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KENYON & KENYON LLP
1500 K STREET, NW
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Applicant(s)

Susan Pratt, Limerick, IRELAND;
Eoin English, Limerick, IRELAND;
John Cleary, Limerick, IRELAND;
Mark Murphy, Kilmore, IRELAND;
Mike Mulqueen, Limerick, IRELAND;

Power of Attorney:

Adeel Haroon--64938

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Title

TOUCH SCREEN AND HAPTIC CONTROL

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page 1 of 3

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TOUCH SCREEN AND HAPTIC CONTROL

BACKGROUND

“Haptics” refers to technique for generating tactile feedback to a user of consumer electronics products, for example, when using a touch screen device. When a user interacts with a touch screen or other touch sensitive user interface, a haptic system produces a mechanical vibration that simulates a “click” of a mechanical actuator. Present day haptics systems suffer from latency problems – often, there is a delay between the moment of user contact and the haptics response, which the user perceives as unnatural. This latency is due to the time the device incurs to register the input, process it through the operating system and/or an active application, select a haptic response to the input and drive a haptic actuator. When the latency exceeds about 250 ms, the latency becomes noticeable to the user and it can be perceived as device error rather than an event that was triggered by the user’s input. For example, the user may have pressed a button on a touch screen (touch) and moved onto another function of the device before feeling the haptic response. This disconnect results in low user acceptance of haptics, or in a poor user experience.

INTRODUCTION

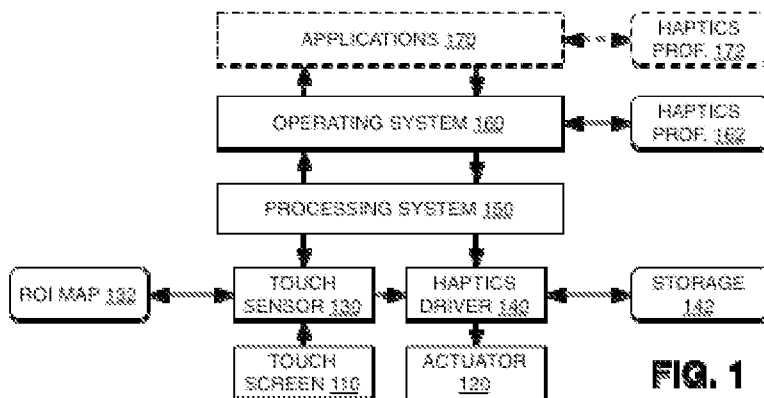
A consumer device may have direct touch screen-to-haptics driver communication pathway for reduced latency. A touch controller may store a map of user interface elements that are interactive at the touch screen (“regions of interest”). The touch controller may decode signals from a touch screen and derives X,Y coordinates from the touch. The touch controller also may determine whether the touch coincides with an interactive element. The touch controller may identify the interactive element to a haptics driver for reduced latency. Profiles of haptics effects may be stored at a haptics driver and invoked by the haptics driver (as opposed to a baseband processor). Preloading the haptic effects into the haptics driver can provide reduced latency over schemes in which a baseband processor invokes the haptics operation. The device may store different “haptics events” for different interactive elements displayed on the touch screen. Examples may include different operating system icons and different application elements (buttons, keys, etc.). The device outputs haptics events only in response to validly entered user input (touches “on” a region of interest). Touches that do not coincide with a region

of interest (“off” all ROIs) do not generate a haptics response. Haptics effects travel with its associated ROI. Thus, if an icon is moved from one screen location to another location, it continues to cause its associated haptic effect to be output when it is selected at its new location. Proximity detection may be provided to reduce latency. A touch screen may be “precharged” as a user’s finger approaches the screen for immediate response when touch occurs. Three dimensional regions of interest may be provided, and haptic events in three dimensional regions of interest may be generated in accordance with presence detection and/or gesture decoding. Force detection may be provided, and a touch screen may detect a force with which an object presses the touch screen.

DETAILED DESCRIPTION

FIG. 1: Basic Block Diagram of Haptics-Controlled Device

FIG. 1 is a simplified functional block diagram of a touch screen-enabled device 100. The device 100 may include a touch screen 110 and haptics actuator 120, a touch sensor 130, haptics driver 140 and processing system 150. The processing system 150 may execute software controls embodied as an operating system 160 and one or more applications 170. The principles of the present invention find application in a variety of different types of touch-screen controlled devices, including for example mobile phones, smart phones, tablet computers, personal digital assistants, media players, home appliances, medical diagnostic devices and the like. The present discussion applies equally to all types of such devices unless noted otherwise below.



