**Project: Acoustic Signaling Based Touchscreen Design and Implementation**

**Sponsor:**

* Faculty Sponsor: Xudong Wang, UM-SJTU Joint Institute
* Faculty Mentor: Aimin Tang and Xudong Wang, UM-SJTU Joint Institute

**Background:**

With the omnipresence of demand for touchscreen input, interests in transforming electronic displays into touchscreens have grown. However, the cost of a touchscreen is much more expensive than an ordinary display. Thus, in many applications with a low-resolution requirement, e.g., instructional displays with support of simple clicks or sliding operations, it is sufficient to provide a low-cost solution to touchscreen. Moreover, for some legacy displays, it is highly desirable to develop a low-cost solution to enable them with a touchscreen-like function.

To this end, a few technologies like Infrared Touch and Surface Acoustic Wave Touch have been introduced. However, these approaches still suffer high cost of extra hardware. Moreover, the hardware usually occupies a large space so that it is not flexible for deployment.

In this project, we leverage acoustic signals that are generated by off-the-shelf microphones and speakers to upgrade a legacy display into a touchscreen. Since the speaker is very small and cheap, the acoustic signaling based touchscreen design can provide a low-cost and easy-deployment solution with small extra hardware.

**Purpose:**

This project aims to upgrade electronic displays into touchscreens by leveraging acoustic signals. More specifically, by analyzing the acoustic signals reflected by finger on the display with some algorithms in digital signal processing, the behaviors of click, slide, etc. can be recognized.

**Expected Deliverables**:

* + Hardware device that consist of low cost microphones and speakers.
  + Implement the corresponding algorithms to perform localization and tracking based on reflection of acoustic signals.
  + Transform recognized user behavior into touchscreen input.

**Team:**

Students with the following skills are encouraged to apply:

* + Basic understanding of digital signal processing.
  + Familiar with embedded system like FPGA.
  + Master C/C++/Matlab programming.

**Benefit to Students**

* + Get In-depth knowledge on smart sensing, digital communication, digital signal processing, embedded system development, etc.
  + Understand the mechanism of perception-based AI.

**Suggested team members:**

* 5 students (ME or ECE)
* Recommended students
  + 唐文达 Tang Wenda 515370910104 (leader)
  + 钱圣轶 Qian Shengyi 515370910143
  + 金林毅 Jin Linyi 515370910120
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