Natural UIs for Activity-based UbiComp

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Microsoft Research Faculty Summit
Shanghai, China
October 19, 2010

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Being Green...

Exercising More…


Aging in Place...

Learning a Language...

Mobile Phone = UbiComp

Activity-based UbiComp

Can Help Improve our Lives

Long-lived activities in our everyday lives

- e.g., staying healthy, graceful aging, learning a language
- high-level, physical, dynamic, & high value

Key elements: social, always at hand, natural UIs,

ubifit

Consolvo, McDonald, Landay …

Activity

Activity-based Application

Problem

- overweight/obesity a global epidemic
- have hard time fitting exercise into lives

Solution: Ambient feedback of activity

- uses both self-journaling & inference

Evaluation

- 3 month study with 28 participants
  - 19 participants w/ garden maintained activity & **saw no decrease over holidays**

dub
University of Washington

CHI 2008, Ubicomp 2008, CHI 2009

Activity-based UbiComp

Key Challenges & New Ideas

Must study in situ over extended periods

Use ***new methods & tools*** to improve data collection, analysis & application prototyping

Physical actions are tedious to record & manage

Build applications using ***action inference***

Natural interactions are ambiguous

Improve ***disambiguation*** using dynamic context

Robust Action Inference:
Human Actions from Motion

Choudhury, Lester, Borriello, Landay, Fogarty, Saponas…

Activity

Intel MSP

collect raw sensor readings → **calculate features** → **produce margins**

mean, median, range, etc.

measure of confidence for particular activities

smooth margins into meaningful actions

Send margins to phone via bluetooth

> 95% accuracy on smartphones (Android, iPhone, Windows) for walking, running, biking, standing

IEEE Pervasive Computing, 7(2), 2008

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Disambiguating Speech Using Physical Context

