closed in copending application Ser. No. 09/487,737, incorporated herein by reference in its entirety, can be coupled to bending, inertial shaker, or linearly-moving EAP actuators as disclosed herein rather than, for example, piezoelectric actuators. Tactile computer keyboards and keypads (as disclosed in copending application Ser. No. 09/570,361, incorporated herein by reference in its entirety), direction pads on gamepads (as disclosed in copending application Ser. No. 09/467,309, incorporated herein by reference in its entirety), and other interface devices may be used with the EAP actuators according to the present invention.

While this invention has been described in terms of several preferred embodiments, it is contemplated that alterations, permutations and equivalents thereof will become apparent to those skilled in the art upon a reading of the specification and study of the drawings. For example, many different types of haptic sensations can be provided with the actuators of the present invention. Furthermore, certain terminology has been used for the purposes of descriptive clarity, and not to limit the present invention.

The invention claimed is:

1. A device comprising;

a housing having a touch surface adapted to be touched by a user;

a sensor coupled to the touch surface and configured to detect at least one of a position or movement of the user's touch on at least a portion of the touch surface, the sensor configured to output sensor signals associated with the position or movement; and

an electroactive polymer actuator coupled to the housing and configured to output a haptic feedback force upon receiving an control signal from a processor, the control signal being associated with the output sensor signals.

2. The device of claim **1**, wherein the touch surface is oriented along a plane, the electroactive polymer actuator outputting the haptic feedback force in a direction substantially perpendicular to the plane.

3. The device of claim **1** wherein the electroactive polymer physically moves in the direction substantially perpendicular to the plane upon receiving the control signal.

4. The device of claim **1**, wherein the electroactive polymer further comprises a plurality of electroactive polymer actuator pins, each pin physically moveable in the direction substantially perpendicular to the plane upon receiving the control signal.

5. The device of claim **4**, further comprising a flexible membrane coupled to an end of two adjacent electroactive polymer actuators in plurality, wherein movement of at least one of the actuators imparts force on the membrane.

6. The device of claim **1**, wherein the processor is of a computer system running a program displaying a graphical user interface, wherein at least a portion of the graphical user interface is configured to cause the processor to output the control signal upon the sensor output signals indicating the position or movement at a designated haptic location on the graphical user interface.

7. The device of claim **1**, wherein the touch surface is a touch screen configured to receive inputs from the user to a graphical user interface via the touch surface.

8. A method comprising;

selecting a housing having a touch surface adapted to be touched by a user;

sensing at least one of a position or movement of the user's touch on at least a portion of the touch surface using a sensor, the sensor configured to an output sensor signal associated with the position or movement to a processor; and

outputting a haptic feedback force using an electroactive polymer actuator upon receiving an control signal from a processor, wherein the control signal is associated with the output sensor signal.

9. The method of claim **8**, wherein the outputting further comprises outputting the haptic feedback force in a direction substantially perpendicular to a plane of the touch surface.

10. The method of claim **9**, wherein the electroactive polymer physically moves in the direction substantially perpendicular to the plane upon receiving the control signal.

11. The method of claim **8**, wherein the electroactive polymer further comprises a plurality of electroactive polymer actuator pins, each pin physically moveable in the direction substantially perpendicular to the plane upon receiving the control signal.

12. The method of claim **11**, further comprising a flexible membrane coupled to an end of two adjacent electroactive polymer actuators in plurality, wherein movement of at least one of the actuators imparts force on the membrane.

13. The method of claim **8**, further comprising running a program displaying a graphical user interface, wherein at least a portion of the graphical user interface is configured to cause the processor to output the control signal upon the sensor output signals indicating the position or movement at a designated haptic location on the graphical user interface.

14. The method of claim **8**, wherein the touch surface is a touch screen configured to receive inputs from the user to a graphical user interface via the touch surface.

15. Logic encoded in one or more tangible media for execution and when executed operable to perform a method, the method comprising:

receiving a sensor signal associated with a sensed position or movement of a user's touch on a touch surface having a sensor coupled thereto, wherein the sensor outputs the sensor signal; and

outputting a control signal to an electroactive polymer actuator upon the sensor signal indicating the sensed position or movement of the user's touch is at a designated haptic feedback force location, wherein the electroactive polymer actuator output a haptic feedback force to the touch surface upon receiving the control signal from a processor.

16. The method of claim **15**, wherein the control signal causes the electroactive polymer actuator to output the haptic feedback force in a direction substantially perpendicular to a plane of the touch surface.

17. The method of claim **16**, wherein the electroactive polymer physically moves in the direction substantially perpendicular to the plane upon receiving the control signal.

18. The method of claim **15**, wherein the electroactive polymer further comprises a plurality of electroactive polymer actuator pins, each pin physically moveable in the direction substantially perpendicular to the plane upon receiving the control signal.

19. The method of claim **18**, further comprising a flexible membrane coupled to an end of two adjacent electroactive polymer actuators in plurality, wherein movement of at least one of the actuators imparts force on the membrane.

20. The method of claim **15**, further comprising running a software program displaying a graphical user interface, wherein at least a portion of the graphical user interface is configured to cause the outputting of the control signal upon the sensor output signals indicating the position or movement at the designated haptic location on the graphical user interface.

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