Title: METHOD AND DEVICE FOR USER INPUT

Abstract: It is provided a method for obtaining user inputs. The method comprises steps of determining moving speed of a manipulating object when the manipulating object moves towards a touchscreen; determining contact information on the touchscreen when the manipulating object touches the touchscreen; and performing an action based on the moving speed and the contact information if the moving speed exceeds a threshold.

Published: — with international search report (Art. 21(3))
METHOD AND DEVICE FOR USER INPUT

TECHNICAL FIELD

The present invention relates to user interface, and more particularly relates to a method and a device for user input.

BACKGROUND

A touchscreen is an electronic visual display that the user can control through simple or multi-touch gestures by touching the screen with one or more fingers. Some touchscreens can also detect objects such as a stylus or ordinary or specially coated gloves. The user can use the touchscreen to react to what is displayed and to control how it is displayed (for example by zooming the text size). And correspondingly, the touchscreen detects contact positions of one or more contact points on the touchscreen and the moving trajectory of the contact points, and responds to the detection based on predefined functions.

Touchscreens are common in devices such as game consoles, all-in-one computers, tablet computers, and smartphones. They can also be attached to computers or, as terminals, to networks. They also play a prominent role in the design of digital appliances such as personal digital assistants (PDAs), satellite navigation devices, mobile phones, and video games.

Herein, a tablet computer, or simply tablet, is a one-piece mobile computer. Devices typically offer a touchscreen, with finger (or stylus) gestures acting as the primary means of control, though often supplemented by the use of one or more physical context sensitive buttons (it may not have any button) or the input from one or more accelerometers; an on-screen, hideable virtual keyboard is generally offered as the principal means of data input. Available in a variety of sizes, tablets customarily offer a screen diagonal greater than 7” (18 cm), differentiating themselves through size from functionally similar smart phones or personal digital assistants. Though generally self-contained a tablet computer may be connected to a physical detachable keyboard (or other input device), as
have a number of convertible touchscreen notebook computers that offer an integrated keyboard that can be hidden by a swivel joint or slide joint, exposing only the screen for touch operation. Tablets have also appeared in a foldable Booklet format that offer the user dual-touchscreens, and can be used as a notebook by displaying a virtual keyboard on one of the displays.

The touchscreen enables the user to interact directly with what is displayed, rather than using a mouse, touchpad, or any other intermediate device (other than a stylus, which is optional for some touchscreens).

It is desired to provide a new input method for touchscreen.

**SUMMARY**

According to an aspect of present invention, it is provided a method for obtaining user inputs. The method comprises steps of determining moving speed of a manipulating object when the manipulating object moves in the air towards a touchscreen; determining contact information on the touchscreen when the manipulating object touches the touchscreen; and performing an action based on the moving speed and the contact information if the moving speed exceeds a threshold.

According to another aspect of present invention, it is provided a device for obtaining user inputs. The device comprises a touchscreen module configured to determine contact information on the touchscreen when a manipulating object contacts the touchscreen; a sensing module configured to determine moving speed of the manipulating object moves in the air towards the touchscreen; and a processing module configured to perform action based on the moving speed and the contact information if the moving speed exceeds a threshold.

It is to be understood that more aspects and advantages of the invention will be found in the following detailed description of the present invention.

**BRIEF DESCRIPTION OF THE DRAWINGS**
The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention together with the description which serves to explain the principle of the invention. Therefore, the invention is not limited to the embodiments. In the drawings:

Fig. 1 is a schematic diagram of a tablet according to an embodiment of present invention;

Fig. 2 is a block diagram of the tablet 100 according to the embodiment of the present invention;

Fig. 3 is a flow chart illustrating an input method according to the embodiment of the present invention; and

Fig. 4 is a schematic diagram of a view displayed on the tablet according to the embodiment of the present invention.

DETAILED DESCRIPTION

The embodiment of the present invention will now be described in detail in conjunction with the drawings. In the following description, some detailed descriptions of known functions and configurations may be omitted for clarity and conciseness.

