

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

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ABSTRACT

Along with the rapid development of human-computer interaction (HCI), controlling objects and smart devices remotely from afar has become the trend to satisfy the needs of consumers. Hand gesture recognition is among the methods that highly attract the attention in this field yet there still exists many aspect to explore and improve. We propose a low-cost low-power wristband-form hand gesture recognition system utilizing capacitive sensing technique. We provide an open source system which includes low-power, low-cost hardware components and user-friendly software stack. This system will be available for users and developers to customize various hand gesture set and integrate into third part application, from computer remote command to video game controller.

KEYWORDS

Capacitive sensing; Hand gesture recognition; DIY devices

1 INTRODUCTION

Human-computer-interaction has recently evolved rapidly since consumers have been introduced to alternative ways to interact with smart objects and devices other than direct physical contact such as touching controller, tapping or swiping on screen. Among these trends, hand gesture recognition has been researched and manufactured in vast range of wearable device productions such as wristbands, gloves, and rings, which utilized various technology methods (e.g. measuring human body signatures [3] or harnessing sensors such as camera [5], pressure sensors [2], gyroscope and accelerator [1]). However, multiple drawbacks still exist and keep hand-gesture-related products from being universally adopted (i.e. either high cost of product, or the hard-to-replicate or non-easy-access of already published research prototypes). We exploit *capacitive sensing*, a low-power but robust and highly accuracy

¹ Source code is available at <https://goo.gl/ebNzeA>

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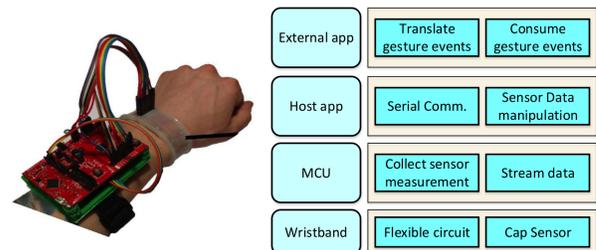


Figure 1: Wristband prototype and system overview

sensing technique; and provide an open source system¹ to tackle these challenges.

In this work, we demonstrate a hand gesture recognition system (shown in Fig. 1) consisting both customized hardware and software design [4]. The low-cost, low-power hardware includes (1) a silicone wristband made from 3D printed mold, (2) a flexible sensor circuit board with optimized number of sensors and sensor placement, and (3) a low-power MCU with BLE module. The software stack consists of a command line interface (CLI) application which maintains the communication between application client and wristband hardware; and a web interface which helps users to customize gesture set, train their hand gesture and export the recognized gestures into specific actions based on the demand of application.

2 DEMONSTRATION SETUP

We will demonstrate our system using our complete set of wristband hardware and web interface software. Users will be instructed to use the wristband and software UI to train the system with their own hand gesture set. After training process, they can validate the hand gesture prediction result. Finally, users will be instructed to record their basic hand gesture set of *up*, *down*, *left*, *right* and use that to control different applications on a Linux PC (e.g. controlling presentation and playing Tetris).

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