

METHOD AND APPARATUS FOR INPUTTING DATA TO AN ELECTRONIC SYSTEM

FIELD OF THE INVENTION

This invention relates generally to a method and apparatus for inputting data to an electronic system and more specifically to a method and apparatus for providing keyboard and/or cursor control input to a computer system in which the primary display is mounted on the user's head, as in augmented and virtual reality applications.

BACKGROUND OF THE INVENTION

Wearable computing technology is currently a technology used primarily by researchers. The users of wearable computing technology typically carry sophisticated computers having communication ability on their bodies throughout the day, which provides the users with constant access to personal data, general data and written communication. The output from a wearable computer may be viewed on a miniature video display which may be worn over a user's eye, thereby providing the user constant access to both the real and virtual worlds. Such a scheme is known as augmented reality. Data is typically entered into the computer through a small hand-held chorded keyboard, several of which are known in the art. Chorded keyboards have a small number of keys which are pressed in combination, similar to playing a musical instrument. As chorded keyboards are operated by touch, there is no need to view a chorded keyboard to operate it.

As wearable computers become more common, there may be resistance to chorded keyboards, as chorded keyboards may be difficult to use and take time to learn. One solution is to use a miniature traditional keyboard, perhaps a miniature keyboard capable of being worn on one of the user's wrists. Using a miniature traditional keyboard, however, presents a problem to augmented reality applications because the user must shift gaze from the display located on the user's eye, to the keyboard in the user's hand on a near-constant basis. This problem is addressed by the instant invention.

One known input apparatus which reduces the necessity for the user to shift gaze includes a two-level keypad system. Each key of the two-level keypad system may be depressed to two different levels. When a user depresses a key of the two-level keypad system to the first level, the system identifies the functionality of the key to the user without actuating the key. When the user further depresses the key to the second level, the system performs the function of the key. This two-level keypad system, however, does not identify to the user the position of the user's finger relative to the two-level keypad unless the user depresses one of the keys to its first level. This two-level keypad system also does not continuously identify the position of the user's finger relative to the two-level keypad as a user transitions between keys.

What is desired then is an apparatus for inputting data to an electronic system which continuously identifies to the user which data will be input to the electronic system, without requiring the user to view the input device or to learn a new keyboard method. It is also desirable to provide an apparatus for inputting data to an electronic system which allows a user to toggle between input modes, such as between a mouse input mode and a keyboard input mode. The present invention permits such functionality.

SUMMARY OF THE INVENTION

The invention relates to a method for inputting data to an electronic system. The method includes the steps of gener-

ating a representation of an input device having a plurality of input options in virtual space, sensing the position of a user in real space, and displaying the representation of the input device and the position of the user in virtual space on a head-mounted display. The method further includes the steps of determining selection of one of the plurality of input options by the user and determining which of the plurality of input options the user selected in response to the position of the user in virtual space relative to the representation of the input device. In one embodiment, the electronic system is a computer system. In another embodiment, the representation of the input device is a representation of a keyboard. In yet another embodiment, the position of the user's finger is sensed. In one embodiment in which the position of the user's finger is sensed, a finger-shaped cursor is used to display the position of the user's finger.

The invention also relates to an apparatus for inputting data to an electronic system. The apparatus includes a sensor, a processor in communication with the sensor, and a head-mounted display in communication with the processor. The sensor senses the position of the user in real space. The processor executes an algorithm which includes a module generating a representation of an input device having a plurality of input options in virtual space, a module determining the position of the user in virtual space relative to the representation of the input device, and a module determining which of the plurality of input options the user selects in response to the user's position. The head-mounted display displays the representation of the input device and the position of the user in virtual space relative to the representation of the input device. In one embodiment, the sensor senses the position of the user's finger. In one such embodiment, the head-mounted display displays the position of the user's finger using a finger-shaped cursor. In another embodiment, the sensor senses the orientation of the user's finger in real space and the head-mounted display displays the orientation of the user's finger by varying the orientation of the finger-shaped cursor. In yet another embodiment, the sensor simultaneously senses the position of more than one of the user's fingers. In this embodiment, the apparatus independently tracks the position of more than one user finger at a time.

The invention also relates to a method for toggling between a first input mode and a second input mode in an electronic system. The method includes the steps of providing an electronic system having a first input mode and a second input mode, providing a sensor capable of distinguishing between a single user finger and a plurality of user fingers, placing the electronic system in the first input mode upon sensing only the single user finger, and placing the electronic system in the second input mode upon sensing the plurality of user fingers. In one embodiment, the first input mode is a keyboard input mode and the second input mode is a mouse input mode.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention is pointed out with particularity in the appended claims. The above and further advantages of this invention may be better understood by referring to the following description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram of an embodiment of a system for inputting data to an electronic system;

FIG. 2 is a flowchart representation of an embodiment of a process for inputting data to an electronic system;

FIG. 3 is a perspective view of an embodiment of a sensor having displaceable keys disposed above a sensor plane composed of a plurality of key elements;