AccessWear: Making Smartphone Applications Accessible to Blind Users

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INTRODUCTION

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

OUR SOLUTION

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

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.

Results

The end-to-end latency on 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).