Demo: *SMART*: Screen-based Gesture Recognition on Commodity Mobile Devices

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ABSTRACT

In-air gesture control extends a touch screen and enables contactless interaction, thus has become a popular research direction in the past few years. Prior work has implemented this functionality based on cameras, acoustic signals, and Wi-Fi via existing hardware on commercial devices. However, these methods have low user acceptance. Solutions based on cameras and acoustic signals raise privacy concerns, while WiFi-based solutions are vulnerable to background noise. As a result, these methods are not commercialized and recent flagship smartphones have implemented in-air gesture recognition by adding extra hardware on-board, such as mmWave radar and depth camera. The question is, can we support in-air gesture control on legacy devices without any hardware modifications?

In this demo, we design and implement *SMART*, an in-air gesture recognition system leveraging the screen and ambient light sensor (ALS), which are ordinary modalities on mobile devices. We implement *SMART* on a tablet. Results show that *SMART* can recognize 9 types of frequently used in-air gestures with an average accuracy of 96.1%.

CCS CONCEPTS

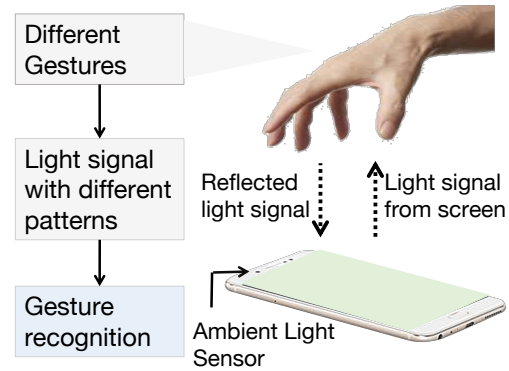• **Human-centered computing → Human computer interaction (HCI)**; **Gestural input**.

Figure 1: "Screen-Hand-ALS" light path. Light from screen is reflected by the hovering hand, and the ALS can sense the intensity of the reflected light. We analyze the received light signal and recognize different gesture.

KEYWORDS

Gesture recognition; visible light sensing; device-free;non-intrusive visible communication

1 INTRODUCTION

Gesture control is a natural and user-friendly way to interact with devices. It extends the traditional keyboard/touch screen and provides users with great freedom. In home scenarios, smart TV can be directly controlled with gestures, instead of using a remote controller; when driving, the driver can adjust the volume of music using simple gestures, which is less distracting than using touch screens or buttons. Besides, gesture control prevents our hands from physically touching any devices which may carry harmful viruses. This is of vital importance for devices in public areas.