

**[0021]** A computer readable medium can be encoded with the above-mentioned computer executable instructions.

**[0022]** In accordance with a fifth aspect of the invention a novel interface module is provided. The interface module comprises:

**[0023]** 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,

**[0024]** 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

**[0025]** a processor unit capable of controlling an electronic device connected to the interface module on the basis of the location indicator and the force indicator.

**[0026]** A number of embodiments of the invention are described in accompanied dependent claims.

**[0027]** Various exemplifying embodiments of the invention both as to constructions and to methods of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

**[0028]** The exemplifying embodiments of the invention presented in this document are not to be interpreted to pose limitations to the applicability of the appended claims. The verb "to comprise" is used in this document as an open limitation that does not exclude the existence of also unrecited features. The features recited in depending claims are mutually freely combinable unless otherwise explicitly stated.

#### BRIEF DESCRIPTION OF THE FIGURES

**[0029]** The embodiments of the invention that are presented in the sense of examples and their advantages are explained in greater detail below with reference to the accompanying drawings, in which:

**[0030]** FIGS. 1a-1h illustrate operational principles of user interfaces according to embodiments of the invention,

**[0031]** FIGS. 2a and 2b show an electronic device comprising a user interface according to an embodiment of the invention,

**[0032]** FIGS. 3a and 3b show an electronic device according to an embodiment of the invention,

**[0033]** FIG. 4 shows an interface module according to an embodiment of the invention, and

**[0034]** FIG. 5 is a flow chart of a method according to an embodiment of the invention.

#### DESCRIPTION OF THE EMBODIMENTS

**[0035]** A user interface according to an embodiment of the invention comprises: (i) 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, (ii) 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 (iii) a processor unit capable of controlling an electronic device on the basis of the location indicator and the force indicator.

**[0036]** FIGS. 1a-1h illustrate operational principles of user interfaces according to embodiments of the invention. The user interfaces comprise a sensor element **101** that has a sensor surface **102**. For the sake of clarity, FIGS. 1a-1h are simplified. For example, a processor unit for controlling an electronic device on the basis of the location indicator and the force indicator is not shown. A coordinate system **130** is shown for presentational purposes.

**[0037]** FIG. 1a shows an exemplifying situation in which an external object **120** directs to the sensor surface **102** force **F** that has an x-component, a y-component, and a (minus) z-component. The x- and y-components of the force **F** are due to friction between the sensor surface and the external object. The external object can direct the force to the sensor surface when the external object is static with respect to the sensor surface and also when a contact point between the external object and the sensor surface is moving along the sensor surface. The external object can be a finger of a user of the user interface or the external object can be e.g. a stylus. In the exemplifying case shown in FIG. 1a, the force sensor equipment comprises a force detector **103** that is arranged to detect a first force component that is an x-directional force component **F<sub>x</sub>** and to detect a second force component that is a y-directional force component **F<sub>y</sub>**. The x-directional force component **F<sub>x</sub>** is a counterforce of the x-component of the force **F** and the y-directional force component **F<sub>y</sub>** is a counterforce of the y-component of the force **F**. An electronic device that is connected to the user interface can be controlled, for example, on the basis of location and/or movement of the external object **120** touching the sensor surface **102** and also on the basis of temporal changes of direction and/or strength of the resultant of **F<sub>x</sub>** and **F<sub>y</sub>**.

**[0038]** FIG. 1b shows an exemplifying situation in which a first external object **120** directs to the sensor surface **102** first force **F<sub>1</sub>** that has an x-component and a y-component and a second external object **121** directs to the sensor surface second force **F<sub>2</sub>** that has an x-component and a y-component. The common effect of the first and the second forces **F<sub>1</sub>** and **F<sub>2</sub>** causes torque **T** directed to the sensor surface **102**. In the exemplifying case shown in FIG. 1b, the force sensor equipment comprises a force detector **103a** connected to a first point of the sensor element **101** and a force detector **103b** connected to a second point of the sensor element. The force detector **103a** is arranged to detect a first force component that is a y-directional force component **F<sub>y1</sub>**. The force detector **103b** is arranged to detect a second force component that is another y-directional force component **F<sub>y2</sub>**. The force components **F<sub>y1</sub>** and **F<sub>y2</sub>** and a distance **D<sub>x</sub>** shown in FIG. 1b indicate at least part of the torque **T** directed to the sensor surface. An electronic device that is connected to the user interface can be controlled, for example, on the basis of locations and/or movements of the external objects **120** and **121** touching the sensor surface **102** and also on the basis of temporal changes of the indicated torque.

**[0039]** In the example case illustrated in FIG. 1a, the first and the second force components directed to the sensor surface **102** are detected substantially at a same point of the sensor element **101** but detection directions of the first and the second force components are mutually different. In the