

**METHOD AND APPARATUS OF PROVIDING
HAPTIC EFFECT USING A PLURALITY OF
VIBRATORS IN A PORTABLE TERMINAL**

CLAIM OF PRIORITY

[0001] This application claims priority to an earlier Korean patent application filed in the Korean Intellectual Property Office on Mar. 20, 2009 and assigned Serial No. 10-2009-0023740, the entire disclosure of which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to a method and apparatus of providing haptic effect using a plurality of vibrators in a portable terminal, and in particular, to a method and apparatus of providing three-dimensional haptic effect according to a user's input position using a plurality of vibrators.

[0004] 2. Description of the Related Art

[0005] A visual or auditory information is used in a conventional computer technology; however, a user demands more and more specific and realistic information. To meet such demand, therefore, a haptic technology transferring tactile information has been developed. The term 'haptic' designates a computer tactile technology, and derives from the Greek adjective 'haptesthai', which means 'contact or touch'.

[0006] The haptic technology includes a force feedback allowing a user to feel a force and a sense of motion, and a tactile feedback technology allowing a user to feel an object. The haptic technology is being widely applied to various fields such as a game simulator and a medical simulator.

[0007] In the advent of Internet and computer technologies, a number of portable terminals provide functions using the haptic technology to enrich consumer's experience. Herein, the portable terminal may include a cell phone, a personal digital assistant (PDA), a portable multimedia player (PMP), a digital camera, a portable game machine, an MP3 player, and the like. For example, a recently launched cell phone provides a technology capable of allowing a user to feel data input through vibration by generating a specific vibration pattern depending on a touched position of a screen.

[0008] A conventional portable terminal provides a haptic effect by controlling a vibration pattern or vibration strength using a single vibrator included in the terminal. However, in general, there is a limitation in the vibration pattern and vibration strength that can be generated using a single vibrator that meets a user's various demands and tastes.

SUMMARY OF THE INVENTION

[0009] An aspect of the present invention is to substantially solve at least the above problems and/or disadvantages and to provide at least the advantages below. Accordingly, an aspect of the present invention is to provide a method and apparatus of providing a haptic effect using a plurality of vibrators in a portable terminal.

[0010] Another aspect of the present invention is to provide a method and apparatus of generating three-dimensional vibration according to a user's input position using a plurality of vibrators in a portable terminal.

[0011] Another aspect of the present invention is to provide a method and apparatus of controlling vibration strengths of respective vibrators according to a user's touch position in a portable terminal.

[0012] Another aspect of the present invention is to provide a method and apparatus of controlling vibration strengths of respective vibrators according to a user's touch duration in a portable terminal.

[0013] According to an aspect of the present invention, a method of providing a haptic effect using a plurality of vibrators in a portable terminal includes: detecting whether user's input information is generated; determining a vibration strength level of each vibrator using the user's input information; and generating vibration according to the determined vibration strength via each of the vibrators.

[0014] According to another aspect of the present invention, an apparatus of providing a haptic effect using a plurality of vibrators in a portable terminal includes: a user input unit in which user's input information is generated; a vibration strength determination unit determining a vibration strength level of each of the vibrators according to the user's input information; and a control unit generating vibration according to the determined vibration strength via each of the vibrators.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The above and other aspects, features and advantages of the present invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings in which:

[0016] FIG. 1 is a block diagram illustrating a haptic effect in a portable terminal according to the present invention;

[0017] FIG. 2 is a flowchart illustrating a procedure of performing a haptic function using a plurality of vibrators in a portable terminal according to the present invention;

[0018] FIG. 3 is a schematic diagram illustrating a construction of a portable terminal including four vibrators according to an embodiment of the present invention; and

[0019] FIGS. 4 to 10 are schematic diagrams illustrating examples of generating a haptic effect in a portable terminal including four vibrators according to embodiments of the present invention.

DETAILED DESCRIPTION

[0020] The following description with reference to the accompanying drawings is provided to assist in a comprehensive understanding of exemplary embodiments of the invention as defined by the claims and their equivalents. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope and spirit of the invention. Also, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

[0021] It is to be understood that the singular forms "a," "an," and "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to "a component surface" includes reference to one or more of such surfaces.

[0022] By the term "substantially" it is meant that the recited characteristic, parameter, or value need not be