

SYSTEM AND METHOD FOR PROVIDING TACTILE FEEDBACK TO A USER OF AN ELECTRONIC DEVICE

FIELD OF DISCLOSURE

[0001] The disclosure herein describes a system and method for providing feedback to a user of an electronic device. In particular, the disclosure relates to providing a tactile feedback to a user action (such as applying a finger) to an input device, such as a key or touchpad, in an electronic device.

BACKGROUND

[0002] Current computing and communication devices perform a variety of functions to enable mobile users to stay current with information and communications, such as e-mail, corporate data and organizer information while they are away from their desks. They often have a variety of input devices, such as keypads, dials, thumbwheels, trackballs, touch screens and the like. Some input devices, such as a touchpad, have smooth surfaces having defined multiple input regions. It may be difficult for a user to scan a touchpad and distinguish between regions on the smooth surface of the touchpad.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] The disclosure and related embodiments will now be described, by way of example only, with reference to the accompanying drawings, in which:

[0004] FIG. 1 is a schematic representation of an electronic device having an input device, shown as a touchpad, in accordance with an embodiment;

[0005] FIG. 2 is a block diagram of internal components including the input device of the device of FIG. 1;

[0006] FIG. 3 is a top profile view of an embodiment of a portion of the input device of FIG. 2;

[0007] FIG. 4 is a top cross-sectional exploded view of parts of a key in the input device, shown as a touchpad of FIG. 2;

[0008] FIG. 5A is a side cross-sectional view of the key in the touchpad with a user's finger above the key of FIG. 4;

[0009] FIG. 5B is a side cross-sectional view of the key in the touchpad of FIG. 4 with a user's finger touching the key and the touchpad;

[0010] FIG. 6 is a side cross-sectional view of another embodiment of the input device of FIG. 2 shown as a touchpad with a user's finger touching a key and the touchpad;

[0011] FIG. 7 is an exemplary sensing circuit provided for the input device of FIG. 2; and

[0012] FIG. 8 is an exemplary algorithm utilized to process signals generated by the sensing circuit of FIG. 7.

DETAILED DESCRIPTION OF AN EMBODIMENT

[0013] The description which follows and the embodiments described therein are provided by way of illustration of an example or examples of particular embodiments of the principles of the present disclosure. These examples are provided for the purposes of explanation and not limitation of those principles and of the disclosure. In the description which follows, like parts are marked throughout the specification and the drawings with the same respective reference numerals.

[0014] In a first aspect, a system for providing tactile feedback to a user of an electronic device is provided. The system comprises: an input device in the electronic device having a first input region for receiving a user action from the user; a surface associated with the input device and covering at least a part of the first input region; an input signal generator associated with the input device; and a physical feature associated with the input region. The physical feature is located on the surface, provides a second input region for receiving the user action and provides a tactile feedback sense to the user when the user contacts the second region. In the system, the input signal generator generates a first input signal when the user action comprises the user touching the first input region while not touching second input region. The input signal generator generates a second input signal when the user action is to touch simultaneously the first input region and the second input region.

[0015] In the system, the input signal generator may generate a third input signal when the user action is to touch the second input region and simultaneously not touch the first input region.

[0016] In the system, the input device may be a touchpad generating voltage signals for the input signal generator.

[0017] In the system, the user action may be a scan of a finger across the touchpad and over the nodule, where the user action generates the first, second and third input signals within a preset time range.

[0018] In the system, the first, second and third input signals may be evaluated for their location, time and order to determine whether they match a predetermined input action.

[0019] In the system, the physical feature may be a nodule located on the surface.

[0020] In the system, the surface may have a well around the first input region and the physical feature may be a nodule located in the well.

[0021] In the system, the second signal may be affected by an air gap existing between the first input region and the second input region when the user touches simultaneously the surface and the second input region.

[0022] In the system, the second signal may vary on a size of the air gap, an area of first input region contacted during the user action and an area of the second input region contacted by during the user action.

[0023] In the system, the second signal may be reduced in magnitude as the air gap increases in size.

[0024] In the system, the second signal may be increased in magnitude as the air gap increases in size.

[0025] In another aspect, a method of providing tactile feedback to a user of an electronic device having an input device is provided. The input device has a first input region for receiving a user action from the user, a surface associated with the input device that covers at least a part of the first input region. An input signal generator is associated with the input device. A physical feature is associated with the input region, located on the surface, which provides a second input region for receiving the user action and provides a tactile feedback to the user when the user contacts the second region. The method comprises: generating by the input signal generator a first input signal when the user action comprises the user touching the first input region while not touching the second input region; and generating by the input signal generator a second input signal when the user action comprises the user touching simultaneously the first input region and the second input region.