

APPARATUS AND METHOD FOR PROVIDING HAPTICS OF IMAGE

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the priority of Korean Patent Application No. 2004-0113691, filed on Dec. 28, 2004, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a method of processing an image, and more particularly, to an apparatus and method for providing haptics of a displayed image to a user.

[0004] 2. Description of Related Art

[0005] A conventional method of providing haptics of an image is disclosed in Korean Patent Application No. 2002-11328. To provide haptics of an image, the conventional method disadvantageously requires a mechanical interface device (e.g., a belt, a pulley, and a cable) and an actuator (e.g., an electrical motor) for driving the interface device.

[0006] Another conventional method of providing haptics of an image is disclosed in Japanese Patent Application No. 2003-330688. The conventional method can indirectly provide haptics of a displayed image to a user through a separate mouse that has a special configuration. Accordingly, such conventional methods cannot directly provide haptics of an image to a user.

[0007] Further, the conventional methods provide haptics of only a single point of an image at a certain time. When users want to feel haptics of a point (referred to as a request point) far away from a reference point, the conventional methods need to perform many calculations to move from the reference point to the request point, thereby making it impossible to feel haptics of the request point. Also, the conventional methods cannot provide haptics to users in real time.

BRIEF SUMMARY

[0008] An aspect of the present invention provides an apparatus for directly providing haptics of an image, which is displayed on an image unit, to a user through the image unit.

[0009] An aspect of the present invention also provides a method of directly providing haptics of an image, which is displayed on an image unit, to a user through the image unit.

[0010] According to an aspect of the present invention, there is provided an apparatus for providing haptics of an image displayed through an image unit, the apparatus including: a touch unit checking whether a user has touched a portion of the displayed image, and searching for a position of the portion when the user touches the portion; and a magnetic force changing unit changing magnetic forces in response to haptic information corresponding to the position and expressing the changed magnetic forces through the image unit. Haptics of the portion are provided through the change of the expressed magnetic forces.

[0011] According to another aspect of the present invention, there is provided a method of providing haptics of an image displayed through an image unit, the method including: checking whether a user touches a desired portion of an image displayed in the image unit, and searching for a position of the portion; and changing magnetic forces according to haptic information corresponding to the searched position and expressing the changed magnetic forces through the image unit. Haptics of the portion are provided to the user through the change of the expressed magnetic forces.

[0012] According to another aspect of the present invention, there is provided an image haptics providing apparatus, including: a touch unit determining whether a user has touched a portion of a displayed image displayed on an image unit and determining a position of the touched portion; and a magnetic force changing unit selecting haptic information corresponding to the determined position among input haptic information and communicating magnetic forces changed in response to the selected haptic information through the image unit.

[0013] According to another aspect of the present invention, there is provided an image unit, including: a display module displaying an image; an upper magnetic force unit above the display module and including a plurality of electromagnetic cells changing magnetic forces in response to an upper magnetic force control signal; a lower magnetic force unit under the upper magnetic force unit and including a plurality of electromagnetic cells changing magnetic forces in response to a lower magnetic force control signal; a touch unit determining whether a user has touched a portion of a displayed image and searching for a position of the touched portion; and a magnetic force changing unit selecting haptic information corresponding to the position and generating the upper and lower magnetic force control signals using analyzed results to communicate the haptic information.

[0014] Additional and/or other aspects and advantages of the present invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] These and/or other aspects and advantages of the present invention will become apparent and more readily appreciated from the following detailed description, taken in conjunction with the accompanying drawings of which:

[0016] **FIG. 1** is a block diagram of an apparatus for providing haptics of an image according to an embodiment of the present invention;

[0017] **FIG. 2** is a flowchart of a method of providing haptics of an image according to an embodiment of the present invention;

[0018] **FIG. 3** is a block diagram of a haptic information generating unit shown in **FIG. 1**;

[0019] **FIG. 4** is a flowchart of an operation of generating haptic information shown in **FIG. 2**;

[0020] **FIG. 5** is a block diagram of a touch unit shown in **FIG. 1**;