In the present invention, a touchscreen is used together with one or more cameras. The cameras are used to detect the average moving speed of manipulating object (which is usually user's hand or finger) in a direction that is perpendicular to the surface of the touchscreen. The moving speed is used as supplemental input parameter for user inputs when the user manipulates or uses a device with the touchscreen.

The principle of the present invention will be described below in the context of a tablet 100 with a touchscreen 101 located in the center of the tablet and two cameras 102 symmetrically mounted on the frame edge of the tablet (as shown in the Fig. 1). It shall note that the table in the Fig. 1 is only for schematic
purpose, and only shows the necessary components for describing the principle of the present invention. For example, the table 100 may further comprise a physical button.

Fig. 2 is a block diagram of the tablet 100 according to the embodiment of the present invention. The tablet 100 comprises a touchscreen module 201, a camera module 202 and a processing module 203. Their functions are as follows.

—The touchscreen module 201 is used to 1) display at least one object, e.g. text and image (icon belongs to concept of image in some sense). Normally, the at least one object is for the purpose of information, and guide the user to manipulate on the touchscreen, e.g. pressing on the touchscreen, moving on the touchscreen while maintaining the contact etc. And the touchscreen module 201 is also used to, when user's finger(s) is in contact with the touchscreen, detect contact position of contact point. If the contact is multiple touch, which means two or more fingers contacts the touchscreen, the touchscreen module 201 can determine the information respectively for two or more contact points.

—The camera module 202 is used to detect the moving speed of the user's finger when the user moves his finger towards the touchscreen. In the example of the Fig. 1, when the finger moves towards the touch screen in the air, the cameras capture two images of the hand at one time. The distance D between the hand and the touch screen can be calculated according to difference of pixels in the left and right images. One example of distance calculation can be referred to in Dornaika, F.; Hammoudi, K (2009). "Extracting 3D Polyhedral Building Models from Aerial Images using a Featureless and Direct Approach" (PDF). Proc. IAPR/MVA. The hand's moving speed can be calculated based on distance change of the hand to the touch screen over the time, herein the distance is changed in a direction perpendicular to the touchscreen surface. For example, at time T1, distance D1 between the hand and the touch screen is calculated based on two images captured by left and right cameras, and at time T2, distance D2 between the hand and the touch screen is calculated based on
two images captured by left and right cameras. So the average moving speed \( Z \) of the hand between \( T_1 \) and \( T_2 \) can be calculated by \( Z = \frac{(D_1 - D_2)}{(T_2 - T_1)} \).

Generally, when the distance is too far or too close, the error is large. So in another example, we can redefine two thresholds, i.e. farness threshold and nearness threshold. Only within the range between the farness threshold and nearness threshold does the camera module calculate the moving speed. For example, when the user figure moves towards the touchscreen, the camera module can compare distance with the farness threshold. When the distance equals to the farness threshold, the camera module records the time \( T_1 \). And when the distance is reduced to the nearness threshold, the camera module records the time \( T_2 \). Then the moving speed can be calculated. In another example, the camera module can record the two positions within the range between the farness threshold and the nearness threshold and their corresponding time points, and use these data to calculate the moving speed.

—The processing module 203 is used to perform actions based on the moving speed as provided by the camera module 202 and the position related contact information (e.g. contact position(s), moving trajectory etc.) as provided by the touchscreen module 201. To be specifically, the processing module 203 first generates instructions based on the moving speed and the contact information, and then performs the instructions itself or sends to other component or device to perform the instructions.

According to a variant of the embodiment, only when the moving speed exceeds a predefined speed threshold does the processing module 203 perform the actions. In other words, the processing module 203 first compares the moving speed to the speed threshold. If the moving speed exceeds the speed threshold, it performs a first action; and if not, it performs a second action.

