



# 智能手表的非接触备择交互模式的设计

*Designing Alternative Contact-free Modalities for Smart Watches*

姓 名 欧长坤

计算机科学与技术学院 计算机科学与技术 1202

指导老师 陈雅茜

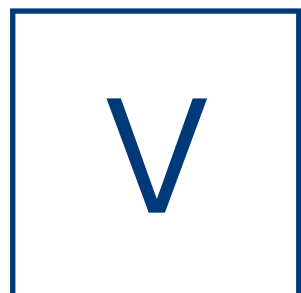
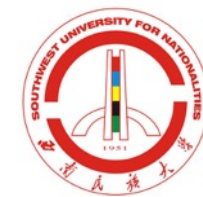
联合导师 Andreas Butz (University of Munich)

答辩时间 2016年5月17日

项目地址  <https://github.com/changkun/BachelorThesis/>  
 <https://changkun.us/bachelorthesis/>



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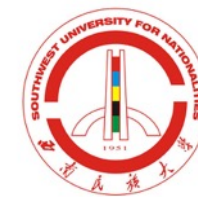


# 视频演示

Video Demo



*Demo*



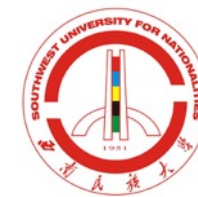
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## 选题意义

Intentions

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# 1

## 备择交互设计

Alternative Interaction Design

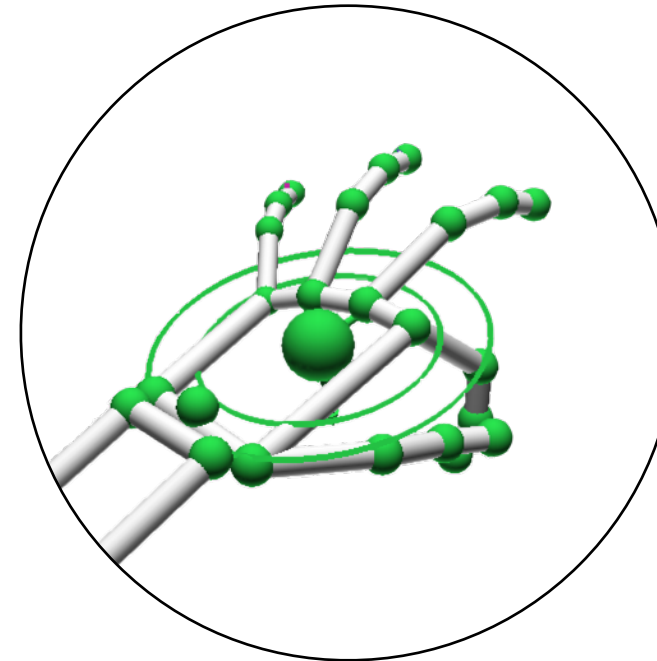
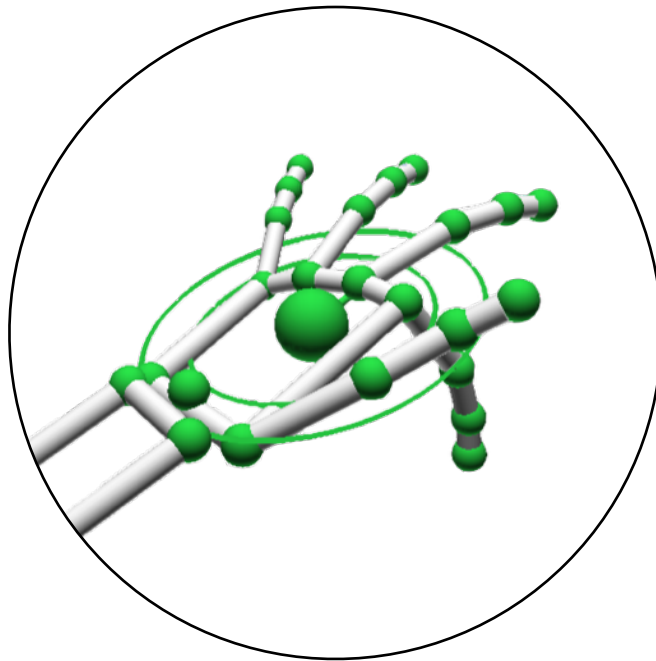
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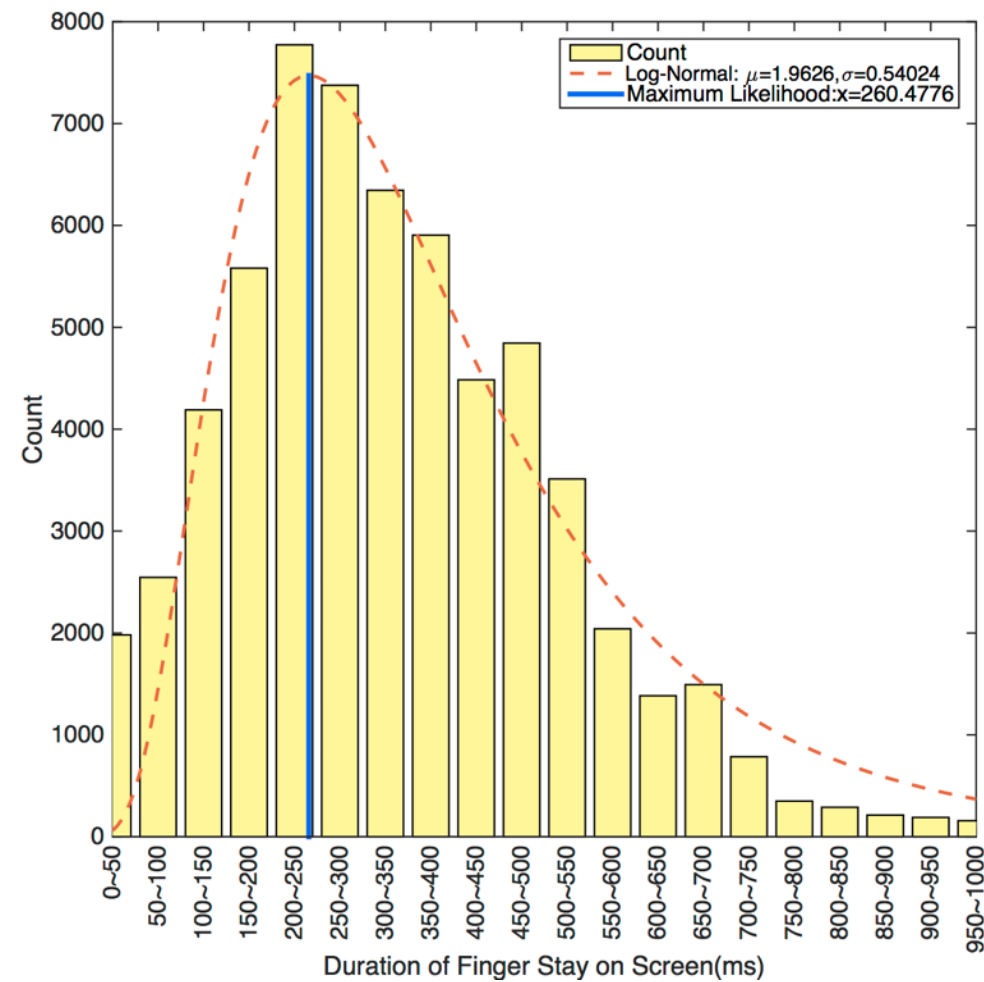
$$T = a + b \log_2 \left( \frac{A}{\sqrt{2\pi e(\sigma^2 - \sigma_a^2)}} + 1 \right)$$

