UCI University of California, Irvine

Informatics 134

Software User Interfaces
Spring 2021

Mark S. Baldwin
baldwinm@ics.uci.edu

5/25/2021

Agenda

1. Upcoming

2. User Interfaces For Tomorrow’s Devices

3. References

Upcoming

Upcoming

- This week: Looking to the future
- Keep working on A4 (DUE 6/8 6/10 (changed today))
- Keep working on T3 (DUE 6/3, Final Presentations Start 6/01)

User Interfaces For Tomorrow's Devices

User Interfaces For Tomorrow’s Devices

Wearables

Augmented Reality

Virtual Reality

User Interfaces For Tomorrow's Devices

Augmented Reality

Virtual Reality

Wearables

What is a Wearable?

User Interfaces For Tomorrow’s Devices

Augmented Reality

Virtual Reality

Wearables

What is a Wearable?

- Smartwatch/Activity tracker
- Smart glasses
- Smart clothing and jewelry
- Tattoos/patches/ingestibles
- Medical devices


Eyewear to assist sleep/ wakefulness
Skin patches
Smart watches
Smart garments
Inertial measure unit
Biomechanical shoe insoles
Headbands
Mobile and Tablet applications
Heart rate
Blood oxygen levels
Breathing rate
Muscle electrical activity
Stress/emotion
Cognitive function
Movement patterns
Sweat analysis
Sleep

source

Wearables

What to do with all the data?

- How do we access?
- How do we control?

User Interfaces For Tomorrow's Devices

Wearables

What to do without a desktop or mobile display?

- **How do we access?**
- How do we control?

Access

Advantages? Limitations?

- On-device display
- Haptic feedback
- Speech synthesis
- On-body display

source[Xiao et al., 2018]

User Interfaces For Tomorrow’s Devices

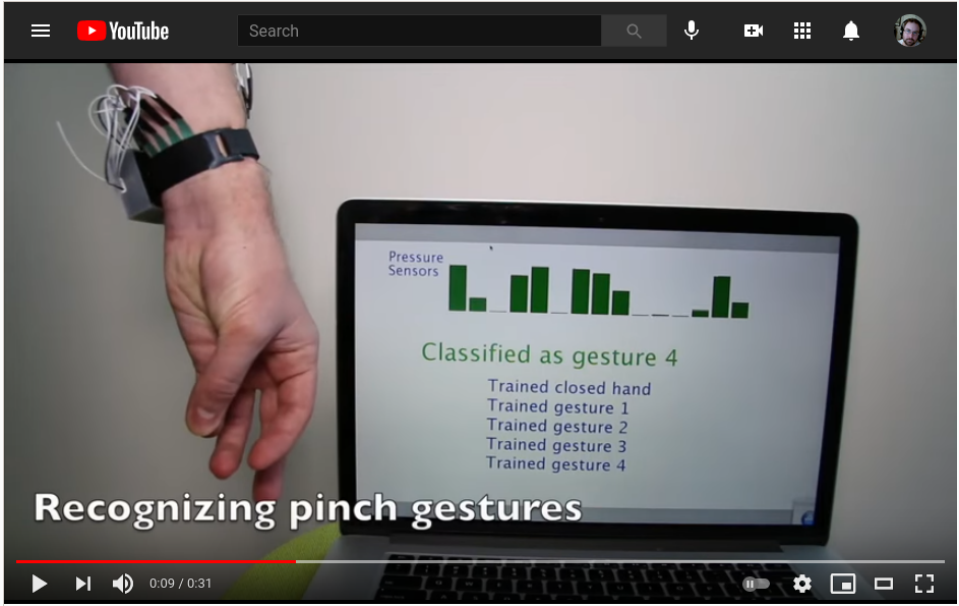
Wearables

What to do without a desktop or mobile display?

- How do we access?
- **How do we control?**

Control

- On-device interactions (tap, swipe, physical buttons)
- Voice
- Gestures
- ...



source[Dementyev and Paradiso, 2014]

User Interfaces For Tomorrow’s Devices

Wearables

What to do without a desktop or mobile display?

- How do we access?
- **How do we control?**

Control

- On-device interactions (tap, swipe, physical buttons)
- Voice
- Gestures
- Passive activity

User Interfaces For Tomorrow's Devices

Wearables

What to do without a desktop or mobile display?