- The touch screen 110 may be a display device with a touch sensitive interface. Common touch screens 110 include backlight-driven LCD displays with polarizers, lenticular lenses and the like to render a display on the touch screen. The touch

screen further may include structures to sense operator input, such as capacitive sensors, 4 wire deflection sensors and the like.

- The haptics actuator 120 may include actuators provided within the device to generate tactile feedback in response to user input. The haptics actuator 120 may be embodied as piezoelectric elements, linear resonant actuators (LRAs) and/or eccentric rotating mass actuators (ERMs).
- The touch sensor 130 may capture signals from the touch screen 110 and identify locations of touch. Typically, the locations may be resolved as X,Y coordinates of touch along a surface of the screen. Additionally, according to embodiments of the present invention, the touch sensor 130 also may identify proximity events, when user's fingers are approaching the touch screen 110 but have not made contact.
- The haptics driver 140 may supply drive signals to control operation of the haptics actuators 120.
- The processing system 150 represents processing resources of the remainder of the device and may include central processing units, memory for storage of instructions representing an operating system 160 and/or applications 170, input/output devices such as a display driver (not shown), audio drivers, user input keys and the like.
- The operating system 160 represents program instructions to govern operation of the device and manage device resources on behalf of the applications 170. The OS 160 may, for example, manage content of the display, providing icons and softkeys thereon to solicit user input.
- The application layer 170 represents application programs such as those common on smartphones and computer systems.

As noted, the functional units illustrated in FIG. 1 provide a simplified view of a haptics enabled device. The haptics systems illustrated herein may be integrated with functionality of other consumer electronics products (not shown).

In an embodiment, the touch sensor 130 may store data defining a user interface (UI) map 132. The UI map may identify spatial areas of the touch screen that are displaying interactive user interface elements, such as icons, buttons, menu items and the like. Map data may be provided by the processing system 150 as it generates display data for the touch sensor 130. The touch sensor 130 may interpret signals from the touch screen 110 and calculate coordinates of user touches along its display surface. Resolved coordinates may be output to the processing system 150. The touch sensor 130 further may determine whether decoded touches coincide with an interactive user interface element. If the touch sensor determines that the user touched an interactive element, the touch sensor 130 may output data representing the touch to the haptics driver 140.

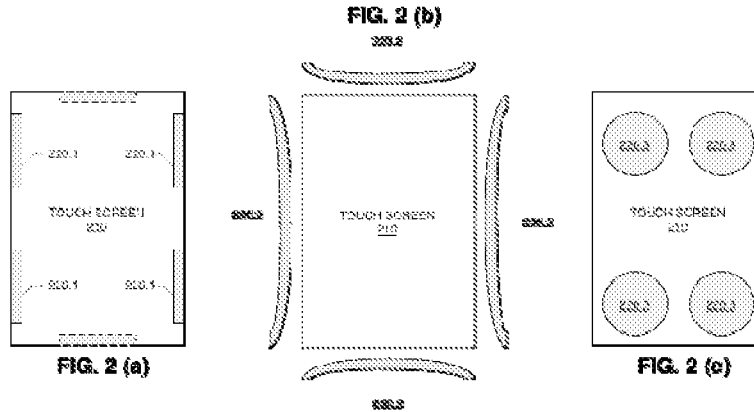
The haptics driver 140 may include storage 142 for data defining different haptics effects. The haptics driver 140 may store data that associates different effects with interactive elements being displayed on the touch screen 110. During operation, as the touch sensor 130 reports data identifying interactive elements that have been touched by the user, the haptics driver 140 may activate the haptics actuator 120 according to an effect pattern stored therein. Accordingly, the haptics driver 140 may output haptics patterns that are specific to the icon being touched.

Having a direct sensor-to-driver communication path in a device advantageously reduces latency of haptics events. As noted, during operation, delays of 250 ms between a touch and a haptics response can interfere with satisfactory user experience. Such delays can be incurred in systems that require an operating system 160 or application 170 to decode a user touch and generate a haptics event in response. During high volume data entry, such as typing, texting or cursor navigation, users enter data so quickly that their fingers may have touched and departed a given touch screen location before a 250 ms latency haptics event is generated. A system with a direct sensor-to-driver communication path can be expected to reduce haptics latency to approximately 1-20 ms.

