Human-Computer Interaction

Introduction & Overview

D K Arvind

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Course administration

- Lecturer:
  - Professor DK Arvind

- Two lectures / week
  - » 11:10 – 12:00 on Mondays and Thursdays in Room 3.D01 in Forrest Hill
- Tutorials
  - » 17:10 – 18:00 on Mondays starting in Week 2

- Course web page:

  www.inf.ed.ac.uk/teaching/courses/hci

Topics Covered

- What is HCI and the scope of Interaction Design – understanding and conceptualising interaction [1]
- Cognitive aspects and design implications: Attention, perception, memory, emotion, learning, mental models [2]
- Spectrum of Protocols – Human-to-Human: social interaction, face-to-face and social media, telepresence; Human-to-machine and Machine-to-machine (6LoWPAN / DASH7 / ZigBee IP/ Lightweight RestFul / CoAP / Lightweight SOAP)[6]
- Interfaces – command-based; WIMP and GUI, windows, menus, icons; Virtual reality; Information visualisation; mobile; speech; pen; touch; gestures; haptic; shareable; tangible; augmented and mixed reality; wearable; brain-computer [6]
- Design process – understanding needs and establishing requirements; design, prototyping, construction; evaluation: from controlled to natural settings; Data gathering: data recording, interviews, questionnaires, observations; Analytics [3]

Interaction Design – beyond human-computer interaction

Rogers, Sharpe & Preece, Wiley 3rd Edition

Assessment

- 70% of course mark
  - Final exam in April 2016
- 30% of course mark
  - Two coursework assignments (marks equally weighted)
- Coursework 1

  Issued on: 21 Sep. 2015

  Deadlines: 12 Oct. 2015 (16:00)

  Feedback: 28 Oct. 2015
- Coursework 2

  Issued on: 12 Oct. 2015

  Deadlines: 09 Nov. 2015 (16:00)

  Feedback: 23 Nov. 2015
- **Plagiarism: don't do it!**

  http://web.inf.ed.ac.uk/infweb/admin/policies/academic-misconduct

Sensing Futures

D K Arvind

Chair in Distributed Wireless Computation

School of Informatics

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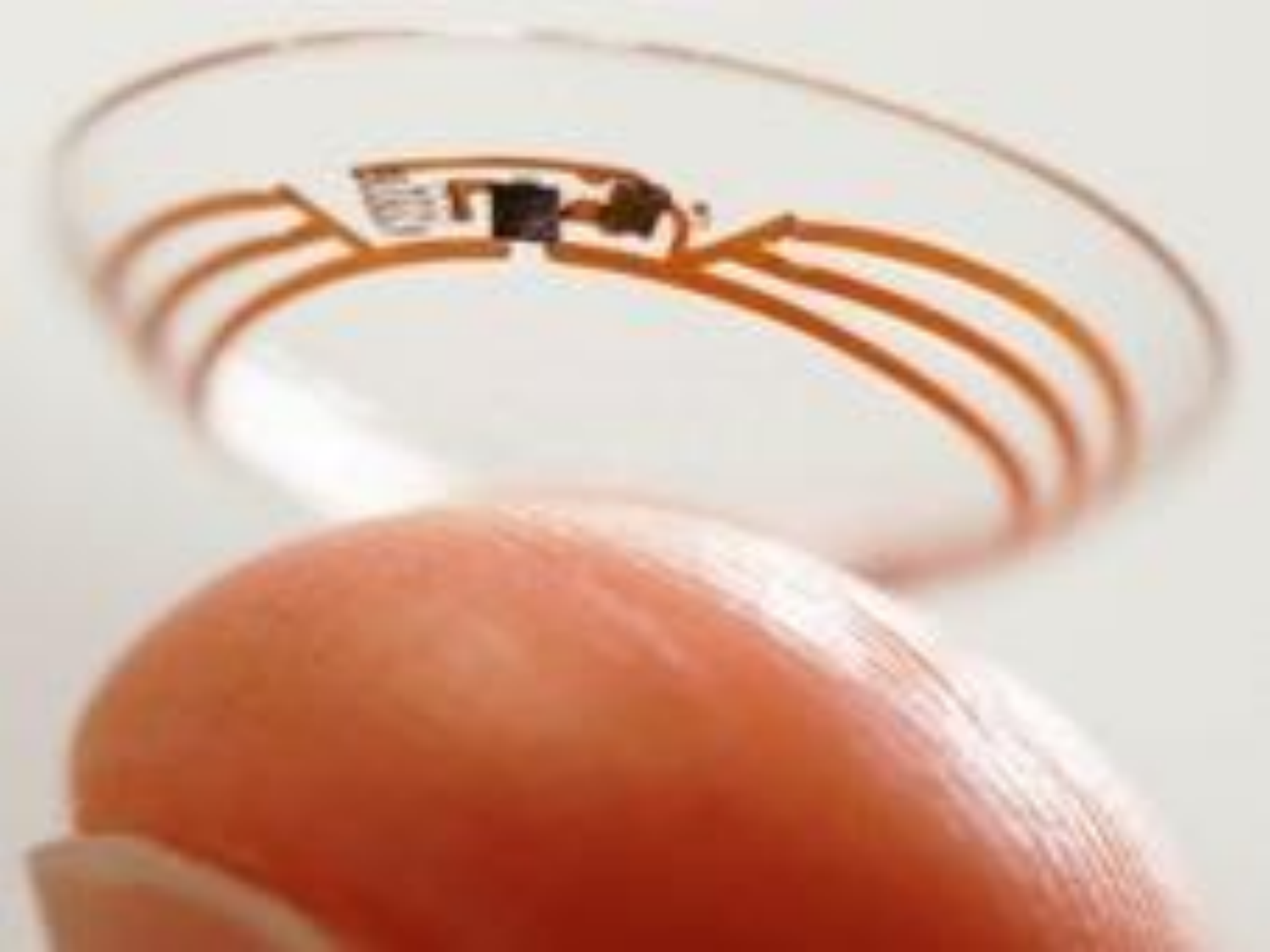
“By 2017, 30% of wearable technology will be unobtrusive to the naked eye. Consumer wearables will blend seamlessly into their surroundings. Smart contact lens are one and another interesting wearable that is emerging is smart jewellery.”