According to a variant of the embodiment, the contact period while contact position is kept still is used as a second supplemental input parameter (named as contact period parameter). And correspondingly, the touchscreen module 201 is used to further provide contact period in addition to the position related
contact information; and the processing module 203 is used to take into consideration of the contact period as well as the moving speed and the position related contact information. In other words, different values of contact period correspond to different actions while keeping the moving speed and the position unchanged.

According to the embodiment, the camera module 202 uses two cameras to detect distance. According to a variant of the embodiment, a person skilled in the art can use other distance sensing device to detect distance. In an example, a single 3D camera (depth camera or depth sensing camera) is used. In another example, the distance sensing device is used, e.g. using RFID technology to detect the moving speed.

Fig. 3 is a flow chart illustrating an input method for a device having a touchscreen module, a processing module and a distance sensing module according to the embodiment of the present invention.

—In the step 301, the touchscreen module displays at least one object (e.g. text or image);

—In the step 302, during the course of moving the manipulating object (e.g. user's hand) towards the touchscreen module, the distance sensing module determines the moving speed of the manipulating object. In another example, the distance sensing module only detects the distance, and it's the processing module that calculates the moving speed;

—In the step 303, when the manipulating object gets contact with the touchscreen module, the touchscreen module detect position-related contact information on the touchscreen module; Herein, the position-related contact information includes 1) one or more contact points and 2) a moving trajectory.

—In the step 304, the processing module performs actions based on the moving speed and the position related contact information.

In an example, in the step 301, more than one icon is displayed; in the step 303, the single contact position is used to determine which icon is touched (or called selected); and in the step 304, if the moving speed exceeds a predefined
speed threshold, the action is to pop up a menu. The position of the menu can be adjacent to the edge of the selected icon or overlap with the selected icon. If not, there is no action or the action is just to change appearance of the selected icon, e.g. highlighting the selected icon.

In another example, in the step 301, a text is displayed; in the step 303, the position-related contact information is used to determine one or more words. For example, it can be a single contact position or a moving trajectory. If it is the single contact position, one or more words neighboring to the single contact position are determined; if it is the moving trajectory, the words along with the moving trajectory are determined; in the step 304, if the moving speed exceeds a predefined speed threshold, the action is to select the determined words. In another example, the action is to select the determined words and pop up a menu.

According to a variant of the present embodiment, the step 301 is not indispensable for some embodiments that embody the principle of the present invention, such as zoom in operation. The contact information is a single contact point, which determines the center of the zoom in. And if the moving speed exceeds a predefined speed threshold, a zoom in operation is executed. In another variant, a link between the moving speed and the zoom in rate is established, which means that the moving speed determines the zoom in rate. In another variant, when user's finger detaches from (doesn't contact with) the touchscreen, the zoom in operation restores to the previous view on the touchscreen.

As to detailed implementation of above examples, the contact information of horizontal and vertical coordinates on the touchscreen is stored as parameter X and parameter Y. The moving speed is stored as parameter Z. The input device, e.g. tablet can store these parameters as a triplet (X, Y, Z).

According to another variant of the present embodiment, different triplets in the view of the touchscreen correspond to different actions. In the view displayed on the touchscreen, there are some regions. And different regions
correspond to different type of actions (including zoom in operation, popping-up menu, word selection and popping-up menu and button click etc.) Fig. 4 is a schematic diagram of a view displayed on the tablet according to the present embodiment. The region 401 is a canvas for diagram drawing and the region 402 are drawing tools. The region 401 corresponds to zoom in operation and the region 402 corresponds to popping up menu. The menu includes the drawing tools of same type, e.g. drawing pens. In another example, the region 401 is a text editing area and the region 402 are function buttons, e.g. save function button, close function button etc. The region 401 corresponds to selection and zoom in operation and the region 402 corresponds to button click. A person skilled in the art shall note that other combinations of action types are also possible.

