Digital Oscillator Method to Implement Non-Contact Sensors for Gesture Detection Displays
Tech ID: 24300 / UC Case 2012-170-0

SUMMARY
Researchers in the UCLA Department of Electrical Engineering have invented an oscillator and frequency counter method for highly-sensitive non-contact gesture detection based on the Theremin patent and updated by implementing modern digital electronics.

BACKGROUND
Gesture recognition is the process by which gestures made by the user are made known to the system, and non-contact gesture recognition can add a new dimension (the z-axis) for interfacing. Current non-contact sensors for gesture detection employ capacitive and charge-based mechanisms where the proximity of a finger, other body part, or the entire body can be measured by sensing electric fields. However, capacitive sensing hardware is vulnerable to external distortions (e.g.; other objects passing the sensor) and has limited range (as there is a rapid decrease of capacitance with increasing distance, especially at distances greater than 10cm). Furthermore, because capacitive sensors can only measure a capacitance, they cannot easily distinguish between different users. New non-contact sensing methods with higher sensitivity can open up the possibilities for 3D motion detection and a wider functionality for motion-based user interface design.

INNOVATION
Researchers in the UCLA Department of Electrical Engineering have invented a method of non-contact gesture detection based on the 1928 patent by Leon Theremin, but which uses one oscillator and a frequency counter that counts each oscillation period. Antennas that sense relative motion are connected to the oscillator, and motion causes the impedance of the antenna (and thus the oscillator’s frequency) to change. Digital circuits then determine the oscillator frequency deviation. In display modules, four or more of these antennas are placed at the four corners and other possible places of a screen, and the frequency deviations of the oscillator with different antennas are compared to estimate a finger’s position over the device surface. This oscillator-based method uses a “dicke” switch to cancel the oscillator frequency drift and provides reduced noise and higher gain (increased sensitivity) than capacitive technology.

APPLICATIONS
- Displays with motion detection
- Smart phones
- Televisions, to eliminate the need for remote controls
- Digital sign language detection/translation
- External motion-detecting units
- Immersive gaming platforms
- Gesture-based driving

ADVANTAGES
- Higher gain (increased detection sensitivity)
- Double sampling (reduced noise)

STATE OF DEVELOPMENT
This technology is in the conceptual stage with plans to construct a discrete version, and later an integrated version for smart phone displays.

PATENT STATUS

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