Finger Fitts Law<sup>[1]</sup>

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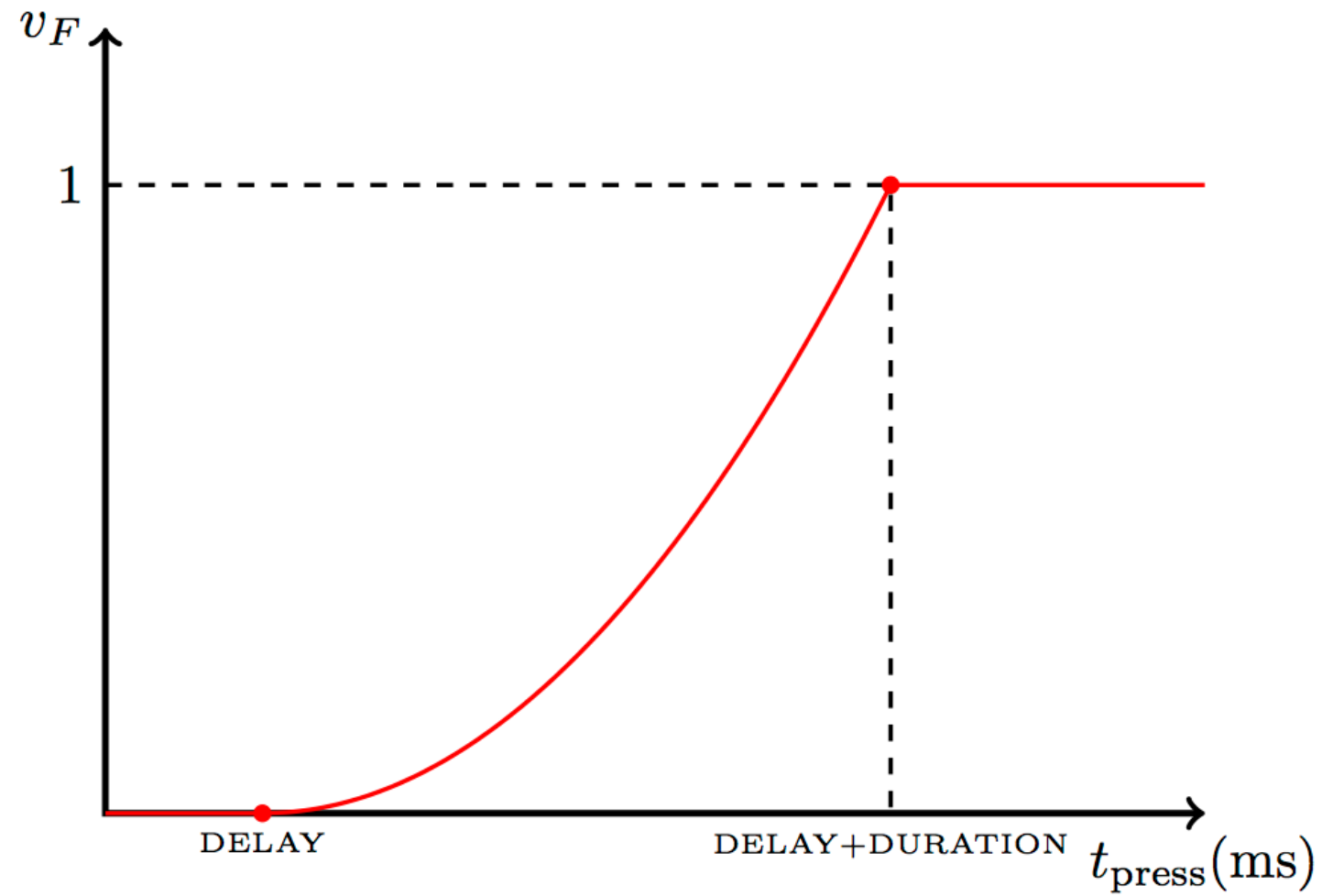