Associating the haptic events with interactive elements according to a UI map 132 also allows haptic events to “follow” the interactive elements when displays are reconfigured. For example, many operating systems 160 of electronic devices allow users to configure the placement of icons and other interactive elements within a workspace. As the workspace is reconfigured, map information 132 may be updated to reflect the new configuration. The touch sensor 130 may associate touch locations with individual interactive elements and output identifiers of the elements to the haptics driver 140 as described above. Accordingly, haptics effects may remain consistent even when users reconfigure device operation.

FIGS.2 (a)-(c): Different Configurations of Piezoelectric Actuators

FIGS. 2(a)-(c) illustrate different configurations of piezoelectric actuators that may be used in accordance with the present invention.



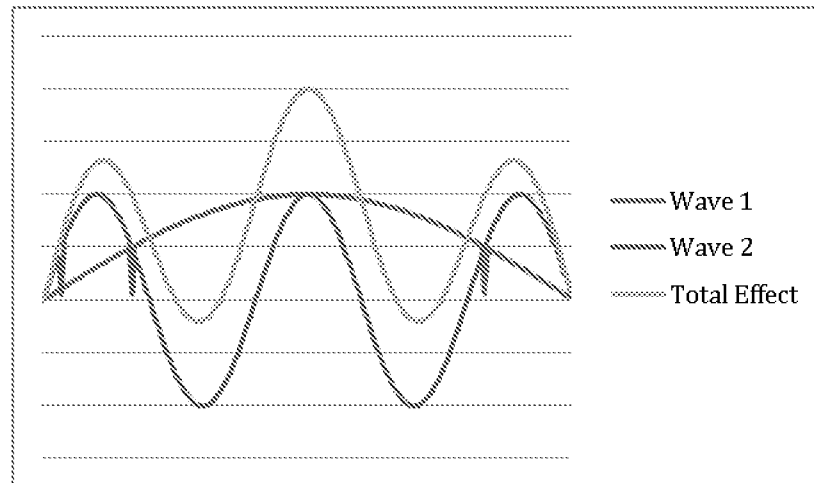
- In FIG. 2(a), piezoelectric elements 210.1 may be affixed to a bottom surface of a touch screen 210. In this embodiment, the piezoelectric elements 220.1 may be integrated with the touch screen and may be provided at a layer above certain optically active elements of the screen (for example, higher than the LCD panel and backlight). For example, the piezoelectric elements 220.1 may be affixed to a glass layer of the screen, which typically is the layer that a user touches directly when interfacing with the touch screen 210. In this embodiment, the piezoelectric elements may be provided at locations toward a periphery of the glass layer, outside the viewable area of the touch screen 210. Electrical activation of the piezoelectric elements may cause flexion in a direction normal to the touch screen surface (up and down).
- In FIG.2 (b), the piezoelectric elements 220.2 may be affixed to a periphery of the touch screen 210. Electrical activation of the piezoelectric element may cause flexion in a direction parallel to the touch screen 210 (laterally in the X and/or Y direction). This embodiment places the piezoelectric elements 220.2 at locations that are off the viewable area of the touch screen 210.
- In FIG. 2 (c), the piezoelectric elements 220.3 may be provided under the touch screen. In this embodiment, the piezoelectric elements may be provided below the touch screen device 210 under the optically active elements of the screen (e.g. below the LCD, backlight, etc.). In this case, the piezoelectric elements 220.1 may be located anywhere along the lower surface of the screen. Electrical activation of the piezoelectric elements 220.2 may cause flexion in a direction normal to the touch screen surface (up and down).

Although piezoelectric elements are illustrated above, embodiments of the present invention also permit use of LRAs or ERMs.

In an embodiment, a haptics driver may assert drive signals to the haptics actuators in a manner to create deflection waves laterally across a surface of the touch screen. Consider the configuration shown in FIG. 2 (a). In this configuration, haptics elements are provided at edges of the touch screen in four or, optionally, six locations. Each of the elements may be driven with a periodic activation pulse that causes deflection wave to radiate laterally across a screen surface

away from the respective elements. Owing to the inertia of the touch screen, digital activation pulses may generate waves on the touch screen surface that are approximately sinusoidal.

In such an embodiment, a haptics driver may control a frequency and phase of drive signals to individual haptics elements to tailor deflection waves that emanate from each actuator. Through constructive and destructive interference of these waves, the haptics driver may control the shape, orientation and magnitude of haptics effects.



