**MOTIVATION**

- Capacitive sensing technique enables high sensitivity measurement, low-power requirement and low-cost prototype components.
- Capacitive sensing technique promises a feasibility for a battery-free hand gesture recognition device.
- The system is provided to research and developer community as open source HW-SW design. Prototype is easy to replicate.
- Developers can adopt easily to integrate into their applications.

**OBJECTIVES & APPROACHS**

- Support large number of gesture
- Continuous and real-time tracking
- Unobtrusive
- User friendly
- Enable various application
- Low power

**CAPACITIVE SENSING**

- An open capacitor design allows the skin of the user to act as the second plate of each capacitor.
- Compression of the silicone wristband causes a change in distance from the user’s skin to the sensors and a change in capacitance.
- Capacitance is measured via a comparator-based relaxation oscillator.

**CHALLENGES**

- The highly sensitivity of capacitive sensors makes the sensor reading fluctuate over time and be susceptible to noise.
- The design sensors (i.e. number and arrangement of sensors, distance to users’ skin) must be aligned precisely.
- There is tradeoff between accuracy and power consumption (i.e. higher number of sensors will require more power consumption for ADC input).
- Continuous and real-time operation is necessary to determine users’ current gesture.

**CONTACT US**

Source Code – https://tinyurl.com/MNSWristband
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**SYSTEM OVERVIEW**

- External application
- Host processing
- Hardware board
- Wristband
- Translate gesture events
- Consume gesture events
- Gesture training & prediction
- Serial Communication
- Low-power sensing circuit
- Communication module (BLE)
- Flexible circuit
- Capacitive sensor

**CAPACITIVE SENSING (CONT.)**

- Silicone housing
- Flex substrate
- Sensor array
- Distance changes when hand moves

**SENSOR DESIGN**

- Sensor array
- Distance changes when hand moves

**SOFTWARE DESIGN**

- Hand Angular WebApp
- Spring MVC API
- Android
- iOS
- Javascript
- NodeJS
- Python
- PHP
- Bash
- C

**SYSTEM PERFORMANCE**

- Detection rate (%) vs. Number of gestures
- Actual class vs. Predicted class
- Confusion matrix for system performance using training data (left hand and right hand respectively)

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**DEMO: Low-power Capacitive Sensing Wristband for Hand Gesture Recognition**

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