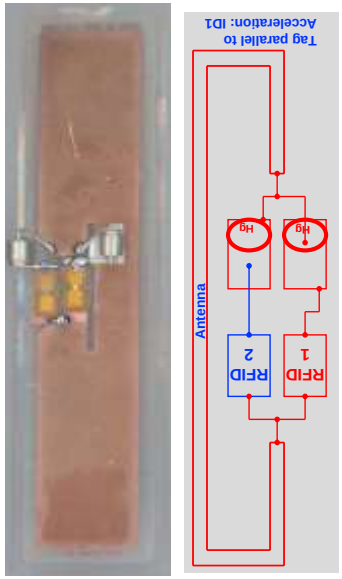
Everitt, Harada, Bilmes, Landay

Natural

α-WISP RFID tags detect objects in use

Activate different grammars based on state of objs

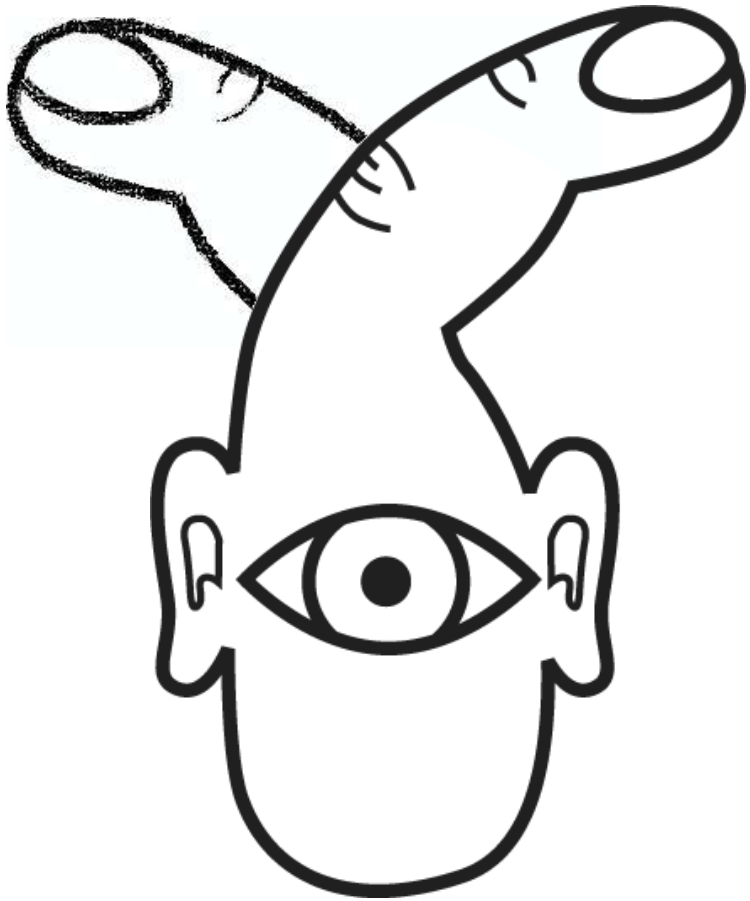
Example domain: Smart Gym



Log 5 curls

Mobile Computing Enables…

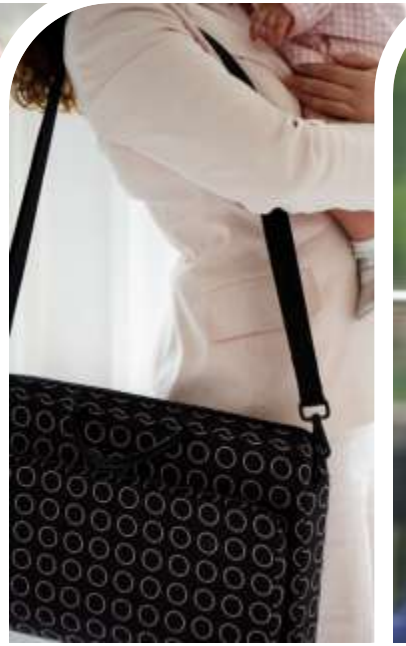
“How the computer sees us”