Graph 1

Graph 1 above illustrates an interference pattern that may be generated across a surface of a touch screen according to an embodiment of the present invention. In this example, wave 2 has a frequency that is five times higher than wave 1. As illustrated, the waves constructively interfere to cause a spike at a central position of the graph. The position of the spike may be shifted laterally within the graph by manipulating the phase of each wave. The shape of the total effect may be controlled by manipulating the frequency of each wave and the numbers of waves radiated onto the surface.

During operation, a haptics driver may control the frequency and phase of waves surface waves generated on a touch screen surface. To generate a spatially narrow sharp effect, waves may be controlled to provide a relatively large spike. To generate a spatially broader effect, waves may be controlled to provide a wider spike.

Further, during operation, as a user's finger moves across the surface of the touch screen, the haptics driver may manipulate phase of the surface waves output to the touch screen in order to cause the waves to track the user's finger.

Moreover, a haptics driver may convey a feeling of texture by manipulating both phase and frequency. In an application where a textured surface is displayed by the device (for example, in a gaming application), a haptic texture effect may be rendered as a user's finger slides along the displayed textured surface.

FIG. 3: Regions of Interest in a Two Dimensional Workspace

According to an embodiment of the present invention, a device establishes interactive user interface elements and provides a haptic response only when user input spatially coincides with a registered element. In another embodiment, the device may register specific haptics response patterns with each of the interactive elements and, when user input indicates interaction with an element, the device responds with a haptic effect that is registered with it.

FIG. 3 illustrates an exemplary workspace 310 that might be provided by a device. There, the workspace 310 is illustrated as including a plurality of icons 320 and buttons 320 that identify interactive elements of the workspace 310. The workspace 310 may include other areas that are not designated as interactive. For example, icons 320 typically are spaced apart from each other by a certain separation distance. Further, other areas of the display may be unoccupied by content or occupied with display data that is non-interactive. Thus, non-interactive areas of the device may be designated as "dead zones" (DZs) for purposes of user interaction (shown in gray in the example of FIG 3). In an embodiment, the

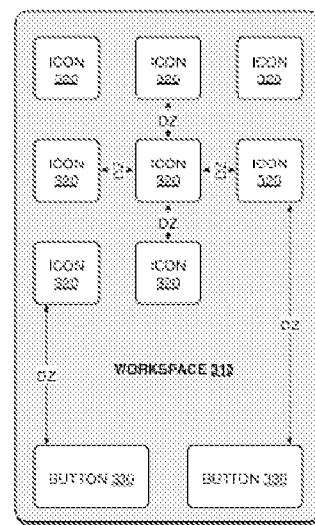


FIG. 3

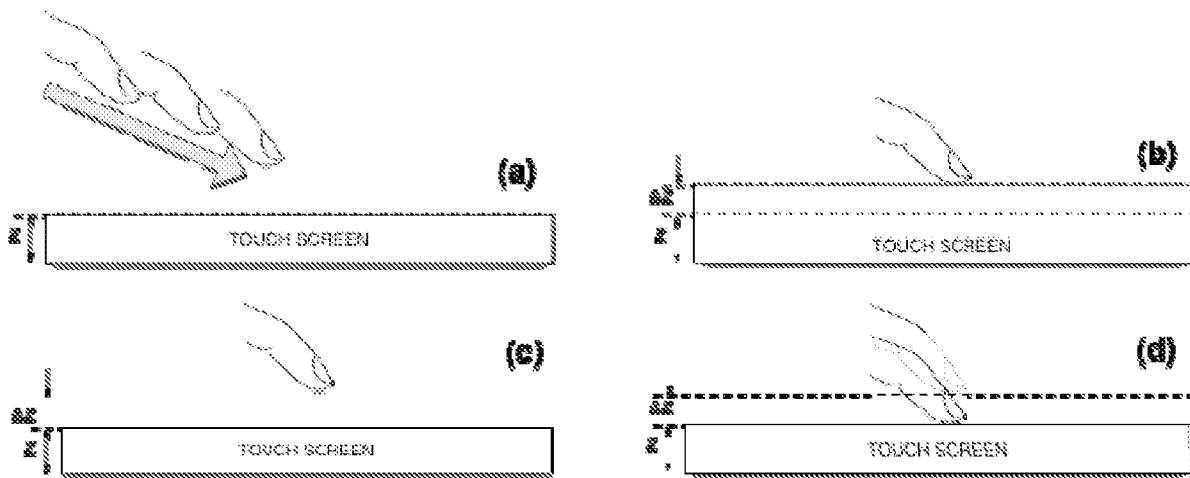
device 100 may output haptics responses when a touch is detected in a spatial area of the workspace that is occupied by an interactive user element. The device may be configured to avoid outputting a haptics response when a user interacts with a dead zone of the workspace, even though the device may register a touch at the position. By avoiding outputting of haptics responses for user touches that occur in dead zones, the device improves user interaction by simulating clicks only for properly registered user interactivity.