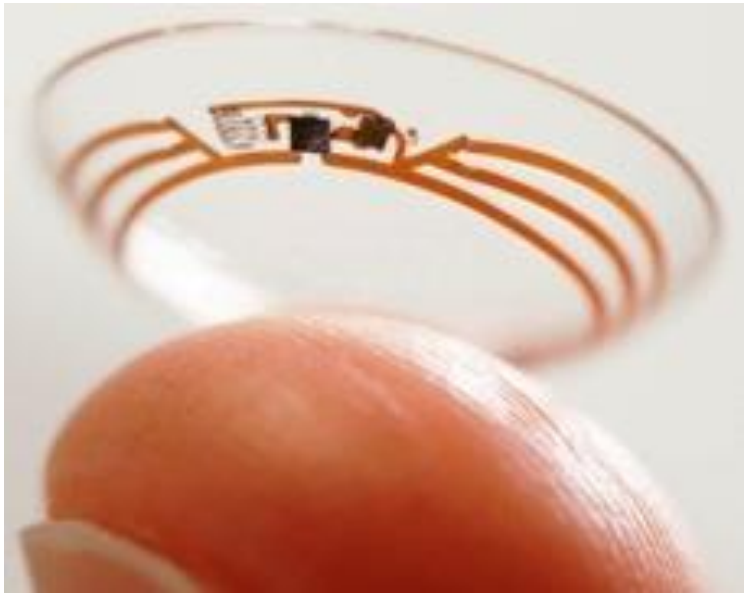
Annette Zimmerman,

Research Director – Gartner,

December 2014.



Google/Novartis(Alcon)

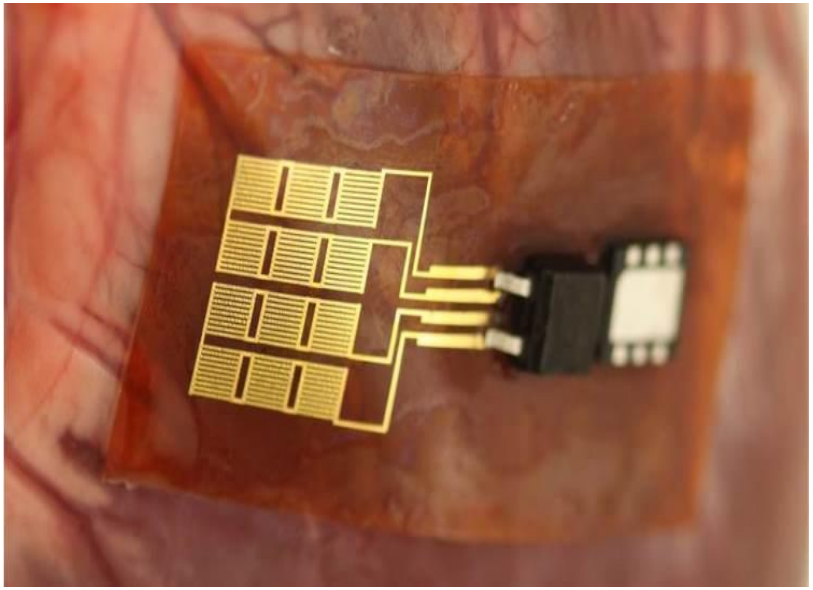


Miniature sensor and antenna sandwiched between two contact lenses.

Continuous monitoring of blood glucose level in human tear.

Uploaded to smart phone.

Flexible Heart Sensor (UIUC)