- How do we access?
- **How do we control?**

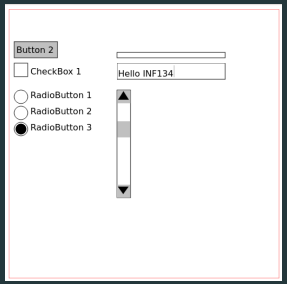
Passive activity with biosensors

- Calorimetric (chemical,thermal)
- Potentiometric (chemical,electrical)
- Optical (physical)
- Piezo-electric (force)

Building an interaction model for wearables

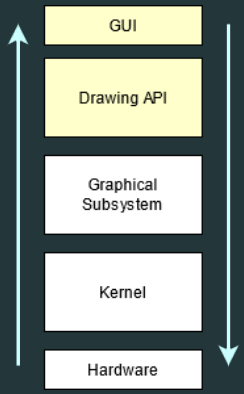
- Signal Processing (amplify, average, filter)
- Training and Classification
  - Least squares
  - Knearest neighbors(kNN)
  - Hidden Markov
  - Artificial neural networks (ANN)
- Fit and Mapping (*e.g.*, gesture taxonomy)

Similarities?, Anything missing?



Standard Interaction Model

- Event-driven programming
- Abstractions
- Toolkits



User Interfaces For Tomorrow’s Devices

We are at a confluence between novel forms of interaction and the tools required to support them.

From Research to Product

Myo gesture band

User Interfaces For Tomorrow's Devices

From Research to Product

- Myo gesture band
- Google glass
- Microsoft Hololens

source

From Research to Product

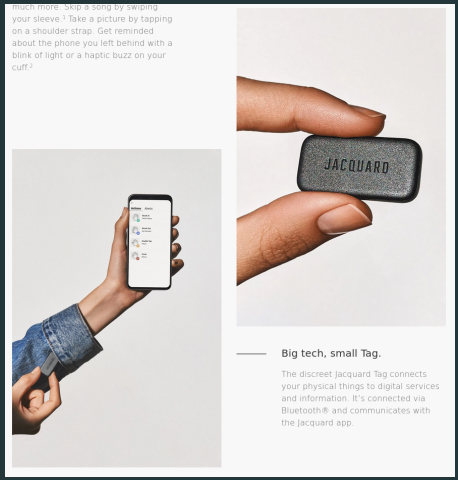
Project Jacquard

Abilities to pair gestures to actions:

- Brush in/up
- Brush out/down
- Double tap
- Cover

Interactive programmability

Perhaps not expressive enough for a body full of sensors



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User Interfaces For Tomorrow's Devices

Moving away from display-based user interfaces to body-based user interfaces expands the opportunity for user-driven toolkits.

- Toolkits must recognize and support the unique qualities of every individual
- Toolkits must help bridge the gulfs of execution and evaluation

A user-driven toolkit

What are some of the challenges you faced while building your toolkit?

A user-driven toolkit

What are some of the challenges you faced while building your toolkit?

- Design?
- Abstraction?
- Composability?
- Debugging and problem solving?

A user-driven toolkit

How can we reduce these obstacles?

Declarative, expressive grammars

Vega-lite

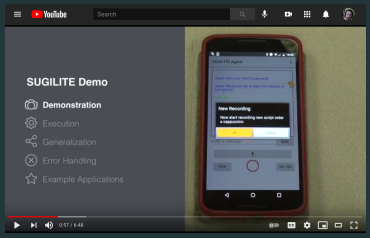
source

A user-driven toolkit

How can we reduce these obstacles?

- Declarative, expressive grammars
- Programming By Demonstration

SUGILITE



source [Li et al., 2017]

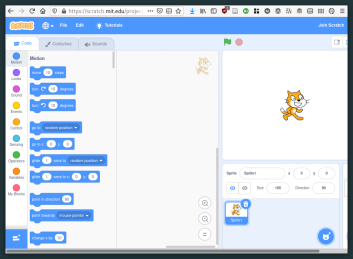
User Interfaces For Tomorrow's Devices

A user-driven toolkit

How can we reduce these obstacles?

- Declarative, expressive grammars
- Programming By Demonstration
- Visual programming

Scratch



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A user-driven toolkit

To wrap, remember (and bring this with you as you work on A4):

We navigate the confluence by building on existing innovations and leaning on the values of user-centered design.

References

References i

Dementyev, A. and Paradiso, J. A. (2014).
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