

SYSTEM AND METHOD FOR PROVIDING DYNAMIC TACTILE FEEDBACK ON HAND-HELD ELECTRONIC DEVICES

BACKGROUND

[0001] 1. Technical Field

[0002] This invention relates to the field of hand-held electronic devices. Specifically this invention relates to providing dynamic tactile-feedback on hand-held electronic devices.

[0003] 2. Description of the State of the Art

[0004] Many hand-held electronic devices provide input means allowing the user to manipulate data on the hand-held electronic device, including for example scrollwheels and keyboards. Scrollwheels are also commonly referred to as thumbwheels or roller wheels. Current scrollwheels provide limited tactile response to the user. Typical feedback to the user includes “bumps” or detents activated when the scrollwheel is rotated a predetermined distance, and “clicks” which are felt when the user pushes the scrollwheel in one or more direction, without rolling it. These feedback mechanisms typically correspond to moving the cursor on a display screen for “bumps” and selection of an option for “clicks.” Current scrollwheel functionality on handheld electronic devices, for example, allow users to scroll in both horizontal and vertical screen directions by rolling a scrollwheel, and to select screen icons by pushing the scrollwheel in towards the handheld electronic device. When rotated, the scrollwheel provides a feeling to the user of moving through “bumps” (detents).

[0005] These feedback mechanisms, however, are limited in scope and are preset by the hardware within the device thereby provide inadequate information to the users. There is a need in the art to provide an improved feedback system.

SUMMARY

[0006] In accordance with the teachings disclosed herein, systems and methods for providing dynamic tactile feedback to a user of a handheld electronic device are disclosed.

[0007] As an example, a system may comprise a scrollwheel for providing input to the handheld electronic device, a dynamic feedback module connected to the scrollwheel for providing a plurality of types of feedback to a user of the handheld electronic device, each type of feedback associated with at least one of a plurality of feedback modes, and a software module for selecting a feedback mode from the plurality of feedback modes and activating the associated type of feedback provided by the dynamic feedback module.

[0008] As another example, a method for providing feedback may comprise the steps of providing a user initiated input to the handheld electronic device through the scrollwheel, analysing data associated with the user initiated input, deciding if a feedback response is required, and if a feedback response is required, initiating an appropriate feedback mode.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The present system will be further understood from the following detailed description, with reference to the

drawings in which similar reference numerals are used in different figures to denote similar elements.

[0010] FIG. 1 is a diagram of an exemplary handheld electronic device in which a dynamic tactile feedback system can be implemented.

[0011] FIG. 2 is a representative diagram showing various types of feedback.

[0012] FIG. 3 is a diagram showing a screen of a handheld electronic device and illustrating different types of dynamic feedback.

[0013] FIG. 4 is a diagram of a screen showing a messaging application.

[0014] FIG. 5 is a diagram of a data page having different objects that trigger different types of feedback.

[0015] FIG. 6 is a block diagram showing a method for providing dynamic feedback to a handheld electronic device user.

[0016] FIG. 7 is a diagram showing the use of clutch plates to provide resistance to rotation in a scrollwheel.

[0017] FIG. 8 is a diagram showing the use of an electromagnetic motor for providing rolling resistance in a scrollwheel.

[0018] FIG. 9 is a diagram showing the use of a cam mechanism for providing lateral motion in scrollwheel.

DETAILED DESCRIPTION

[0019] As handheld device users are forced to process more and more data and applications, the use of a limited number of preset feedback responses is not adequate. The feedback responses are constant, whether a particular set of data or a particular application is relevant, or irrelevant to the user. In one example, a user scrolling through a list of unread messages will currently feel the same feedback response whether a message is of normal or high importance.

[0020] Providing the user with different feedback responses for different types or priority levels of data, allows the user to easily select relevant data from a list including both relevant and irrelevant data. Additionally, different users may desire different types or levels of feedback associated with different applications, events or data sets.

[0021] Turning now to the drawing figures, FIG. 1 is a diagram showing an exemplary handheld electronic device 100 in which a dynamic tactile feedback system can be implemented. The handheld electronic device 100 comprises a display 110 for displaying user data and a scrollwheel 120 capable of providing dynamic feedback to a user. This handheld electronic device also includes an auxiliary input device, shown here as a keyboard 130. It will be appreciated by those skilled in the art that there are a variety of possible form factors and input interfaces for the handheld electronic device 100. For example, the auxiliary input device could be a touchscreen interface or some other input interface.

[0022] FIG. 2 is a representative diagram showing various types of feedback that may be returned to the user based on the type of data, application or event that is selected by the user on the handheld electronic device 100. Dotted line 201 represents a frictional resistance, which works against the