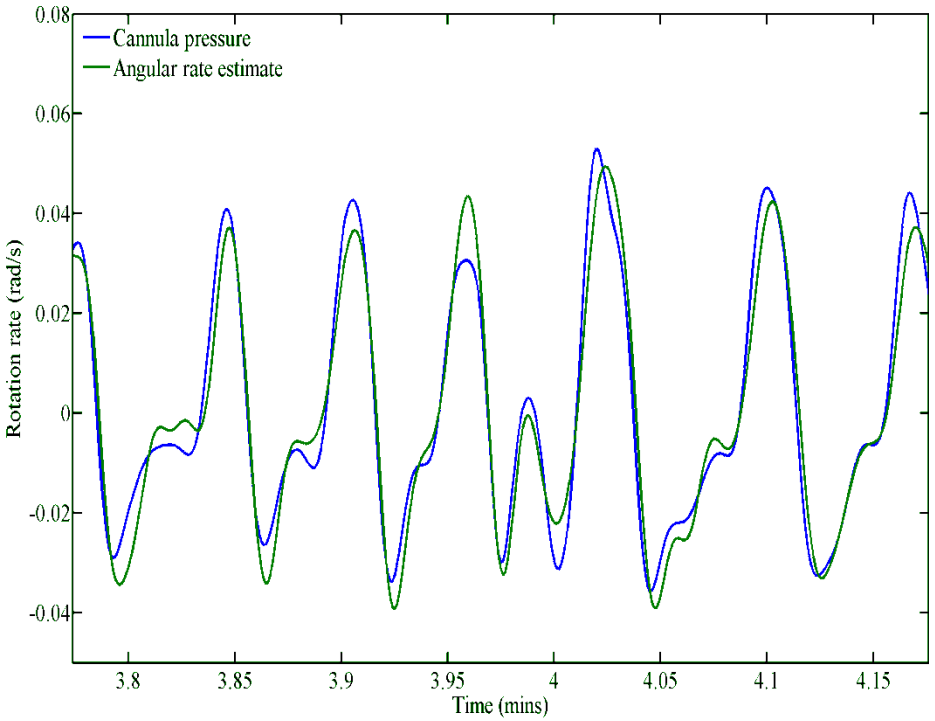


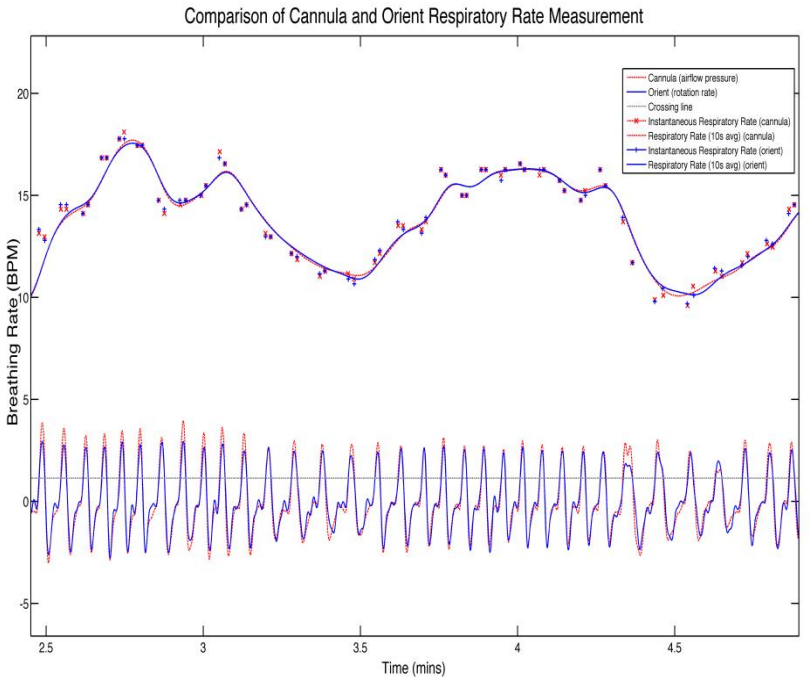
Sensor laden sheath around the heart.

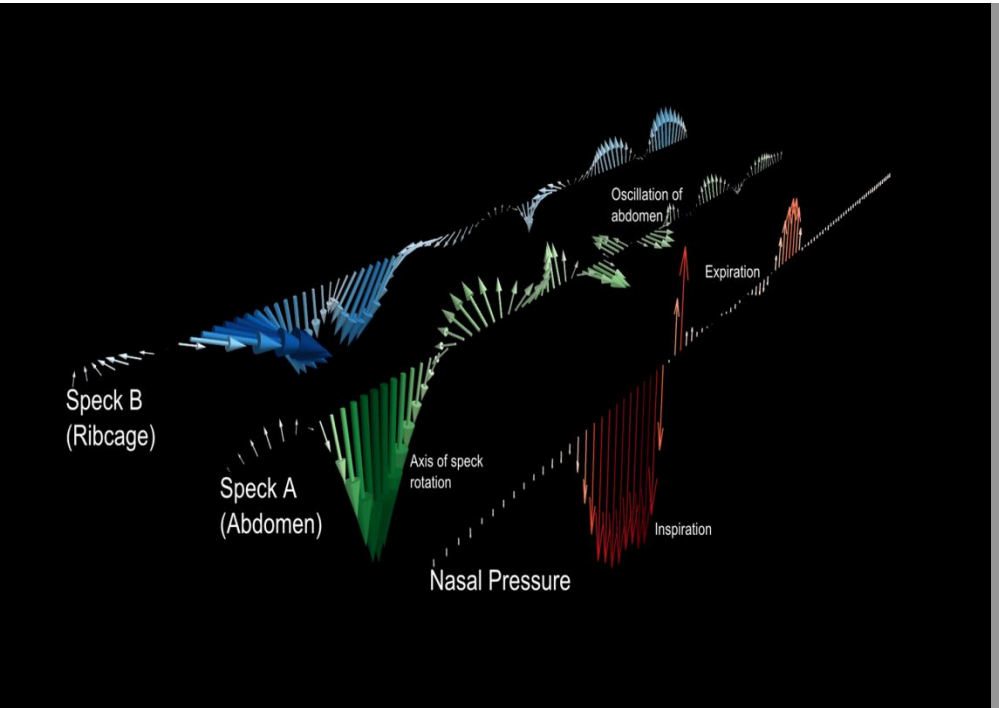
Irregular heart rhythm.