FIG. 4: Proximity Detection

FIGS. 4 (a)-(d) illustrate operation of a device to detect user proximity to a touch screen before contact is made and to initiate haptic effects in response to such detection to reduce latency.

Many touch screen devices, particularly capacitive touch screens, can detect locations of a user's finger before the finger makes direct contact with the touch screen. Current devices can detect a user's finger typically within 3-5 cm of the screen surface. Accordingly, in addition to generating data representing X,Y coordinates of user touch, the touch sensor may generate output data representing a distance of the user's finger from the screen, for example as a Z coordinate. The touch sensor further may determine when a user's finger is approaching the touch screen, a rate of approach to the screen (the finger's velocity) and an X,Y coordinate of the user's finger as it approaches.

Embodiments of the present invention may use an X,Y,Z coordinates of a user's finger as it approaches the screen to manage haptics effects. In a first embodiment, a device may pre-charge haptics effects as a user's finger approaches to reduce latency of operation. An example is shown in FIGS. 4(a)-(d).



- FIG. 4(a) illustrates a state of the touch screen prior to detection. As the user's finger approaches the touch screen, it enters the "field of view" of the touch screen and is identified by the touch sensor.
- In response, a haptics driver may precharge the haptics actuator to cause the touch screen to deflect toward the users finger by a predetermined amount, shown as ΔZ in FIGS. 4(a)-(d). Thus, the touch screen should be deflected toward the user's finger by the time it makes contact with the touch screen as shown in FIG. 4(b).

- When the touch sensor determines that the user's finger has made contact, it may initiate the haptic effect. As shown in FIG. 4 (c), a mechanical button click may be simulated, for example, by removing the precharge effect and inducing the touch screen to return to its default level (shown as "Z").
- After the retraction of the touch screen, the user's finger falls to the surface of the screen at the Z level, shown in FIG. 4 (d). The click effect is induced by the user feeling mechanical resistance at the first point of contact with the screen deflected forward (FIG. 4 (b)) and then at the second point of contact with the screen at the rest position (FIG. 4 (d)). This effect simulates a mechanical compression effect.

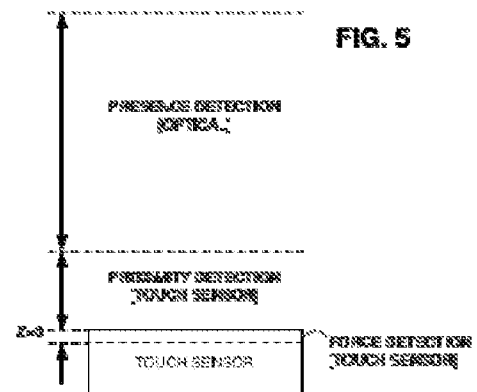
Of course, the proximity-based deflection operations are not limited to click effects. Vibration effects may be induced by deflecting the screen forward prior to initial contact, then oscillating the screen forward and backward after contact is made. A variety of different haptic effects may be used in connection with proximity detection operations.

In an embodiment of the present invention, different types of haptic events may be selected based in part on proximity measurements. For example:

- Haptic effect types may be selected based on a velocity of a user's finger as it moves toward a touch screen -- a first haptic effect selected in response to a relatively "fast" velocity and a second haptic effect selected in response to a relatively "slow" velocity.
- Haptic effect types may be selected based on a force to be imparted by a user's finger, which may be derived from velocity measurements.
- Haptic effects may be selected based proximity detections and the user's history of interaction. For example, in a text entry application, different users may enter text at different rates. If a user touches a first letter and it initiates a haptic effect, then the user's moves toward another letter, the touch sensor may recognize the approaching finger and terminate the first haptic effect sufficiently early before the second letter is touched so as to minimize blur between successive haptic effects.

FIG. 5: Presence Detection

In another embodiment, a device may be configured to perform both proximity detection and presence detection. As noted, conventional touch sensors can detect user fingers within a predetermined distance from the top surface of a touch screen, typically about 5 cm. A device further may include an optical sensor system to detect objects at farther distances from the device, for example as far as 30 cm from the surface of the touch screen.