Two Fingers Swipe Gesture



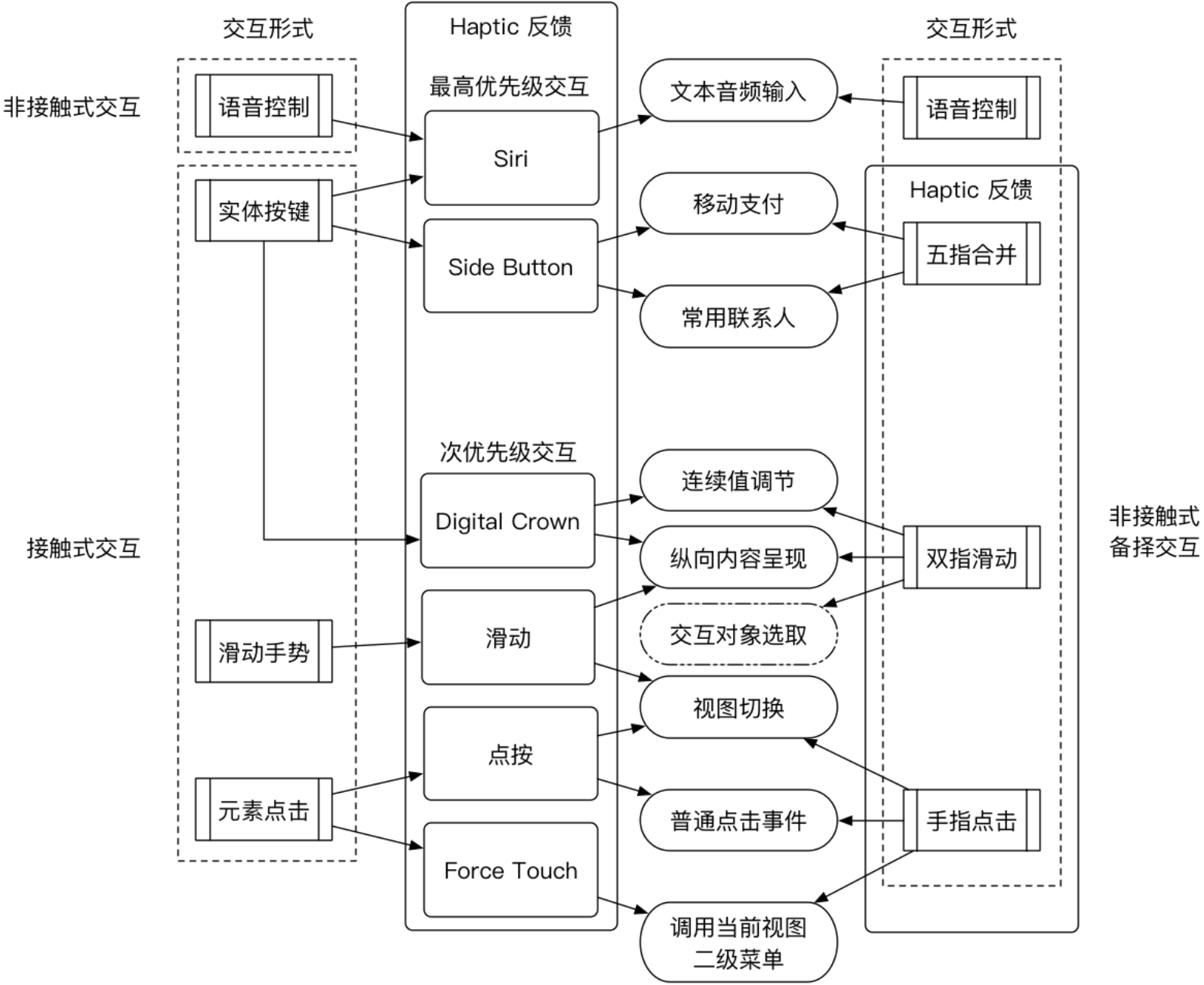
AugmentedTouch 项目[2] 实施的用户调研记录了 61440 次手指点击屏幕时的停留时间, 停留时间的统计分布服从对数正态分布