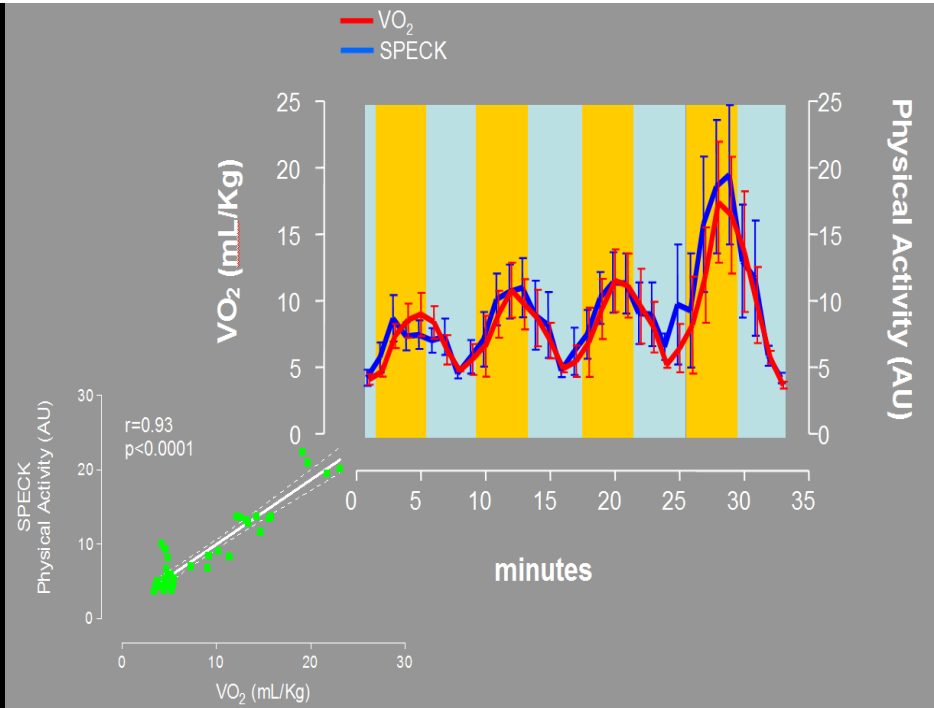
Changes in pH during restriction of blood supply.

Temperature fluctuations resulting from localized burns.

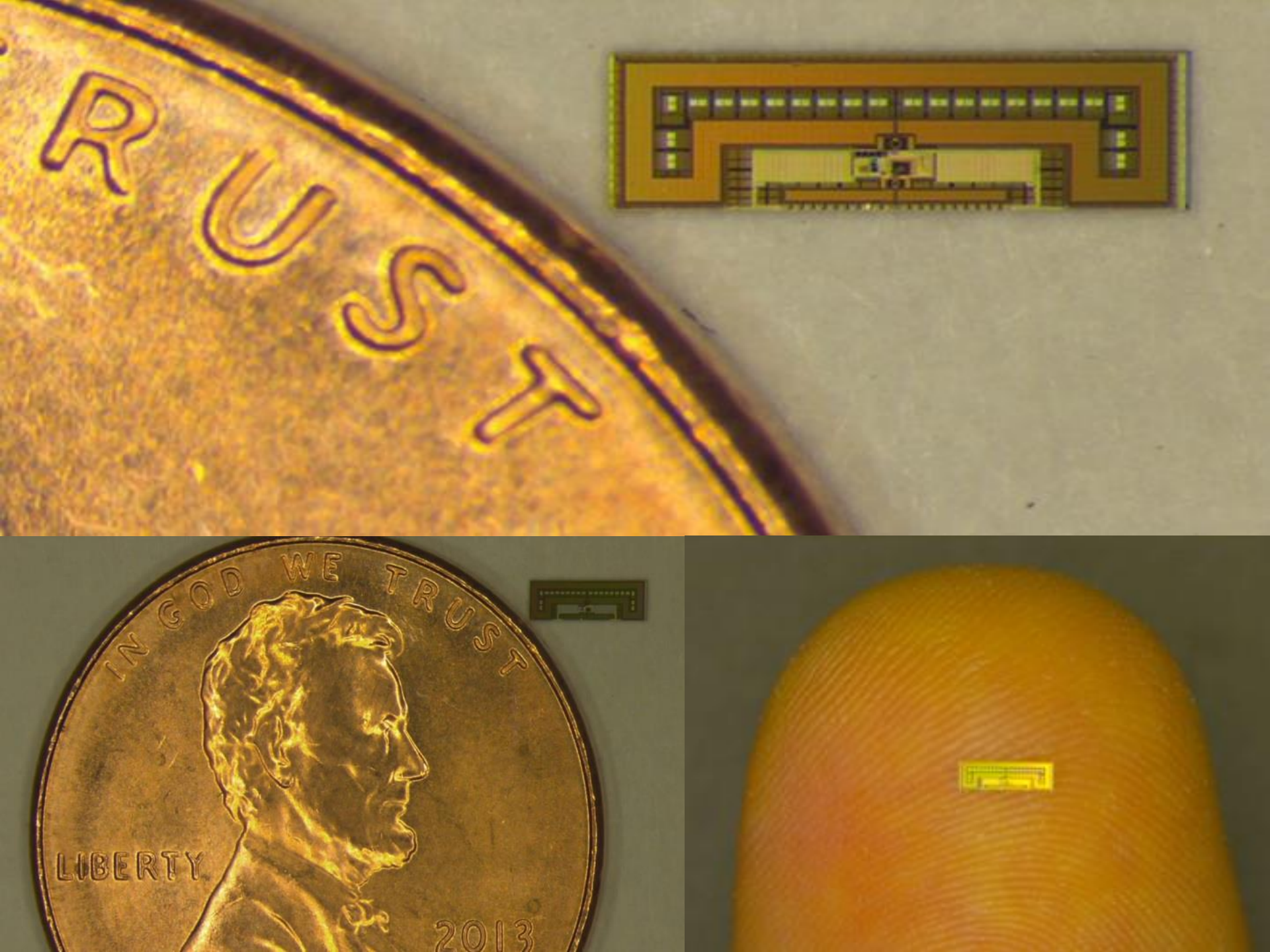

Cannula pressure
Angular rate estimate
Rotation rate (rad/s)
Time (mins)