In such embodiments, the system may detect objects in different layers above the device and may take various actions in response to activity in such layers:

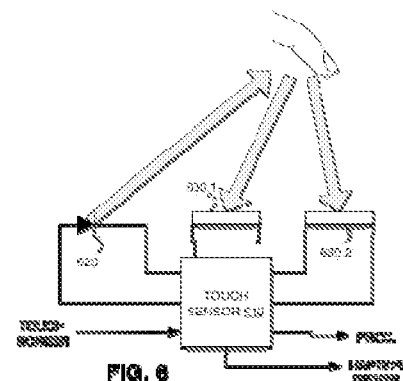
- The system may perform presence detection via the optical system to determine when objects approach the device. If an object is detected while the device is in a sleep mode or some other low power operational state, the system may initiate power up events to “wake up” the device.
- The system may perform gesture recognition from inputs received by the optical device. The touch sensor may decode inputs from the optical sensors and classify inputs as gestures based on pattern matching between the input data and gestures that have been pre-registered with the touch sensor. The device may perform operations specified by individual operations such as power up, power down, mute all sounds, lock or unlock the device, etc.

FIG. 6: Basic Block Diagram of Optical Sensor

FIG. 6 illustrates a simplified block diagram of an optical system 600 that may be used with the device. The system may include a light emitter 620 (typically, a light emitting diode) and one or more light sensors 630.1, 630.2 provided in communication with a touch sensor 610.

During operation:

- The LED 620 emits light into a spatial volume above the touch screen (not shown). If an object is in the field of view of the optical system, light will be reflected from the object back to the device.
- The light sensor(s) 630.1, 630.2 may generate electrical outputs representing intensity of light

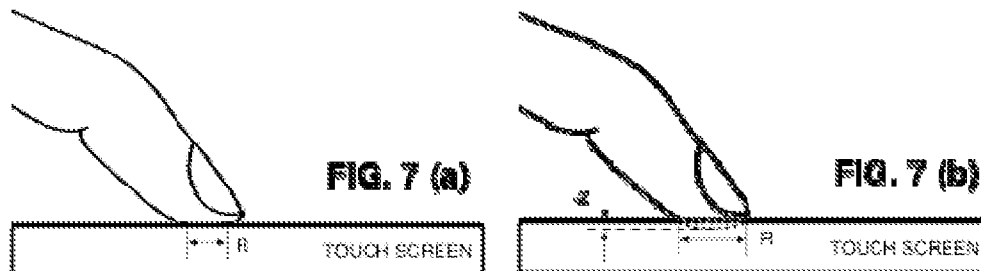


incident thereon. The signals may indicate a location of light impingement on a surface of each sensor.

- The touch sensor 610 may digitize and decode the signals from the sensor(s) to calculate an X, Y, Z position of the object. Calculation of X, Y, Z coordinates of an object in a field of view is described in the follow co-pending patent applications, the contents of which are incorporated herein:
 - US 12/327511, entitled “Method of Locating an Object in 3D,” filed on Dec. 3, 2008.
 - US 12/499355, entitled “Method of Locating an Object in 3D,” filed on July 8, 2009.
 - US 12/499369, entitled “Method of Locating an Object in 3D,” filed on July 8, 2009.
 - US 12/499384, entitled “Method of Locating an Object in 3D,” filed on July 8, 2009.
 - US 12/499414, entitled “Method of Locating an Object in 3D,” filed on July 8, 2009.
 - US 12/435439, entitled “Optical Distance Measurement by Traingulation of an Active Transponder,” filed on May 5, 2009.
 - US 12/789190, entitled “Position Measurement Systems Using Position Sensitive Detectors,” filed on May 27, 2010.
 - US 12/783673, entitled “Multiuse Optical Sensor,” filed on May 20, 2010.
- The optical system may receive light from multiple objects, if they appear in the device’s field of view. The touch sensor 610 may output data identifying the number of objects detected and the coordinates of each object.

FIG. 7: Force Detection

In another embodiment, the touch sensor may generate output data representing a force with which an object presses the touch screen. FIGS. 7 (a) and 7 (b) illustrate operating principles.