According to another variant of the present embodiment, the camera provides a further function of gesture recognition, e.g. with methods for gesture recognition disclosed by US1 2196767 and US1 1827272. Before moving user's finger towards the touchscreen, the user makes a hand gesture. The hand gesture is captured and interpreted, e.g. as button selection. If the moving speed exceeds the speed threshold, button is clicked, i.e. the function associated with the button is executed.

A number of implementations have been described. Nevertheless, it will be understood that various modifications may be made. For example, elements of different implementations may be combined, supplemented, modified, or removed to produce other implementations. Additionally, one of ordinary skill will understand that other structures and processes may be substituted for those disclosed and the resulting implementations will perform at least substantially the same function(s), in at least substantially the same way(s), to achieve at least substantially the same result(s) as the implementations disclosed. Accordingly, these and other implementations shall fall in the scope of the invention.
CLAIMS

1. A method for obtaining user inputs, wherein the method comprising steps of
determining moving speed of a manipulating object when the manipulating
object moves towards a touchscreen;
determining contact information on the touchscreen when the manipulating
object touches the touchscreen; and
performing an action based on the moving speed and the contact information if
the moving speed exceeds a threshold.

2. The method of the claim 1, wherein it further comprises a step of
determining contact period during which the manipulating object maintains
contact with the touchscreen after the manipulating object touches the touchscreen;
and the performing step further comprises
performing the action based on the moving speed, the contact information and
the contact period.

3. The method of the claim 1, wherein it further comprises a step of
defining a range between the manipulating object and the touchscreen with a
farness threshold and a nearness threshold, wherein the moving speed is determined
within the range.

4. The method of the claim 1, wherein it further comprises a step of
displaying a view including at least one object on the touchscreen; and the
performing step further comprises steps of
determining an object among the at least one object based on the contact
information; and
performing the action based on the moving speed.

5. The method of the claim 4, wherein the performing step further comprises a
step of
popping up a menu.

6. The method of the claim 4, wherein the determined object is a text and the contact information is a contact point; the determining step further comprises a step of determining at least one word of the text neighboring to the contact point; and the performing step further comprises a step of selecting the at least one word.

7. The method of the claim 4, wherein the performing step further comprises a step of zooming in the view, wherein the contact information is a contact point that determines center of the zooming in.

8. The method of the claim 7, wherein the method further comprises a step of determining zoom in rate based on the moving speed.

9. The method of the claim 4, wherein the view comprises at least two view regions, and each region contains an object corresponding to a different action type.

10. A device for obtaining user inputs, wherein the device comprising
    a touchscreen module configured to determine contact information on the touchscreen when a manipulating object contacts the touchscreen;
    a sensing module configured to determine moving speed of the manipulating object moves towards the touchscreen; and
    a processing module configured to perform action based on the moving speed and the contact information if the moving speed exceeds a threshold.

11. The device of the claim 10, wherein
    the touchscreen module further configured to determine contact period during which the manipulating object maintains contact with the touchscreen after the manipulating object touches the touchscreen; and
    the processing module further configured to perform the action based on the moving speed, the contact information and the contact period.
12. The device of the claim 10, wherein
the touchscreen module further configured to display a view including at least
one object on the touchscreen; and
the processing module further configured to determine an object among the at
least one object based on the contact information and to perform the action based on
the moving speed.
Fig. 3

1. Displaying
2. Detecting moving speed
3. Detecting contact information
4. Performing actions
InternationaI application No. PCT/CN2013/073874

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: G06F 3/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, CNKI, CNTXT, WPI, EPDOC: touch+, speed+, threshold, towards, approach+, screen, display, zoom+, magnif+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"I." document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing data but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve a inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search 07 Jan. 2014 (07.01.2014)

Date of mailing of the international search report 23 Jan. 2014 (23.01.2014)

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Form PCT/ISA/210 (second sheet) (July 2009)
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A. CLASSIFICATION OF SUBJECT MATTER

G06F 3/0488 (2013.01) i
G06F 3/041 (2006.01) i