Comparison of Cannula and Orient Respiratory Rate Measurement
Cannula (airflow pressure)
Orient (rotation rate)
Crossing line
Instantaneous Respiratory Rate (cannula)
Respiratory Rate (10s avg) (cannula)
Instantaneous Respiratory Rate (orient)
Respiratory Rate (10s avg) (orient)
Breathing Rate (BPM)
Time (mins)

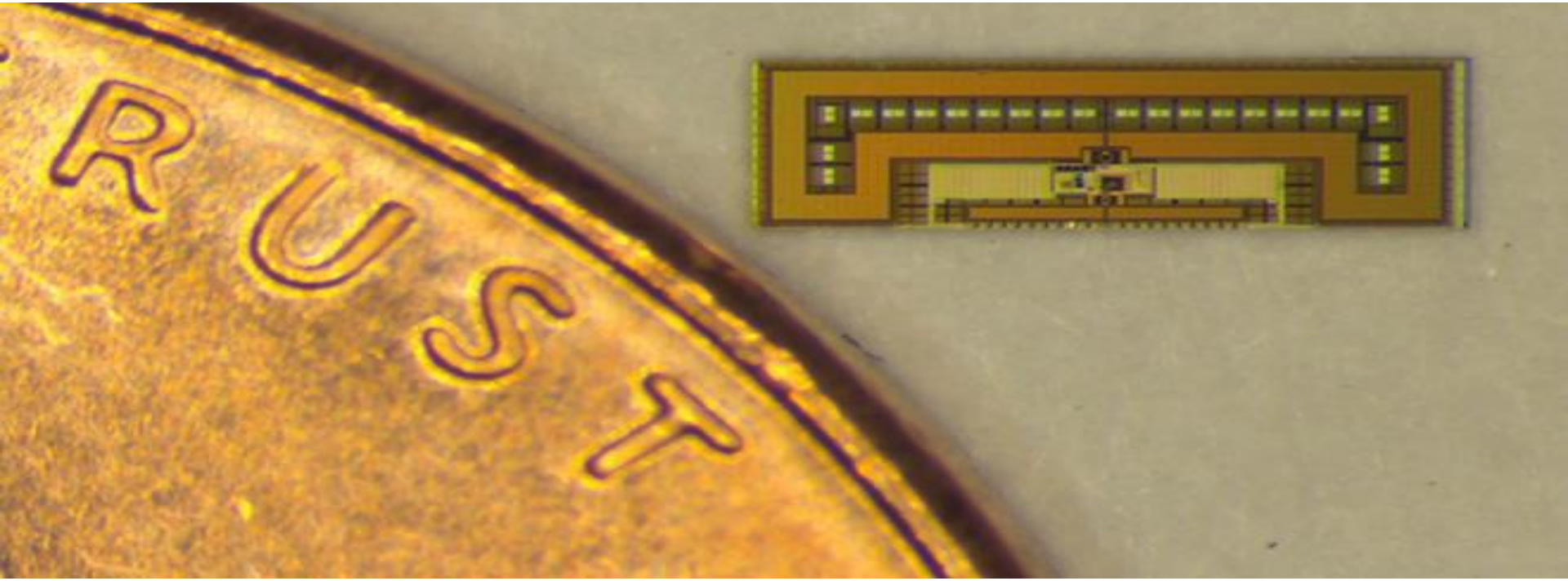

Oscillation of abdomen
Expiration
Speck B (Ribcage)
Speck A (Abdomen)
Axis of speck rotation
Inspiration
Nasal Pressure


VO2
SPECK
VO2 (mL/Kg)
Physical Activity (AU)
minutes
r=0.93
p<0.0001
SPECK Physical Activity (AU)
VO2 (mL/Kg)

Miniaturisation


RUST
IN GOD WE TRUST
LIBERTY
2013

Stanford/Berkeley



Self contained – no external components.

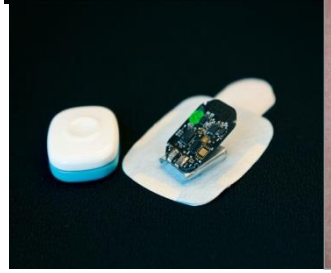
24/60 GHz radio.

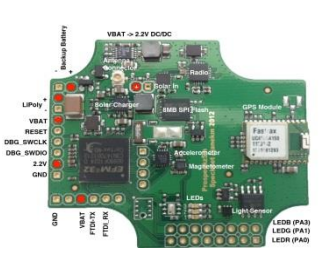
50 cm radio range.

No battery required.