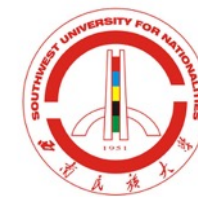


$$v_F = \begin{cases} 0 & \text{if } t_{\text{press}} < \text{DELAY} \\ \left( \frac{t_{\text{press}} - \text{DELAY}}{\text{DURATION}} \right)^2 & \text{if } 0 < t_{\text{press}} - \text{DELAY} < \text{DURATION} \\ 1 & \text{Otherwise} \end{cases}$$

Force Touch Simulation and Its Formula



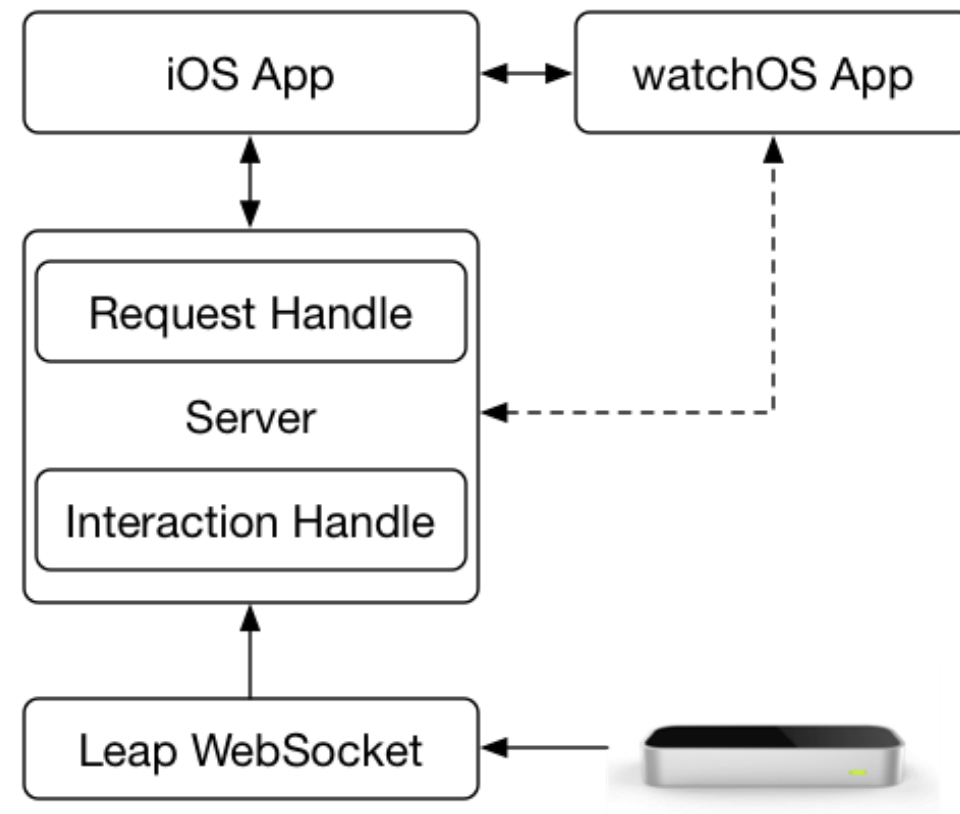
Original Design v.s. Alternative Design



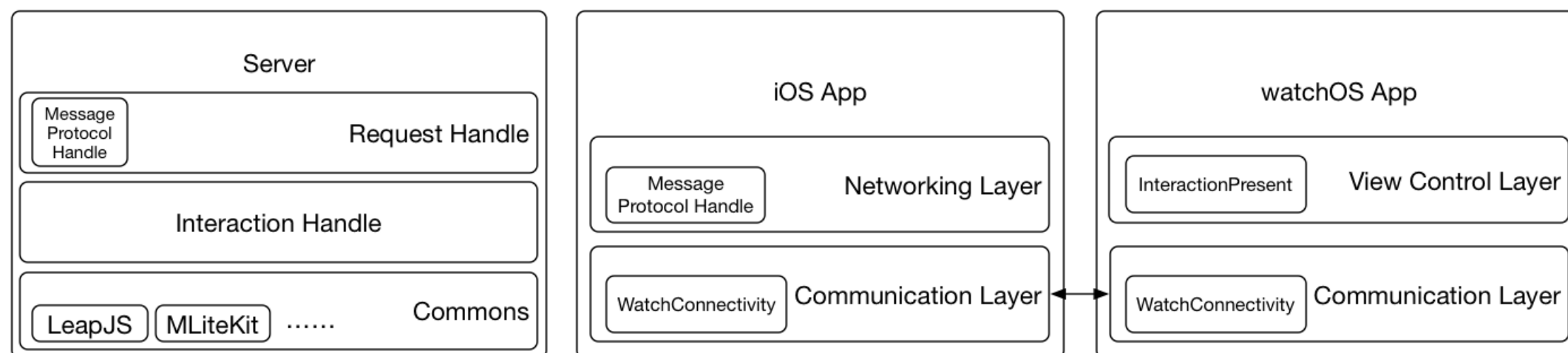
# 2

## 核心实现

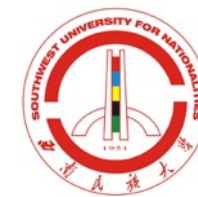
Implementation



Communication Logic



Server Side, Phone Side and Watch Side

