

tions in the absence of real mechanical buttons, switches, or the actual physical objects being represented.

**[0026]** In another embodiment, multiple users may apply multi-touch contacts to touchscreen **11** and each user may need different haptic effects based on the specific application or interaction they are making at any given moment in time. Further, a single, multi-hand user may need different haptic effects for each hand based on the specific actions each hand is making at any given moment. For example, one hand may be using two fingers to grab or pinch a virtual object while the other hand is using two fingers to manipulate the virtual object or to zoom in/out or even scroll through a separate menu list. Both actions may be happening simultaneously on the same surface and benefit from different dynamic haptic effects being generated at each hand.

**[0027]** As disclosed, embodiments generate dynamic haptic effects in response to multi-touch interactions on a touchscreen. As a result, a user can more easily and more effectively make use of functionality of a touchscreen multi-touch device.

**[0028]** Several embodiments are specifically illustrated and/or described herein. However, it will be appreciated that modifications and variations are covered by the above teachings and within the purview of the appended claims without departing from the spirit and intended scope of the invention.

What is claimed is:

1. A method of generating haptic effects comprising: sensing at least two generally simultaneous touches on a touchscreen; and generating a dynamic haptic effect in response to the sensing.
2. The method of claim **1**, wherein the sensing comprises determining a location of the touches.
3. The method of claim **1**, wherein the sensing comprises determining a number of touches on the touchscreen.
4. The method of claim **1**, wherein the dynamic haptic effect is a vibration that comprises a variation of at least one parameter.
5. The method of claim **4**, wherein the at least one parameter is one or more of amplitude, frequency and duration.
6. The method of claim **4**, wherein the dynamic haptic effect is generated by at least one actuator.
7. The method of claim **4**, wherein the sensing comprises a first determination that a first finger and a second finger are being moved apart, and the dynamic haptic effect comprises increasing the parameter.
8. The method of claim **7**, wherein the sensing comprises a second determination that the first finger and a second finger are being moved together, and the dynamic haptic effect comprises decreasing the parameter.
9. The method of claim **4**, wherein the sensing comprises a determination that a first finger and a second finger are being rotated, and the dynamic haptic effect comprises generating a detent simulation from the variation.
10. The method of claim **4**, wherein the sensing comprises a determination that a first finger and a second finger created a boundary box and the box is being dragged, wherein the dynamic haptic effect comprises generating a dragging speed indication from the variation.

**11.** The method of claim **1**, wherein the dynamic haptic effect is generated substantially solely at points of contact of the touches.

**12.** A multi-touch device comprising:

a touchscreen;

a processor coupled to the touchscreen; and

a haptic feedback system coupled to the processor;

wherein the processor is adapted to sense at least two generally simultaneous touches on a touchscreen; and

the processor is adapted to generate through the haptic feedback system a dynamic haptic effect in response to the sensing.

**13.** The multi-touch device of claim **12**, wherein the haptic feedback system comprises at least one actuator.

**14.** The multi-touch device **12**, wherein the sensing comprises determining a location of the touches.

**15.** The multi-touch device **12**, wherein the sensing comprises determining a number of touches on the touchscreen.

**16.** The multi-touch device **12**, wherein the dynamic haptic effect is a vibration that comprises a variation of at least one parameter.

**17.** The multi-touch device **16**, wherein the at least one parameter is one or more of amplitude, frequency and duration.

**18.** The multi-touch device **16**, wherein the sensing comprises a first determination that a first finger and a second finger are being moved apart, and the dynamic haptic effect comprises increasing the parameter.

**19.** The multi-touch device **16**, wherein the sensing comprises a second determination that the first finger and a second finger are being moved together, and the dynamic haptic effect comprises decreasing the parameter.

**20.** The multi-touch device **16**, wherein the sensing comprises a determination that a first finger and a second finger are being rotated, and the dynamic haptic effect comprises generating a detent simulation from the variation.

**21.** The multi-touch device **16**, wherein the sensing comprises a determination that a first finger and a second finger created a boundary box and the box is being dragged, wherein the dynamic haptic effect comprises generating a dragging speed indication from the variation.

**22.** The multi-touch device **16**, wherein the dynamic haptic effect is generated substantially solely at points of contact of the touches on the touchscreen.

**23.** A computer readable medium having instructions stored thereon that, when executed by a processor, causes the processor to:

sense at least two generally simultaneous touches on a touchscreen; and

generate a dynamic haptic effect in response to the sensing.

**24.** A system for generating haptic effects comprising:

means for sensing at least two generally simultaneous touches on a touchscreen; and

means for generating a dynamic haptic effect in response to the sensing.

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