AccessWear: Making Smartphone Applications Accessible to Blind Users

Prerna Khanna, Shirin Feiz, Jian Xu, IV Ramakrishnan, Shubham Jain, Xiaojun Bi, Aruna Balasubramanian
Stony Brook University

Stony Brook University
Computer Science

INTRODUCTION

- Blind users typically interact with their phones using a **screen readers**.

- Touch screen interaction with smartphones even using a screen reader is challenging for blind users.

- We present **AccessWear**, a system that significantly improves accessibility for **blind users**.

- AccessWear is to allow users to **flexibly** and **universally** use **alternate gestures** to replace touch gestures.

CHALLENGES

Existing gesture recognition systems are not suited for blind users:
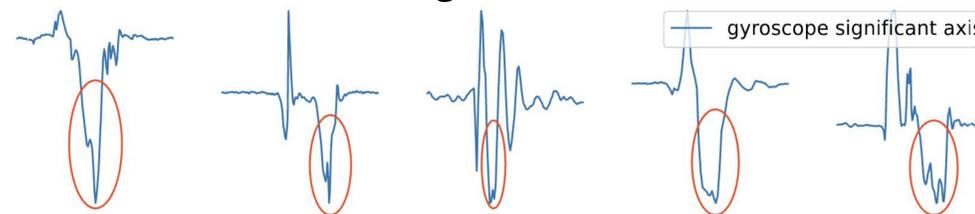
- Large training data, personalized learning, or high-end computation.

- Exploratory study with 9 blind users shows they perform gestures differently compared to sighted users.
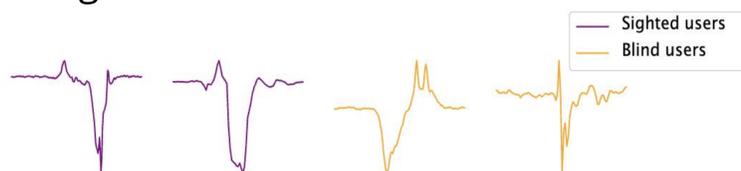
*Flick gesture performed by 2 sighted users and 2 blind users*

OUR SOLUTION

- AccessWear identifies small micro-movements (**nucleus**) that is consistent across users for a gesture.

Similar micro-movement trend from the sensor data for blind users across a gesture.

- Isolate nucleus and detect nucleus buried inside the gesture using **lightweight** algorithms in **real-time.**

- Low-cost gesture recognition system works **without** the need for **personalization** or large amounts of **training data**.

- **Input virtualization** technique for replacing a smartwatch gesture with a touch gesture can be performed with **near-zero-effort:**

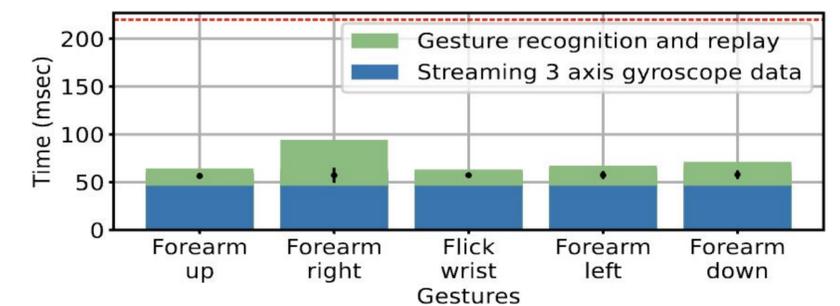 - A **metaprogram** specifying which gesture replaces which touchscreen gesture.
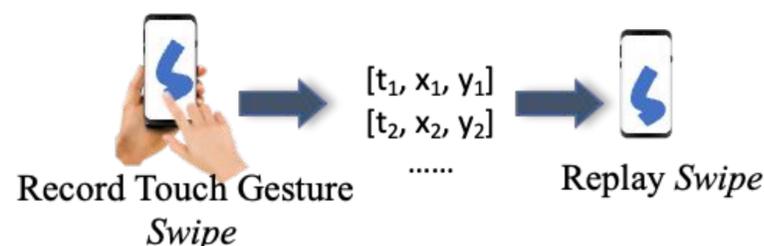
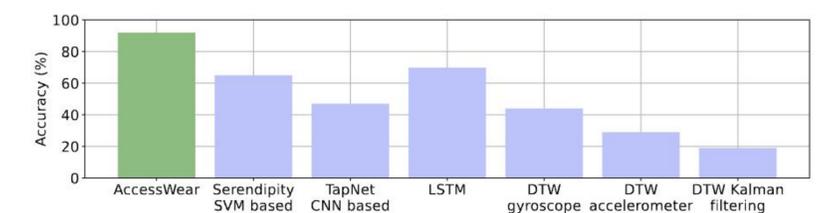 - **Record-and-replay** for recreating virtual touch gesture.

Some gestures supported by AccessWear

Results

The end-to-end latency on an average is 57ms, less than the reaction time for humans.

The accuracy of gesture recognition is 92% across all gestures and all blind users (34.39% higher than alternate gesture recognition techniques).