BoldMove: Enabling IoT Device Control on Ubiquitous Touch Interfaces by Semantic Mapping and Sequential Selection

Tengxiang Zhang[1], Xin Zeng[1], Yinshuai Zhang[2], Xin Jiang[3], Xuhai Xu[4], Anind K Dey[4], Yiqiang Chen[1]

[1]Institute of Computing Technology, Chinese Academy of Sciences, UCAS

[2]Dingdao Intelligent Technology, [3]Lenovo Research, [4]Information School University of Washington, Seattle

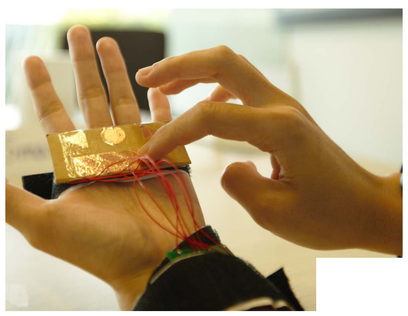
Contact us: {zhangtengxiang, zengxin18z}@ict.ac.cn

Introduction

- We propose BoldMove, the **semantic-based** IoT function filtering to improve control efficiency with **the sequential selection mechanism** for interfaces **with constrained input and output resources**.
- We implement BoldMove on a custom-built touch interface with capacitive button inputs and a smartwatch display.
- We then conduct two user studies to

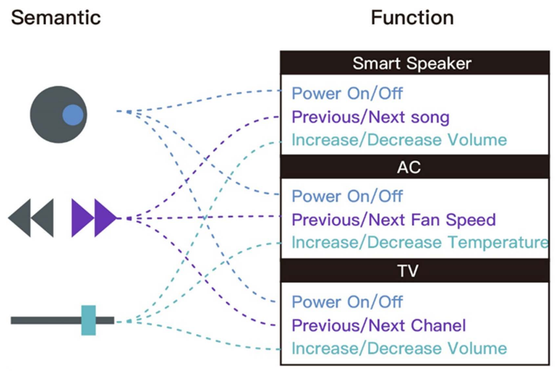
1) determine the design parameters for the sequential selection method,

2) evaluate BoldMove performance, and compare it with device-based menu-navigated baseline.



Approach

- We first filter IoT functions **by mapping the semantics** of both the function and the touch widget. Only functions matching the inputs' semantic are displayed for further selection.

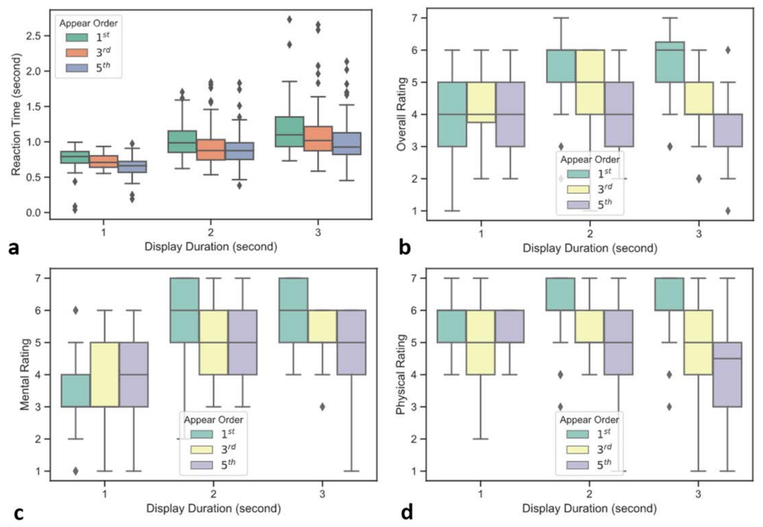


- We define **three semantics** in BoldMove:

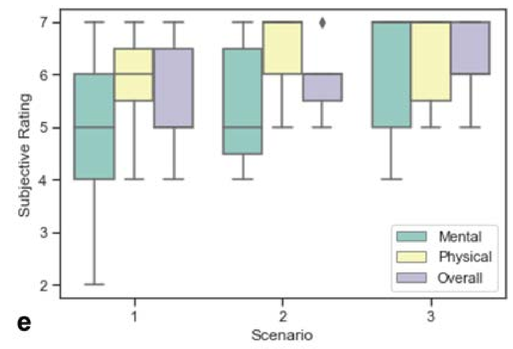
Semantic	State	Example
Toggle	two binary states	power on/off
Switch	several discreet states	AC modes
Adjust	continuous states	lamp brightness

- We adopt **a wait-confirm sequential selection mechanism** to select from the matching functions. The user holds the press to **wait** until the target function appears on the smartwatch screen, then **confirms** selection by lifting or sliding the finger.

Results



- User Study 1 show the overall rating is positive when the target function to appear within **the Top 3 items** with a display duration of **2 seconds**



- User Study 2 show that BoldMove average selection time **3.25 seconds** < device-based menu-navigated baseline **10.22 seconds** on our prototype interface. The latter is substantially inefficient due to long click lags.

Implementation

- **Capacitive touch input**:
  - Bluetooth transceiver module
  - copper-made touchpads
- **Smart watch display**