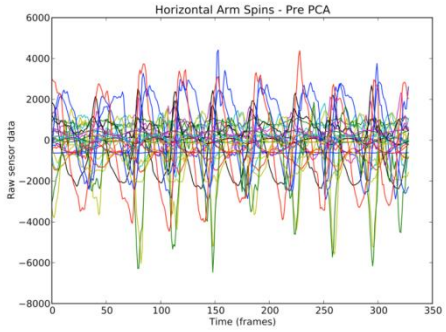
Sensor Data Analytics



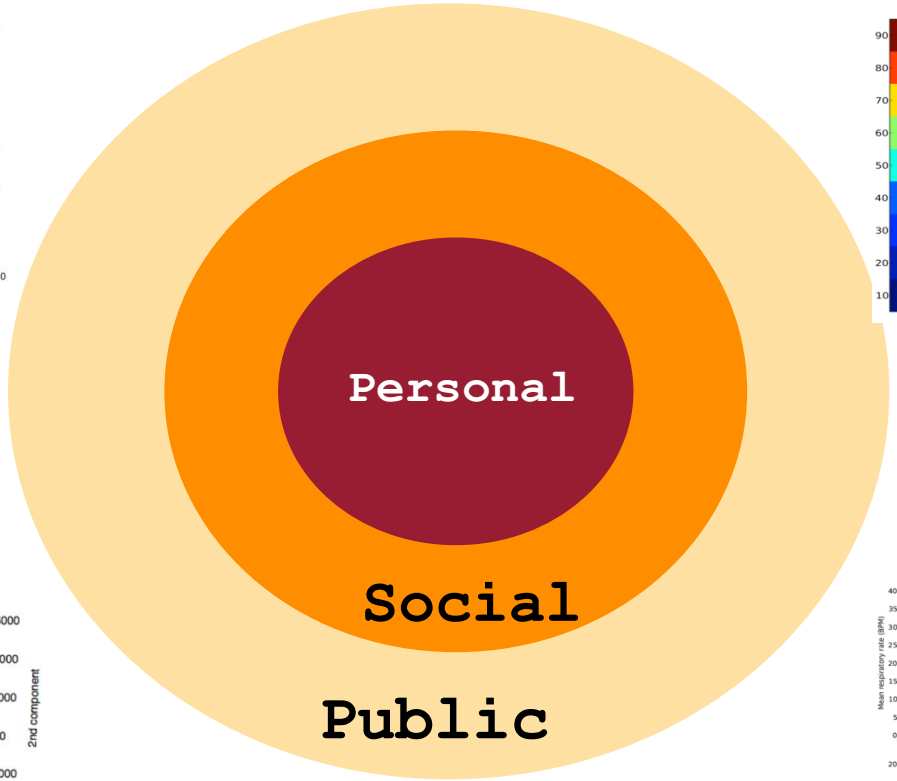


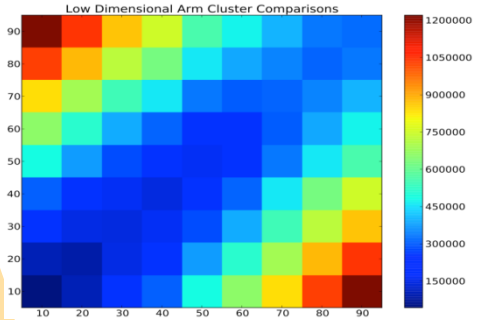


Integration of Computation, Communication and Control to provide time-bounded decisions and actions

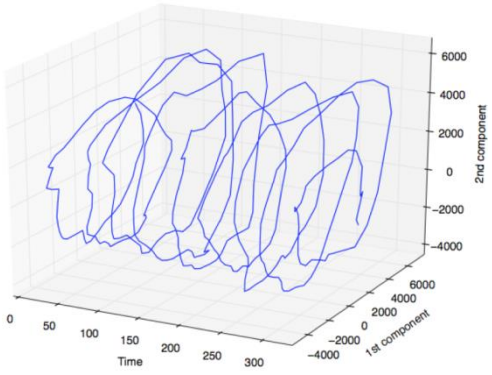


Sense – Learn -- Act

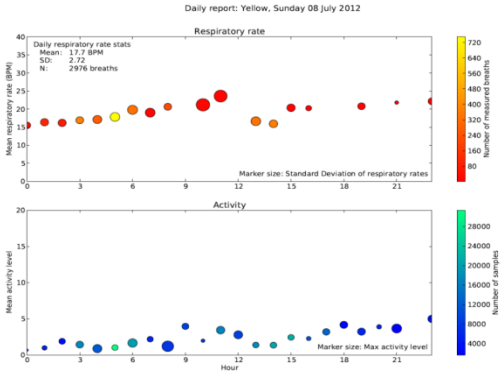




"Intelligence"



Communication



Sensing Daily Rituals

How do consumers use FMCG products?