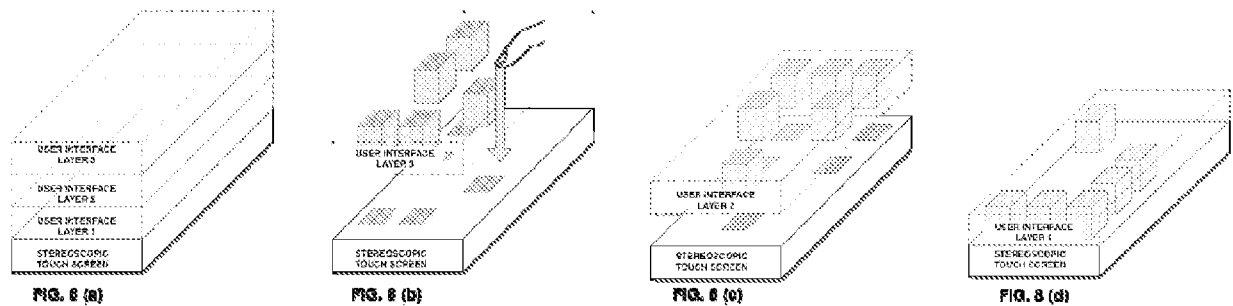
- In FIG. 7 (a), a user presses the touch screen lightly with his finger. In this case, there is a small deflection of the user’s finger at the point of contact, which may be registered on the touch screen as an area of contact. In FIG. 7 (a), the area may be considered as a circle having radius R. A touch sensor may derive a force at the point of contact from the calculated area.

- In FIG. 7 (b), the user presses the touch screen with greater force, causing a greater amount of deformation in the user's finger. The user's finger, therefore, registers a greater area of contact than in the FIG. 7 (a) case, which the touch sensor may use to derive a corresponding higher value of force.

In an embodiment, the touch sensor may represent force as a distance value in the Z plane. The touch sensor may calculate an area of contact between the user and the touch screen and convert the value to a distance value in the Z plane. If, in the proximity and presence detection operations, distance values are represented as positive Z values, distance values representing user force may be represented as negative Z values. See, FIG. 7 (b). In the example of FIG. 7 (b), the negative Z value models a hypothetical depth of an operator's touch, based on deformation of the user's finger, rather than an actual depth of touch.

FIG. 8: Regions of Interest in a Three Dimensional Workspace

Embodiments of the present invention provide support for three-dimensional workspaces in a device using optical or electrical proximity sensors. In this embodiment, the touch screen may be provided as a stereoscopic display with a touch screen interface. In a mobile device application, an auto stereoscopic display may be convenient for use where the display apparatus includes lenses (not shown in FIG. 8) to focus left and right eye information respectively upon the left and right eyes of a user. Such systems provide a visual effect of depth to a user.



In such an embodiment, the device's workspace may be provided as a plurality of interactive layers that are associated with respective spatial volumes over the touch screen. FIG. 8 (a) illustrates an exemplary three-layer workspace. In such systems, the stereoscopic display displays the content of a single layer at a time. User interaction with such a device may cause the device to replace a workspace layer with content of another layer as the operator navigates through the workspace. For example, the user may move his finger toward the touch screen through the volume of a first layer to another layer to signify navigation to another workspace

layer. Alternatively, the user may bring his finger to a stop within the volume of a given layer to signify selection of a user interface element displayed within. The user may perform a snap touch within a volume (move it quickly forward and back resembling touch of an element on the touch screen) as an alternative way to select a user interface element.

- FIG. 8 (b) figuratively illustrates display of icons within layer 3 of the exemplary three-layer workspace. At this point, the stereoscopic display renders icons associated with the third layer. FIG. 8 (b) also illustrates a user's finger descending past the spatial volume associated with layer 3 toward this stereoscopic touch screen.
- FIGS. 8(c) and (d) respectively illustrate display of icons in layers 2 and 3. In each case, the stereoscopic touch screen displays icons associated with the respective layer, which are perceived as appearing in three dimensions.

Although the foregoing discussion has presented each layer as if they appear in mutually different spatial volumes, this need not be the case. FIG. 9 illustrates a three dimensional workspace according to another embodiment of the invention. In this embodiment, a primary spatial volume above the touch screen is associated with a current workspace layer being displayed. Other spatial volumes, located in planes above and below the volume of the current workspace layer may be dedicated to navigation commands. For example a previous workspace layer may be invoked if a user moves his finger aware from the touch screen and a next workspace layer may be invoked if a user moves his finger toward the screen.

