

HAPTIC BUTTON AND HAPTIC DEVICE USING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of Korean Patent Application No. 10-2006-0000672 filed on Jan. 3, 2006 in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a haptic input device, and more particularly, to a haptic button providing various stimulations to a user according to a current application and a haptic device using the same.

[0004] 2. Description of the Related Art

[0005] The term “haptic” generally refers to computer touch technology and is from the Greek “haptesthai” meaning relating to the sense of touch. Conventional computer technology usually uses vision or hearing information for interaction with a human being. However, with the development of technology, users have wanted more specific and realistic information through a virtual reality. To satisfy the users’ want, haptic technology for transmitting the sense of touch and force has been developed.

[0006] The haptic technology is largely divided into force feedback technology and tactile feedback technology. The force feedback technology allows a user to feel a force and a motion through a mechanical interface and is wide spread in daily life. For example, when a user shoots a gun in games, actual repulsive power is transmitted to a joystick. When a car driven by a user collides with another car in games, a virtual impact is transmitted to a steering wheel.

[0007] The tactile feedback technology is mainly used in medicine. A three-dimensional image showing an anatomical structure of a virtual patient is displayed on a computer screen, thereby providing simulation allowing a surgeon to perform operations. Here, the surgeon’s mechanoreceptor is stimulated through a device such as a small pin moved by compressed air or electricity so that the surgeon can feel like actually touching skin tissue.

[0008] Such haptic technology can be widely used in various fields such as game simulation and medical simulation requiring too much costs, time, or risk to directly experience.

[0009] With the development of information and telecommunication technology including Internet and computers, many digital devices satisfying the tastes and demands of customers have been manufactured and spread. Recently, digital devices such as mobile phones, personal digital assistants (PDAs), portable multimedia players (PMPs), digital cameras, portable game devices, and MP3 players characterized by convenient portability have particularly attracted customers’ interest.

[0010] Such digital devices usually include a key or button input device. Conventional button input devices are simply used to input commands. FIG. 1 illustrates a conventional button input device 10.

[0011] To make a button input, a user presses a key top 11. A rubber cover 12 contacts the bottom of the key top 11. When the key top 11 is pressed, the rubber cover 12 is also

pressed downward. When the rubber cover 12 eventually pushes down a metal dome 14, the user can perceive that a corresponding key is pressed through the sense of touch or hearing. Generally, force acting on the metal dome 14 and displacement generated by the transformation of the metal dome 14 are illustrated in FIG. 2. Referring to FIG. 2, a user feels a clicking feeling at an inflection point 21 where a force changes from increase to decrease.

[0012] The transformed metal dome 14 presses down a film 15 having upper contacts 17 and the upper contacts 17 become in contact with a lower contact 18. Then, a predetermined circuit connected to the upper contacts 17 and the lower contact 18 senses that the button input is made.

[0013] In such a button input procedure, repulsive power or a clicking feeling provided to a user simply depends on the material or structure of the metal dome 14. Accordingly, the same repulsive power or clicking feeling is provided regardless of a type of application unless the metal dome 14 is replaced. However, when haptic technology is applied to a button, a user pressing the button can feel different stiffness according to an application. In other words, when the haptic technology is used, a user has soft sensation when pressing a soft object and has stiff sensation when pressing a hard object.

[0014] As described above, haptic technology has been used and developed in many fields. However, a technique of adaptively providing force feedback or tactile feedback according to an application or a function of a button in a button input device wide spread as an input device has not been researched and developed satisfactorily. In particular, additional consideration is needed to use a haptic button for a variety of portable devices becoming smaller and lighter.

SUMMARY OF THE INVENTION

[0015] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the invention.

[0016] The present invention provides a haptic button for providing diverse stimulations to a user according to an application or a function of a button, thereby facilitating the operation of an object.

[0017] The present invention also provides a haptic button for informing a user whether the haptic button is available at a current time.

[0018] According to an aspect of the present invention, there is provided a haptic button including an electro-active polymer layer, a pair of electrodes which partially contact two sides of the electro-active polymer layer, a power supply to supply a voltage to the pair of electrodes, and a sensor to sense a button input from a user, wherein stimulation, provided from the electro-active polymer layer of the haptic button to the user who contacts the haptic button, is changed by changing a waveform of the voltage.

[0019] According to another aspect of the present invention, there is provided a haptic button including an electro-active polymer layer, a pair of electrodes which partially contact two sides of the electro-active polymer layer, a power supply to supply a voltage to the pair of electrodes, and a sensor to sense a button input from a user, wherein one side of the electro-active polymer layer includes a plurality of notches which open when the voltage is applied to the electrodes.