Development of a Cost Effective Swept-Frequency Capacitive Sensor as a Gesture Recognizing Touch Interface

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A capacitive sensing system was developed that operates on a swept frequency, unlike the static frequencies of conventional sensing methods. The initial prototype used an Arduino Uno as the main source of processing and waveform generation creating a system that passes high-frequency signals through an electrode and then creates an envelope of the return signal. This method allows a more dynamic input than simply pressed or otherwise. Water is one of the most effective sensing surfaces as it has a high capacitive profile and the change in return frequencies contrasts clearly against the initial signal. Because the system can create a sensing "probe" out of nearly any conductive surface, it means that it is very versatile, and has potential in fields ranging from medical to commercial products. The Arduino prototype was limited in processing speed so a new prototype is being developed that separates the signal generation from the return measurement. The final, compact and less expensive, prototype is based on the same processor but has a separate waveform generator chip. This approach also eliminates a large inductor and the Arduino board. The devices accurately detect touch input and proximity with response times of under a second. There is a clear change in response when a hand comes near the electrode, and increasing the surface area of the electrode increases the sensing distance threshold, with 3 inch by 3 inch electrodes being able to detect minute changes in hand distance anywhere from four inches to the surface of the electrode.

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