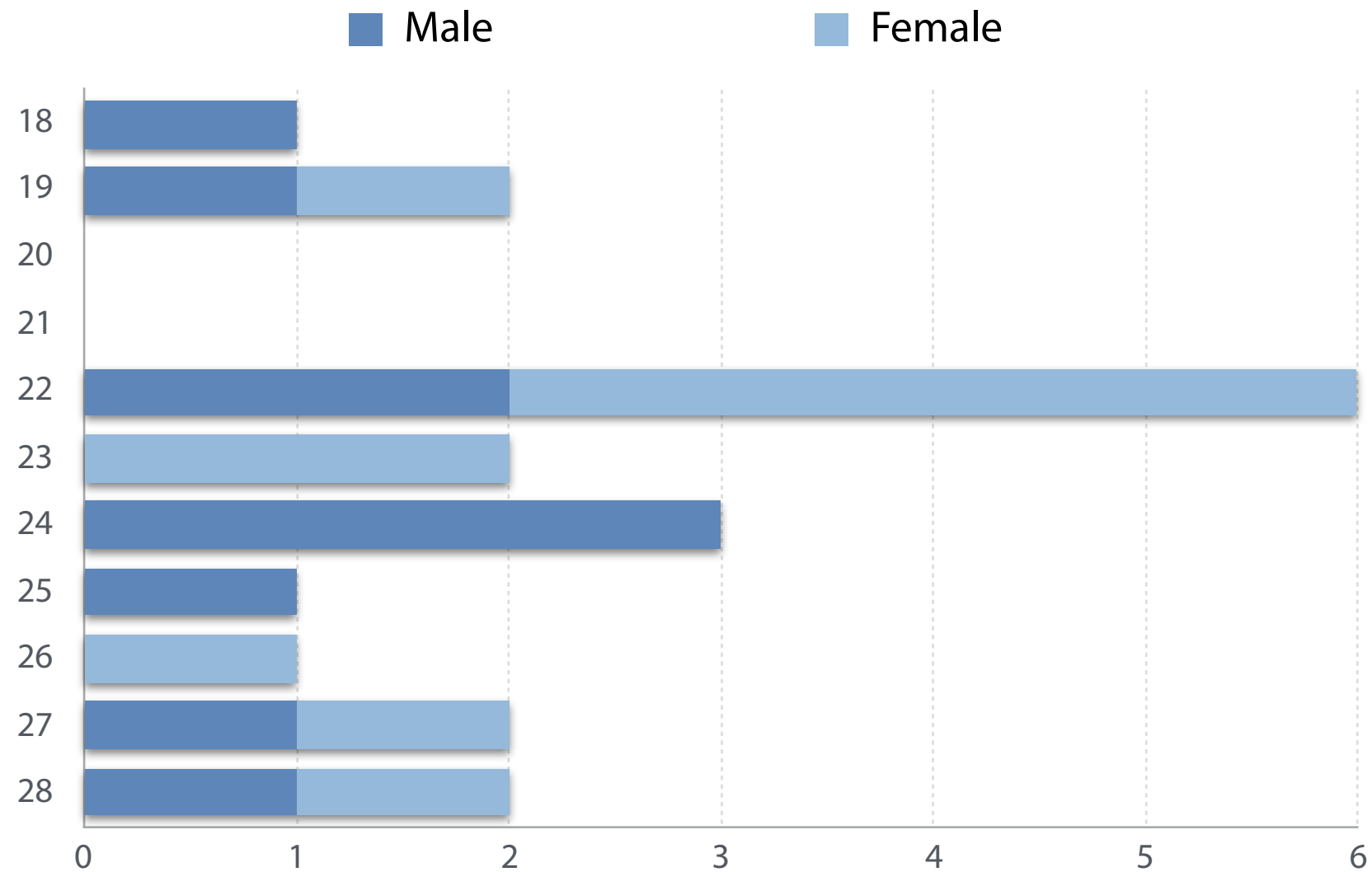


# 3

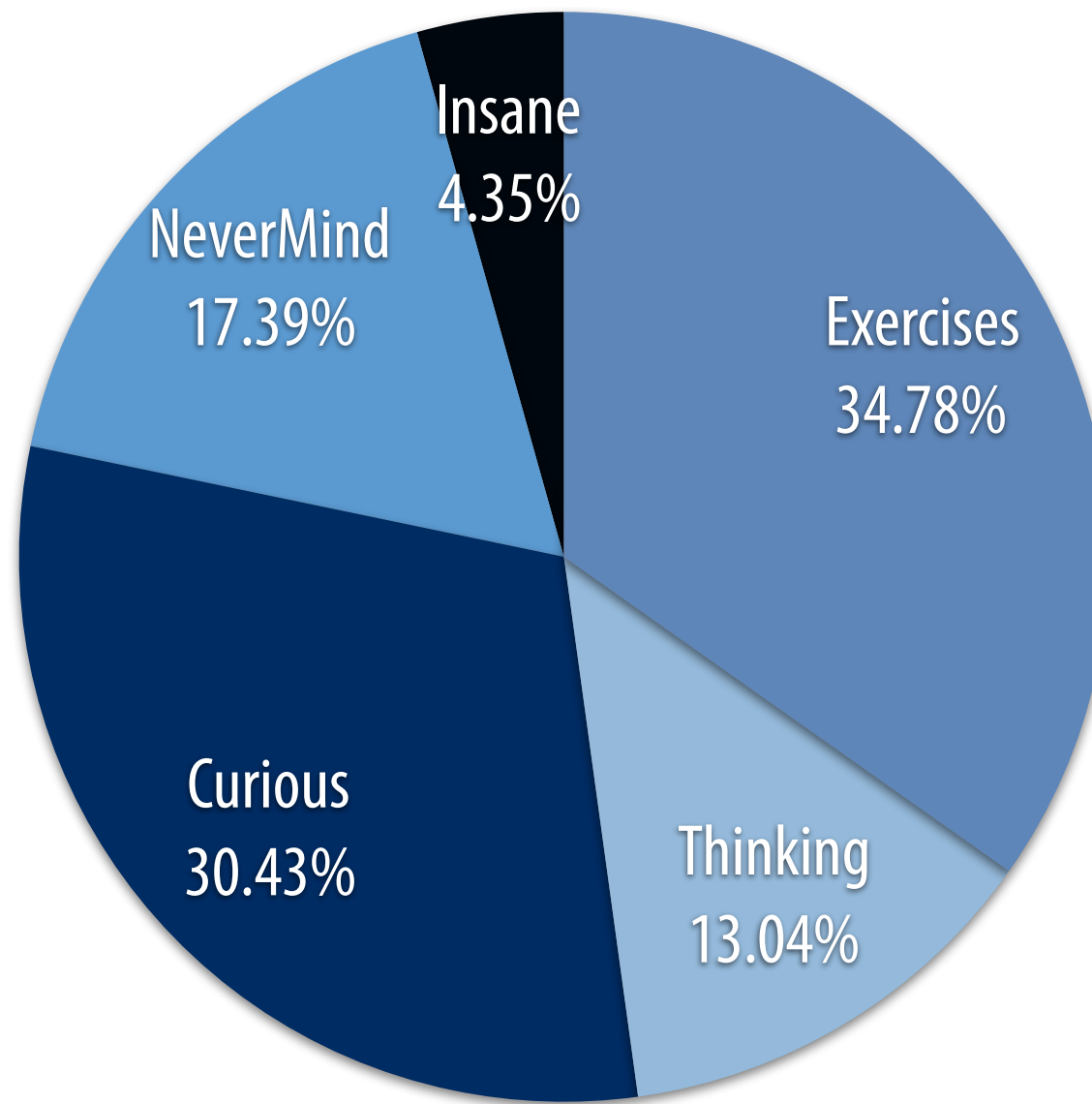
## 用户调研

User Study

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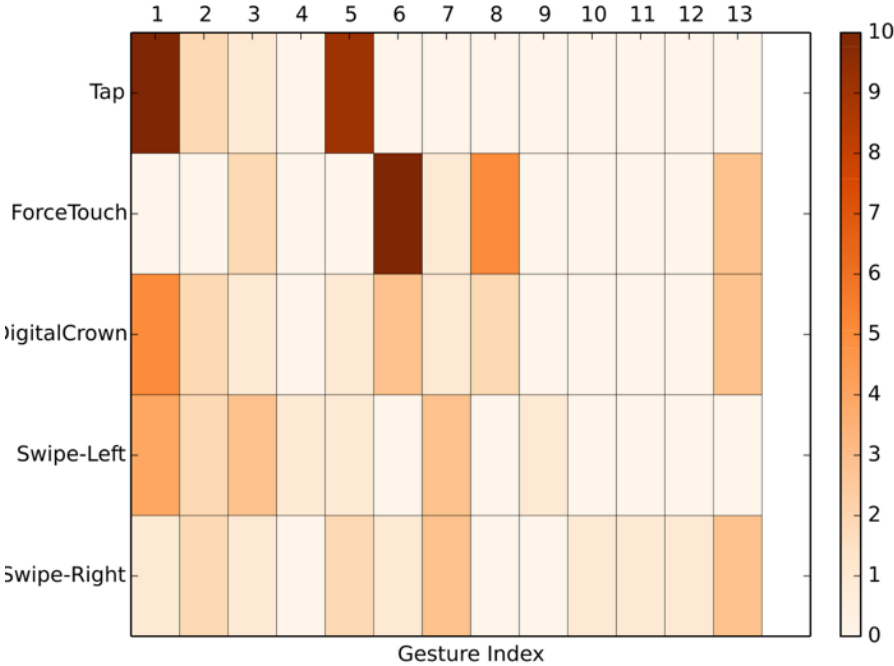
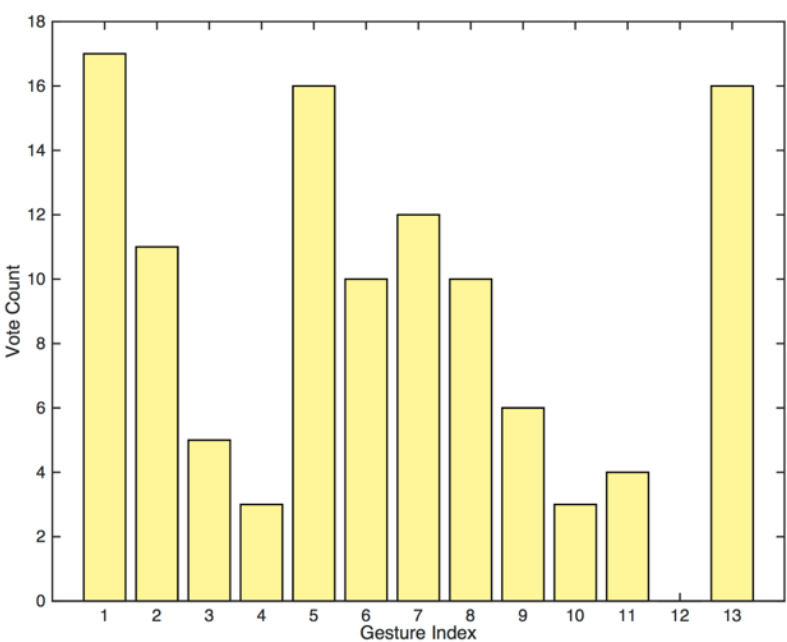
如何看待公共场所陌生人抬起手腕执行手指尖捏合、滑动的手势？





