

USER INTERFACE

FIELD OF THE INVENTION

[0001] The invention relates to a user interface for controlling an electronic device. The invention further relates to a method and a computer program for controlling an electronic device. The invention further relates to an electronic device and to an interface module that can be used as a building block of an electronic device.

BACKGROUND

[0002] Electronic devices such as mobile communication terminals and palmtop computers are typically equipped with digital devices capable of supporting various services and application functions. As a consequence, designing user interfaces for electronic devices of the kind mentioned above presents unique challenges in view of limited size, a limited number of controls that can be accommodated on such devices, and a need for quick, simple, and intuitive device operation. Especially in conjunction with mobile devices, the challenge related to a user interface is exacerbated because such devices are designed to be small, lightweight and easily portable. Consequently, mobile devices typically have limited display screens, keypads, keyboards and/or other input and output devices. Due to the size of the input and output devices, it may be difficult for users to enter, retrieve and view information using mobile devices. Users may have difficulty in accessing desired information, a desired service, and/or a desired application function due to variety of information that may be contained in or accessed with the mobile device, as well as due to a growing number of services and applications functions such devices are capable of supporting. Due to a great number of services and application functions a user interface of an electronic device typically includes a hierarchical menu structure.

[0003] A typical user interface of an electronic device according to the prior art includes a hierarchical menu structure in which one or more menu layers are being directly accessible at a time. The user interface can comprise a touch sensitive display screen such that a user of the electronic device is enabled to accomplish control actions by touching icons, texts, or other symbols displayed on the touch sensitive display screen. Due to the limited size of the touch sensitive display screen all details of the menu structure cannot usually be displayed simultaneously. Therefore, the user has usually to perform many successive control actions in order to get to a desired menu item that can be e.g. a desired application function to be performed. Each control action may include pressing a relevant spot of the touch sensitive display screen and, after getting response to the pressing, releasing the above-mentioned spot of the touch sensitive display screen from pressure. The repetitive pressing and release actions make the use of the user interface physically tiring.

SUMMARY

[0004] In accordance with a first aspect of the invention a novel user interface is provided. The user interface comprises:

[0005] a sensor element having a sensor surface and being arranged to produce a location indicator that is adapted to indicate a location of a spot of the sensor surface that is closest to an external object,

[0006] force sensor equipment connected to the sensor element and arranged to produce a force indicator that is adapted to indicate a temporal change of a first force component directed to the sensor surface and a temporal change of a second force component directed to the sensor surface, the first force component and the second force component being parallel with the sensor surface, and

[0007] a processor unit capable of controlling an electronic device on the basis of the location indicator and the force indicator.

[0008] A user of the electronic device is enabled to control the electronic device by using different levels and directions of force and/or torque directed to the sensor surface. Therefore, the electronic device can be controlled with a smaller number of repetitive pressing and release actions.

[0009] In accordance with a second aspect of the invention a novel method that can be used for controlling an electronic device is provided. The method comprises:

[0010] producing a location indicator that indicates a location of a spot of a sensor surface that is closest to an external object,

[0011] producing a force indicator that indicates a temporal change of a first force component directed to the sensor surface and a temporal change of a second force component directed to the sensor surface, the first force component and the second force component being parallel with the sensor surface, and

[0012] controlling an electronic device on the basis of the location indicator and the force indicator.

[0013] In accordance with a third aspect of the invention a novel electronic device is provided. The electronic device comprises:

[0014] a sensor element having a sensor surface and being arranged to produce a location indicator that is adapted to indicate a location of a spot of the sensor surface that is closest to an external object,

[0015] force sensor equipment connected to the sensor element and arranged to produce a force indicator that is adapted to indicate a temporal change of a first force component directed to the sensor surface and a temporal change of a second force component directed to the sensor surface, the first force component and the second force component being parallel with the sensor surface, and

[0016] a processor unit arranged to control the electronic device on the basis of the location indicator and the force indicator.

[0017] The electronic device can be, for example, a mobile communication terminal, a palmtop computer, a portable play station, or a combination of them.

[0018] In accordance with a fourth aspect of the invention a novel computer program is provided. The computer program comprises computer executable instructions for making a processor unit to control an electronic device on the basis of:

[0019] a location indicator that is adapted to indicate a location of a spot of a sensor surface that is closest to an external object, and

[0020] a force indicator that is adapted to indicate a temporal change of a first force component directed to the sensor surface and a temporal change of a second force component directed to the sensor surface, the first force component and the second force component being parallel with the sensor surface.