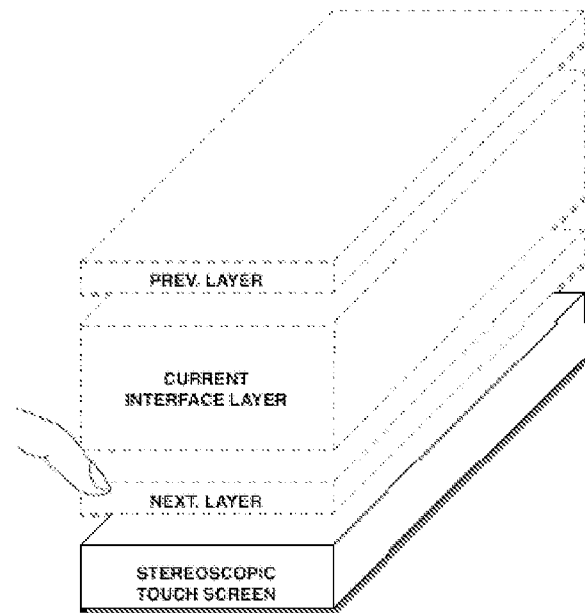


FIG. 9

The principles of the present invention accommodate still other mechanisms to navigate among layers of a three dimensional workspace including, for example, gesture-based commands to switch among layers and select elements within them.

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Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

[Remove](#)

Given Name

Middle Name

Family Name

City

State

Country

Susan

Pratt

Limerick

IE

Inventor 2

[Remove](#)

Given Name

Middle Name

Family Name

City

State

Country

Eoin

English

Limerick

IE

Inventor 3

[Remove](#)

Given Name

Middle Name

Family Name

City

State

Country

John

Cleary

Limerick

IE

Inventor 4

[Remove](#)

Given Name

Middle Name

Family Name

City

State

Country

Mark

Murphy

Kilmore

IE

Inventor 5

[Remove](#)

Given Name

Middle Name

Family Name

City

State

Country

Mike

Mulqueen

Limerick

IE

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

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Title of Invention

TOUCH SCREEN AND HAPTIC CONTROL

Attorney Docket Number (if applicable)

13641/999900

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number

☐ Firm or Individual Name

Customer Number

79338

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☒ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are:

Entity Status

Applicant claims small entity status under 37 CFR 1.27

- ☐ Yes, applicant qualifies for small entity status under 37 CFR 1.27
- ☒ No

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Signature

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/Adeel Haroon/			Date (YYYY-MM-DD)	2011-04-01
First Name	Adeel	Last Name	Haroon	Registration Number (If appropriate)	64938

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.**

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Electronic Patent Application Fee Transmittal

Application Number:

Filing Date:

Title of Invention:

Touch Screen and Haptic Control

First Named Inventor/Applicant Name:

Susan Pratt

Filer:

Robert L. Hails/ERICA BRAUER

Attorney Docket Number:

13641/999900

Filed as Large Entity

Provisional Filing Fees

Description

Fee Code

Quantity

Amount

**Sub-Total in
USD(\$)**

Basic Filing:

Provisional application filing

1005

1

220

220

Pages:

Claims:

Miscellaneous-Filing:

Petition:

Patent-Appeals-and-Interference:

Post-Allowance-and-Post-Issuance:

Extension-of-Time:

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Total in USD (\$)				220

Electronic Acknowledgement Receipt

EFS ID:	9792918
Application Number:	61470764
International Application Number:	
Confirmation Number:	7597
Title of Invention:	Touch Screen and Haptic Control
First Named Inventor/Applicant Name:	Susan Pratt
Customer Number:	79338
Filer:	Robert L. Hails/ERICA BRAUER
Filer Authorized By:	Robert L. Hails
Attorney Docket Number:	13641/999900
Receipt Date:	01-APR-2011
Filing Date:	
Time Stamp:	16:00:16
Application Type:	Provisional

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	\$220
RAM confirmation Number	2346
Deposit Account	110600
Authorized User	KENYON & KENYON LLP

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Specification	prov999999.pdf	373552	no	13
			a4dd6501af1709ae96df4fa1fe9c3fbc72d5449a		

Warnings:

Information:

2	Provisional Cover Sheet (SB16)	coversheet999900.pdf	1060267	no	4
			244e5c4018dd258489cf16989b376f836696119a		

Warnings:

Information:

3	Fee Worksheet (PTO-875)	fee-info.pdf	29236	no	2
			fd66283b28fdcce3d66bf2b2a83e7c956883b3ce		

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New International Application Filed with the USPTO as a Receiving Office

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