Igoe & O'Sullivan

Buttons & Touchscreens Insufficient





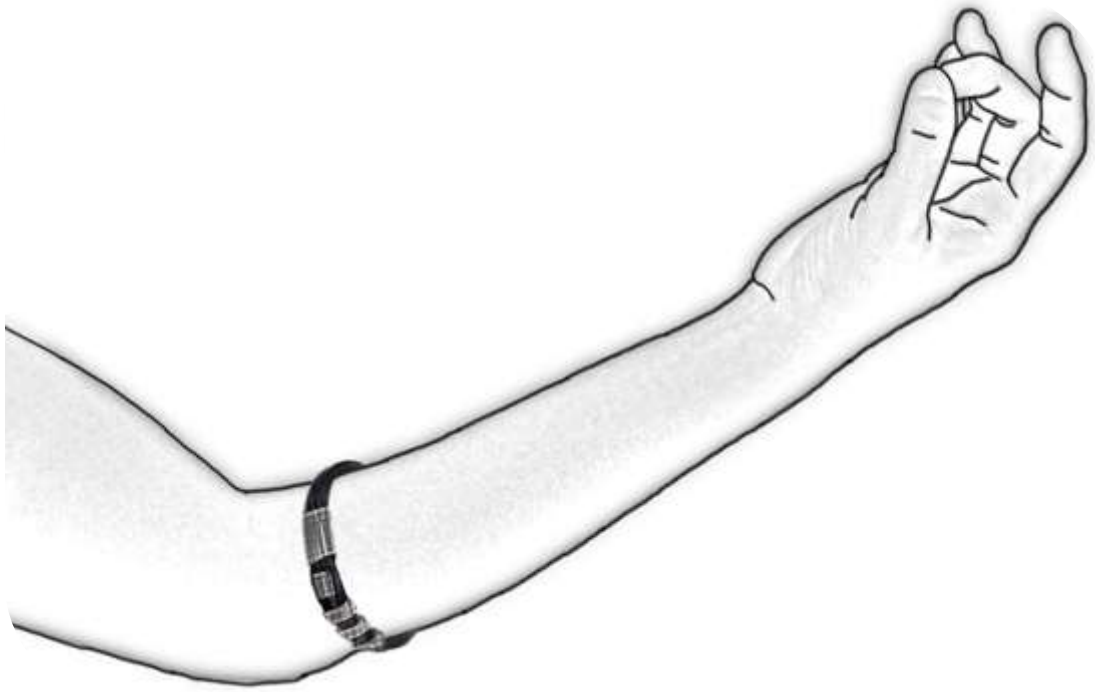

Hands Busy

Physically Active

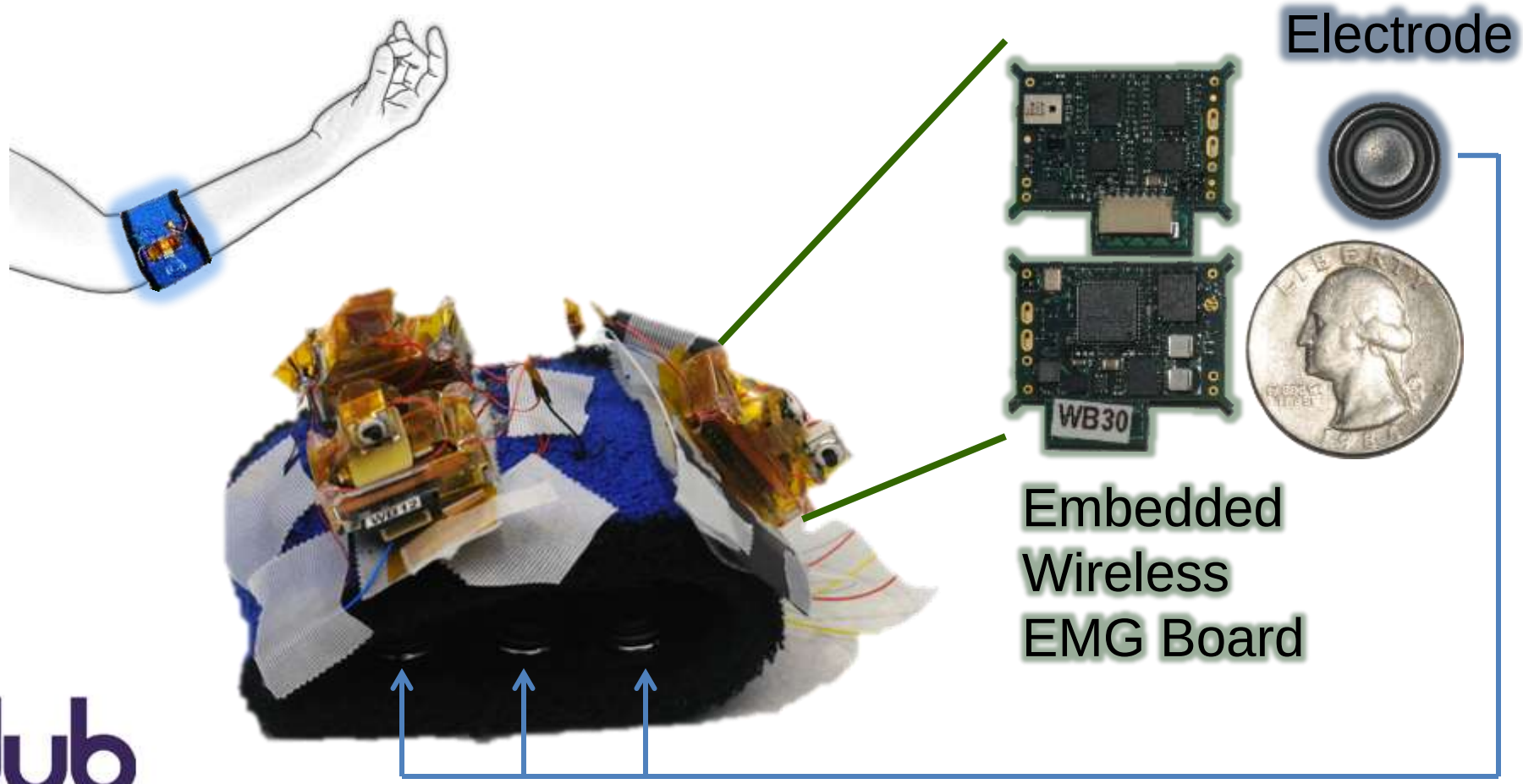
Muscle-Computer UIs

Finger Level Gestures Using EMG

Saponas, et al



Wireless EMG Armband v1.0



Real-Time Classification of Free Space & Hands Busy Gestures

Saponas, et al

Natural

Pinch

Mug

Bag

Participants achieved 85-90% accuracy

Wireless Air Guitar Hero

Continuous Language Learning

Edge, et al

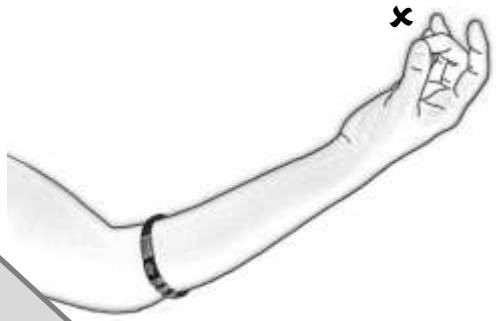
Natural

。。。我会说一点儿英语

text-to-speech:
How do you say:
“I speak a little Chinese”?

