation, the substantially uninterrupted drag-movement is applied to the touchscreen interface by a dramatic sweep of the physical object;

automatically continuing scrolling the content in a direction of the substantially uninterrupted drag-movement, upon releasing the drag operation, as if the content was moving with inertia; and

invoking the over-panning action upon reaching the end of the content in the direction of the substantially uninterrupted drag-movement.

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