

provides tactile feedback. U.S. Pat. No. 5,977,867, U.S. 2003/0038776 and WO 03/038800, which are incorporated herein by reference, describe various solutions for giving tactile feedback. The solutions described can be used, where applicable, in connection with the structure described in **FIG. 1A**. The touch pad **106** can be implemented by prior art solutions, which may be based on capacitive or resistive sensors. When the user touches the touch pad **106** with his finger, for example, the touched point and usually also the touch force can be determined. The display **102** can be implemented by prior art solutions; for example, if the display should be flat, a liquid crystal display (LCD), plasma display or thin film transistor display (TFT) can be used. The feedback unit **108** providing tactile feedback can be implemented by prior art solutions, for example by a piezo-electric element or a linear vibrator based on a solenoid. The feedback unit **108** generates a mechanical movement, which the user can sense through touch. The frequency, amplitude and duration of the movement can be controlled. The movement can be sensed as trembling and vibration. The movement can simulate the click generated by a key press, for example. In the most complex case, the tactile feedback can imitate the texture of a surface. The home page of a company producing piezoelectric elements is found at [www.americanpiezo.com](http://www.americanpiezo.com). This manufacturer calls these piezoelectric elements 'disc benders'.

[0019] **FIGS. 1B and 1C** illustrate a front view of the device appearance and a side view of how the components shown in **FIG. 1A** are located in principle. In the example of **FIG. 1B**, the device **100** is a subscriber terminal of a radio system, which is provided with a display **102**. In **FIG. 1A**, the display **102** is a touch screen on which a keyboard **104** has been generated. In our example the keyboard comprises twelve keys, i.e. "1", "2", "3", "4", "5", "6", "7", "8", "9", "0", "\*" and "#". As described, the display **102** is provided with a touch pad **106** and a feedback unit **102**. **FIG. 1C** illustrates a subscriber terminal **100**, which comprises a display **102** and a touch pad **106**, on which a virtual keyboard has been formed. As described, the image **104** of the keyboard, i.e. the contours of single keys, can be printed on the surface of the touch pad **106** during its manufacture, but this is not necessary. As described, the display **102** may be a separate part, and the touch pad **106** and the feedback unit **108** are in connection with each other.

[0020] Next, the structure of the electronic device will be described with reference to **FIG. 6**. Since we use a subscriber terminal as an example, the device **100** comprises an antenna **604** and a radio transceiver **602**. The radio transceiver **602** is e.g. a prior art transceiver of a mobile station which functions in the GSM system (Global System for Mobile Communications), GPRS system (General Packet Radio Service) or in the UMTS system (Universal Mobile Telecommunications System), for instance. In addition to the above-mentioned virtual keyboard **104**, display **102**, touch pad **106** and feedback unit **108** for implementing the user interface, a typical device **100** comprises a microphone **608** and a loudspeaker **610** for processing sound. A chargeable battery **606** usually functions as the power source.

[0021] The device **100** further comprises a processing unit **600**, which controls and monitors the operation of the device and its various parts. The processing unit **600** also includes the application programs of the device **100**, e.g. for radio signal processing and user interface management. Nowa-

days the processing unit **600** is usually implemented as a processor and its software but various hardware solutions are also feasible, such as a circuit built from separate logic components or one or more application-specific integrated circuits (ASIC). If necessary, there may be more than one processor. A hybrid of these solutions is also feasible. In the selection of the implementation method a person skilled in the art will naturally consider the requirements set on the size and power consumption of the device, the necessary processing capacity, production costs and production volumes.

[0022] An electronic device **100** comprising a touch pad **106**, a processing unit **600** connected to the touch pad **106** over a data transmission connection and a feedback unit **612** connected to the processing unit **600** over a data transmission connection was described above. The processing unit **600** is configured to determine a virtual keyboard **104** for the touch pad **106** and a tactile appearance of the keyboard **104**. The feedback unit **612** is configured to give tactile feedback on the use of the keyboard **104** to the device user.

[0023] To manage the keyboard **104**, the processing unit **600** is configured to receive information generated by the pressing of a keyboard **104** key and to identify the key that was pressed on the basis of the information. The touch pad **106** usually gives information on the point where the screen was pressed, e.g. as x and y coordinates, and also on the force by which the key was pressed. Other control data may also be transmitted to the processing unit **600** from the touch pad **106**.

[0024] The processing unit **600** is further configured to collect the above-mentioned information on the key presses and to carry out an analysis of them. The analysis is used to generate at least one of the following results: coordinates of an accepted key press, coordinates of a rejected key press, coordinates of a corrected key press, time used for successive key presses, mean of the coordinates of the presses of one key, variance of the coordinates of the presses of one key, another statistical variable describing the presses of one key. The coordinates may refer to coordinates that define the pressed point with a desired accuracy, e.g. the centre point of a press or the touched area defined by the borderlines of a press. The statistical variable refers to other feasible ways of determining statistics for a key press, e.g. the median or the average size of the touched area, expressed as the width and height or the radius. The touched area can also be defined as an elliptical area where the touched area is defined by the centre point and main axes of the ellipse. The processing unit **600** can be configured to identify a press at the border of two keys or outside the keyboard **104** as a rejected key press. In addition, the processing unit **600** may be configured to identify the following sequence as a corrected key press: the first key press is deleted by the delete key, after which another key is pressed.

[0025] Then, on the basis of the collected information and the analysis carried out, the processing unit **600** re-determines the tactile appearance of the keyboard **104** so as to make the keyboard **104** more ergonomic for the user, which makes the use of the keyboard **104** easier and/or the pressing of a wrong key less likely. The tactile keyboard **104** appearance comprises at least one of the following: key size, key shape and key location. The key shape can also be defined as the key position; for example, if the key is implemented