“I speak a little Chinese”

respond with finger gestures



text-to-speech:
我会说一点儿中文!

Muscle-Computer UIs

Finger Level Gestures Using EMG

Saponas, et al

Natural

Use the appropriate recognizer based on the activity context

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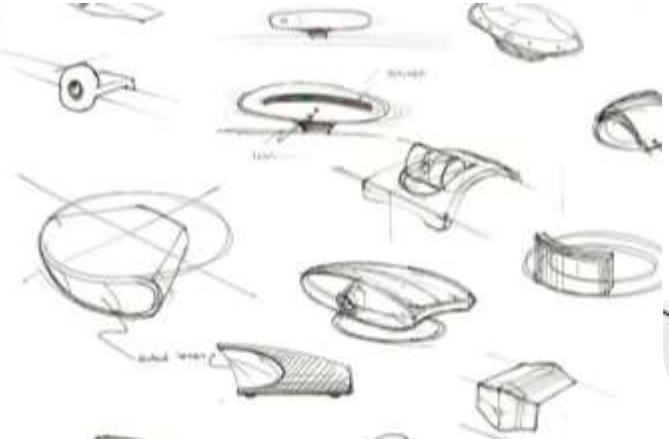
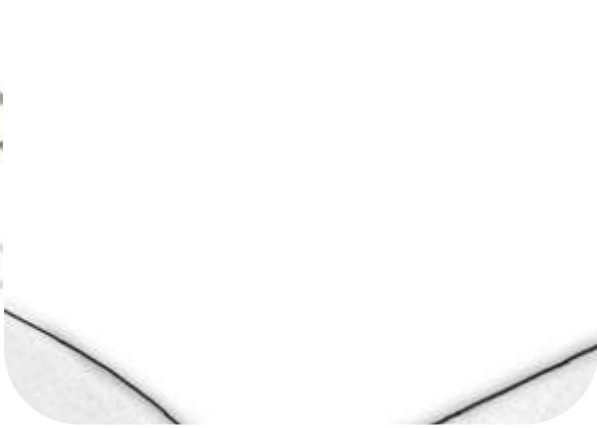
Summary

Solve high value problems, improving our lives by using

- tools: for visualization, design, & user studies
- inference: actions & high level activities
- natural UIs: improve recognition using context





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