Index	Gesture
1	拇指食指滑动
2	拇指中指滑动
3	拇指无名指滑动
4	拇指小指滑动
5	拇指食指捏合
6	拇指食指长时间捏合
7	拇指中指捏合
8	拇指中指长时间捏合
9	拇指无名指捏合
10	拇指无名指长时间捏合
11	拇指小指捏合
12	拇指小指长时间捏合
13	五指握拳

Gesture Vote Count



HeatMap of Instinct

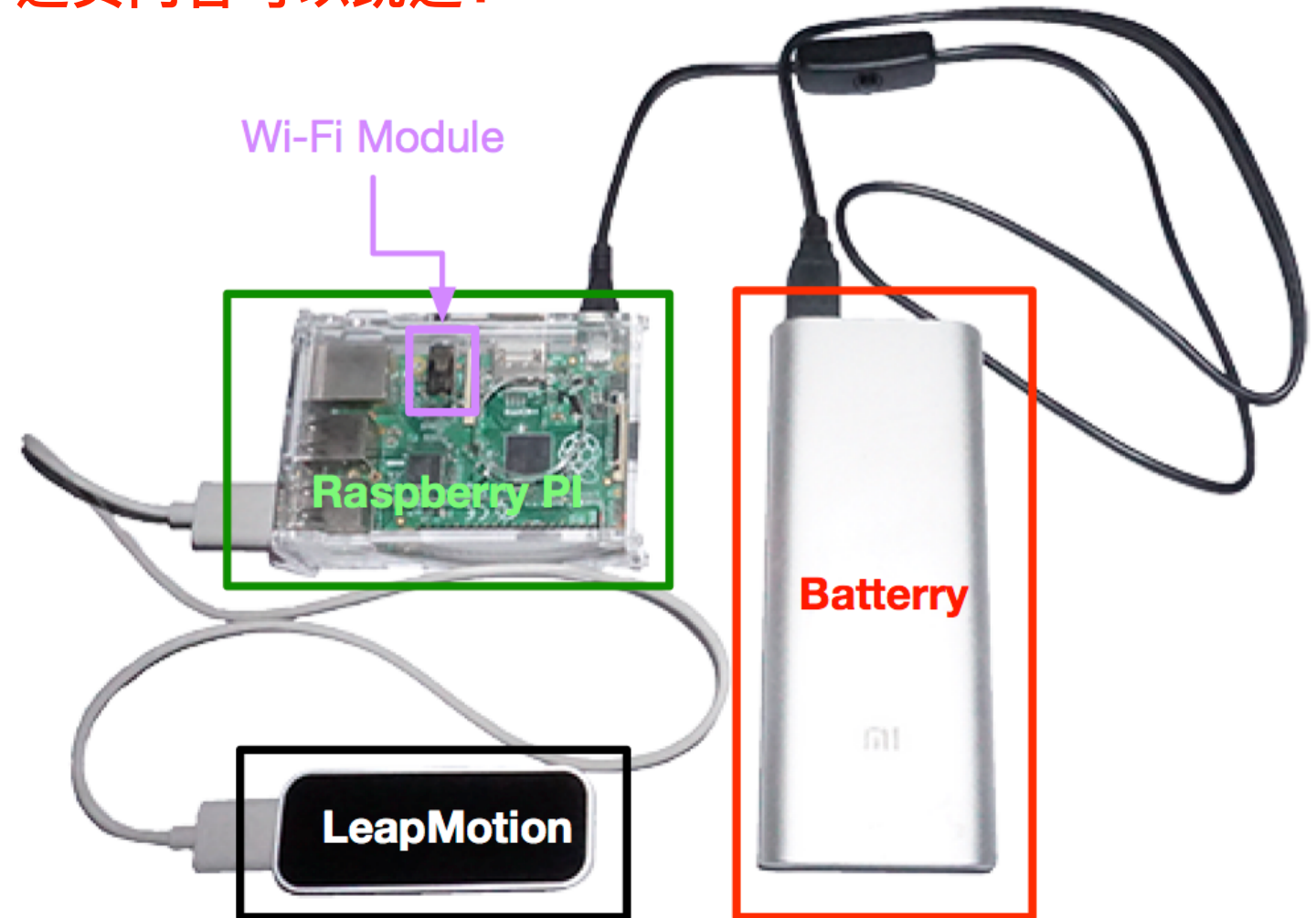


# 4

## 进一步工作

Future Works

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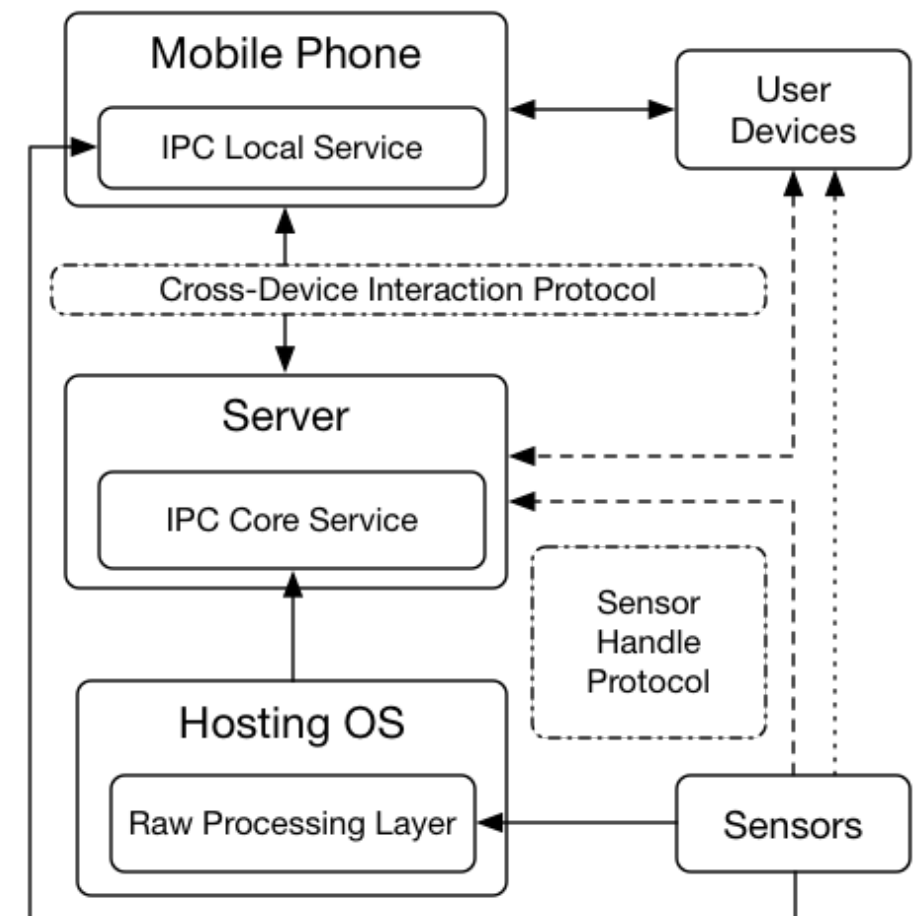
Variable	Description
K	Tap
F	Force Touch
S	Digital Crown
T	Selection
R	System Response
M	User Thinking
H	High Priority Operate

Keystroke-Level Model on Smart Watches

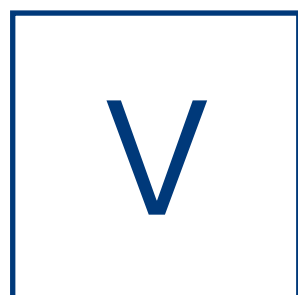
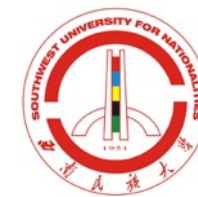
$$\Sigma_{K,F,S,T,R,M,H} \text{Contact Task} < \Sigma_{K,F,S,T,R,M,H} \text{Contact-free Task}$$

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- IPC Core Service
- IPC Local Service
- Sensor Handle Protocol, SH Protocol
- Cross-Device Interaction Protocol, CDI Protocol



Universal Communication Logic



# 现场演示

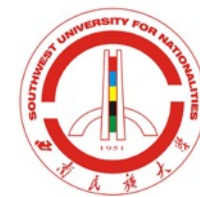
Live Demo



Free as in Freedom



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# *Thanks and Never Ends.*

*Here's to the crazy ones.*

*The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently.*

*They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them.*

*About the only thing you can't do is ignore them. Because they change things.*

*They push the human race forward. And while some may see them as the crazy ones, we see genius.*

*Because the people who are crazy enough to think they can change the world, are the ones who do.*



**Free as in Freedom**



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