Current methods

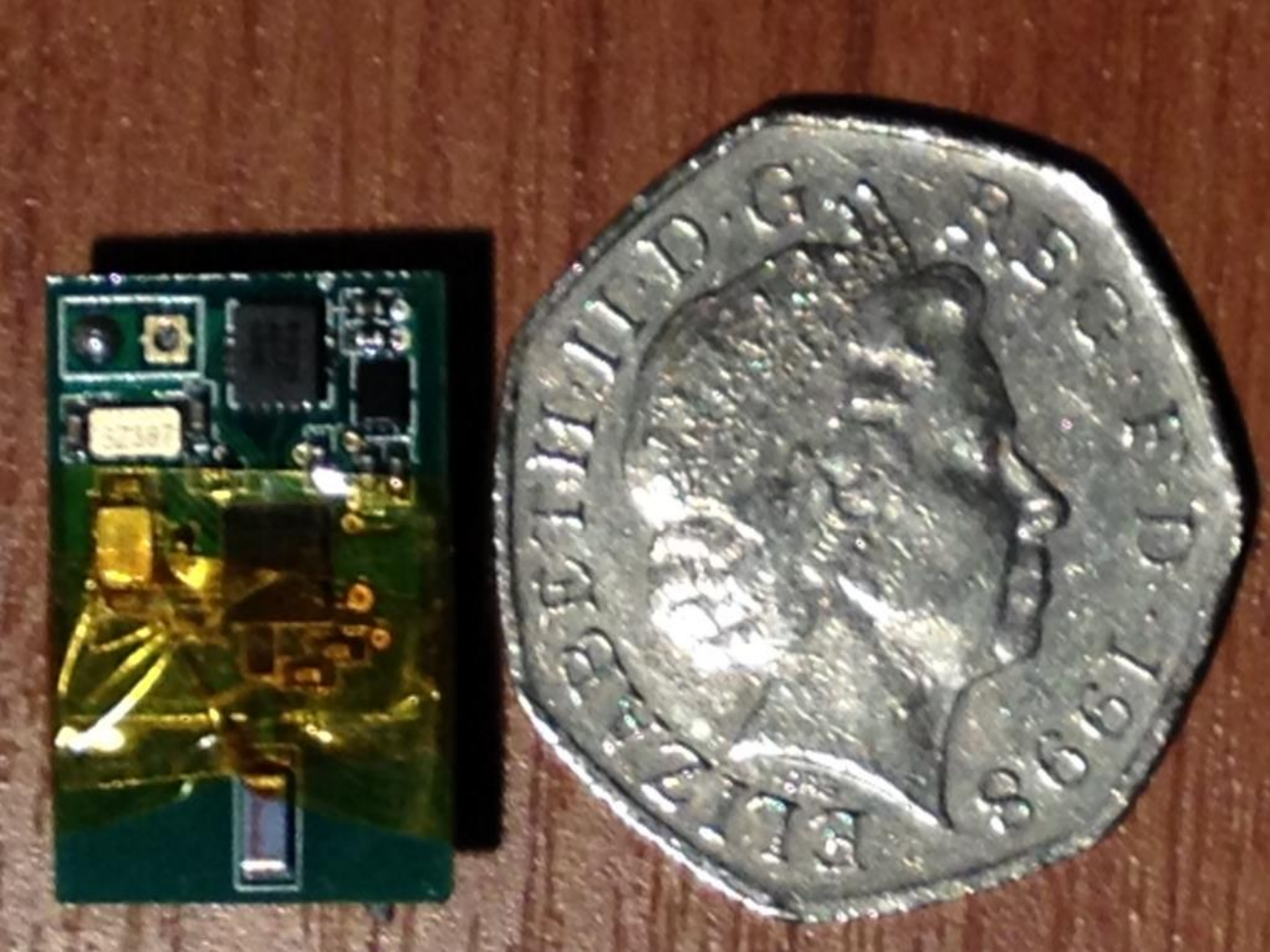
- Interviews
- Diaries
- Questionnaires

Advantages

- Low-tech

Disadvantages

- Error-prone, Inaccurate, Intrusive, Overhead, Unreliable (noisy data)
- Time-consuming - what's in it for the consumer?


