[0103] In addition to the above-described exemplary embodiments, exemplary embodiments of the present invention can also be implemented by executing computer readable code/instructions in/on a medium/media, e.g., a computer readable medium/media. The medium/media can correspond to any medium/media permitting the storing and/or transmission of the computer readable code/instructions. The medium/media may also include, alone or in combination with the computer readable code/instructions, data files, data structures, and the like. Examples of code/instructions include both machine code, such as produced by a compiler, and files containing higher level code that may be executed by a computing device and the like using an interpreter.

[0104] The computer readable code/instructions can be recorded/transferred in/on a medium/media in a variety of ways, with examples of the medium/media including magnetic storage media (e.g., floppy disks, hard disks, magnetic tapes, etc.), optical media (e.g., CD-ROMs, or DVDs), magneto-optical media (e.g., floptical disks), hardware storage devices (e.g., read only memory media, random access memory media, flash memories, etc.) and storage/transmission media such as carrier waves transmitting signals, which may include computer readable code/instructions, data files, data structures, etc. Examples of storage/transmission media may include wired and/or wireless transmission media. For example, storage/transmission media may include optical wires/lines, waveguides, and metallic wires/lines, etc. including a carrier wave transmitting signals specifying instructions, data structures, data files, etc. The medium/media may also be a distributed network, so that the computer readable code/instructions are stored/transferred and executed in a distributed fashion. The medium/media may also be the Internet. The computer readable code/instructions may be executed by one or more processors. The computer readable code/instructions may also be executed and/or embodied in at least one application specific integrated circuit (ASIC) or as FPGA (field-programmable gate array).

[0105] According to the present invention, a haptic button provides various stimulations to a user according to a current application or a button function, thereby facilitating the operation of an object.

[0106] Accordingly, when the user interacts with an object such as a menu or an icon displayed on a display unit, attributes corresponding to the object can be given to the haptic button so that the haptic button provides the user with the tactile sensation, texture, and stiffness of the object displayed on the display unit.

[0107] Although a few exemplary embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these exemplary embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A haptic button comprising:

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.

2. The haptic button of claim **1**, further comprising a fixing portion which fixes the electro-active polymer layer so that a part of the electro-active polymer layer is not expanded.

3. The haptic button of claim **1**, wherein the change in the stimulation is change in stiffness of the haptic button.

4. The haptic button of claim **1**, further comprising a metal dome providing a bias stiffness to the user, wherein one of the electrodes at least partially contacts an upper curve of the metal dome.

5. The haptic button of claim **1**, wherein the waveform of the voltage is changed according to a current application status.

6. The haptic button of claim **1**, wherein the sensor includes a contact switch or a touch pad.

7. A haptic button comprising:

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 comprises a plurality of notches which open when the voltage is applied to the electrodes.

8. The haptic button of claim **7**, wherein the user senses a rough texture when the notches are open and wherein the amount of opening in each of the notches increases in proportion to a level of the voltage supplied by the power supply to the pair of electrodes and the rough texture increases as the amount of the opening increases.

9. The haptic button of claim **7**, wherein a unique rough texture is given to the haptic button by applying voltage to the electrodes to allow the user to identify the haptic button just through the sense of touch.

10. The haptic button of claim **7**, further comprising a fixing portion which fixes the electro-active polymer layer so that a part of the electro-active polymer layer is not expanded.

11. The haptic button of claim **7**, wherein the sensor includes a contact switch or a touch pad.

12. A haptic button comprising:

an electro-active polymer layer divided into regions;

a plurality of pairs of electrodes which partially contact two sides of the electro-active polymer layer;

a power supply to supply voltage to the plurality of pairs of electrodes;

a sensor to sense a button input from a user;

a fixing portion which fixes the electro-active polymer layer at an edge of the haptic button; and

at least one separator which extends in at least one direction between a widthwise direction and a lengthwise direction of the haptic button, wherein each separator fixes a portion of the electro-active polymer layer contacting the separator,