ELIZABETH II D·G·REG·F·D·
1998

Message in a bottle

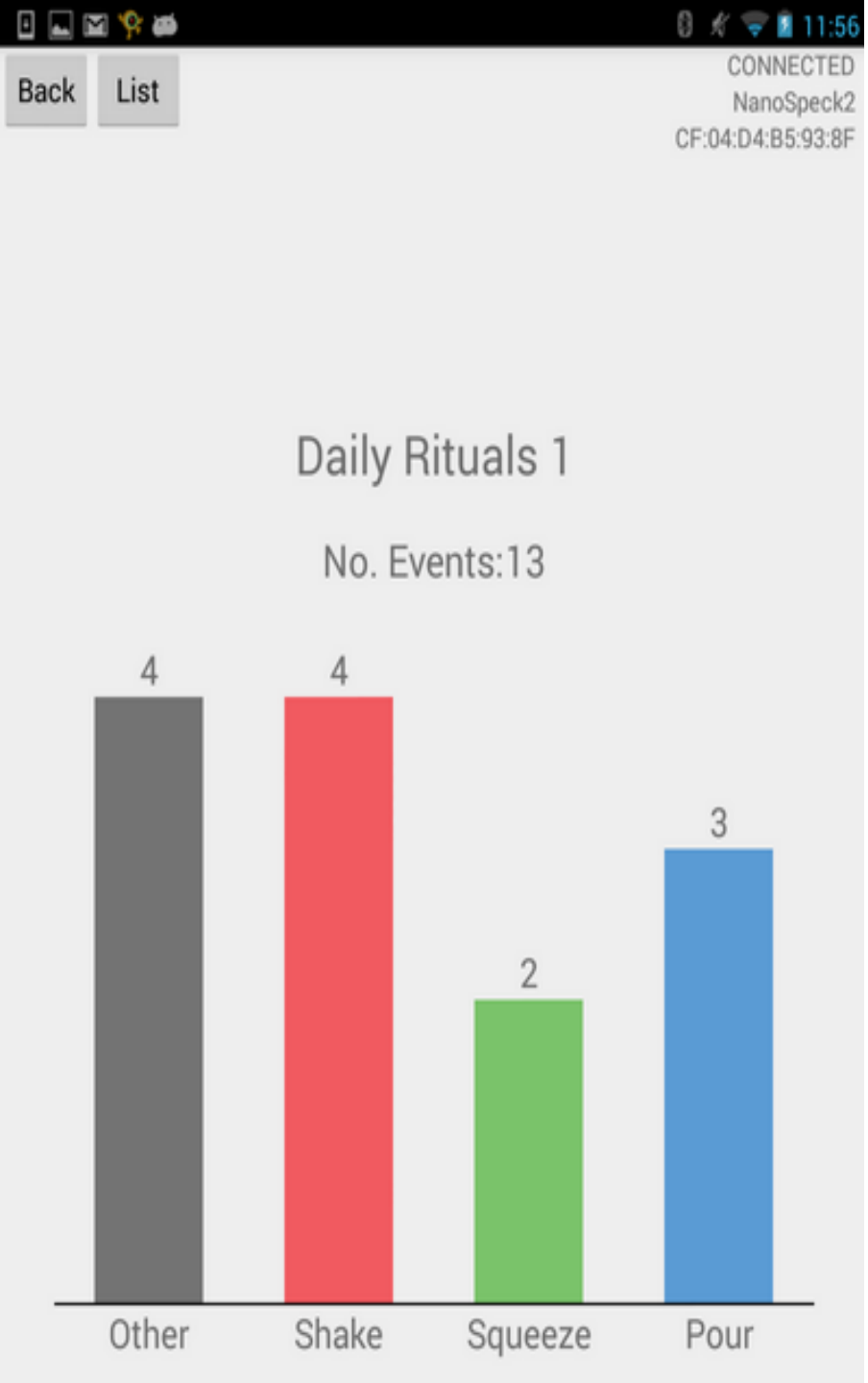
No change in consumer's behaviour

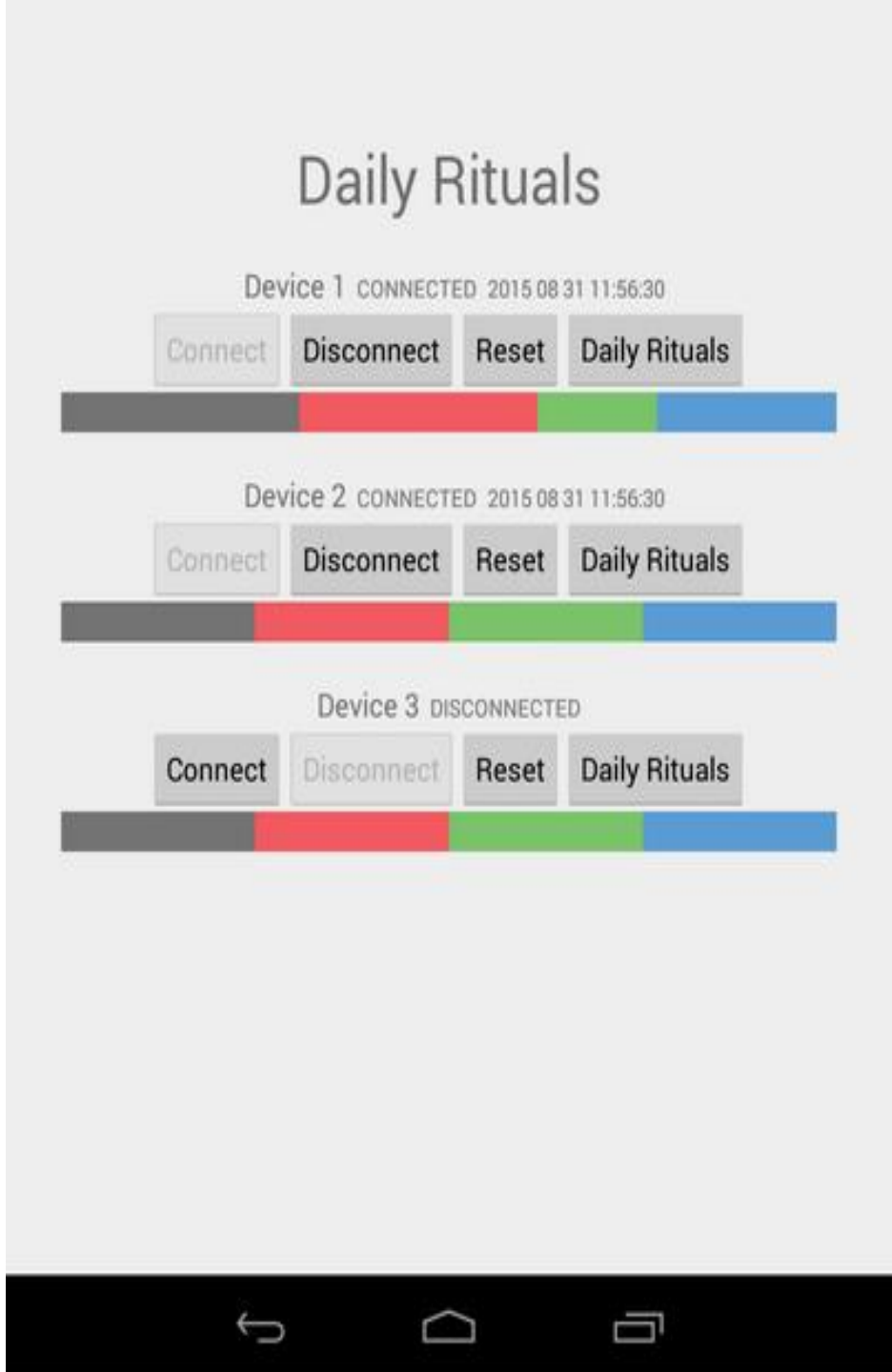
- Customer oblivious to data collection
- Data transmitted automatically to server

Data Analytics extracts actionable information

- Times and Frequency of usage
- Usage patterns (diurnal, monthly, annual)

Make informed Business and Design decisions


11:56
Back
List
CONNECTED
NanoSpeck2
CF:04:D4:B5:93:8F
Daily Rituals 1
No. Events:13
4
4
2
3
Other
Shake
Squeeze
Pour


Daily Rituals
Device 1 CONNECTED 2015 08 31 11:56:30
Connect
Disconnect
Reset
Daily Rituals
Device 2 CONNECTED 2015 08 31 11:56:30
Connect
Disconnect
Reset
Daily Rituals
Device 3 DISCONNECTED
Connect
Disconnect
Reset
Daily Rituals

Events

- Pouring
- Squeezing
- Shaking

Phone App

- Recognises events
- Timestamp
- Transmits to server

Events

- Pouring
- Squeezing
- Shaking

Phone App

- Recognises events
- Timestamp
- Transmits to server

Interaction Design for the Internet of Things

- User oblivious to data collection
- Data transmitted automatically to the server

Data Analytics extracts actionable information

Design for the human at the centre