# **Human-Computer Interaction**

Introduction & Overview

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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-toface and social media, telepresence; Human-to-machine and Machine-tomachine (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.





# Miniaturisation



### 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



# 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?



#### 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



## Events

- Pouring
- o Squeezing
- o Shaking

# Phone App

- Recognises events
- o Timestamp
- o Transmits to server

Back	Graph				CONNECTE NanoSpeci	.D
Event N 2015 0	No: 1 Actio 8 27 15:01	on Type: Ot :45	her		CF:04:D4:B5:93:8	3F
Event N 2015 0	No: 2 Actio 8 27 15:01	on Type: Po :57	our			
Event N 2015 0	No: 3 Actio 8 27 15:36	on Type: Sh :17	nake			
Event N 2015 0	No: 4 Actio 8 27 16:18	on Type: Sh :48	nake			
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## Events

- Pouring
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# **Tangible Computing**

- •" Discrete interventions to make the interactions between the physical and virtual worlds natural and easy"
- Closer coupling between the physical and digital worlds
- Enable users to 'grasp and manipulate' foreground digital information using physical objects
  - E.g. Marble Answering Machine, Live Wire

# **Marble Answering Machine**





Durrell Bishop, Royal College of Art

- Pick-up message A marble is deposited in the upper tray (A)
- Play message Place marble in lower indentation (B)
- Recycle Drop marble in hole (C)

# **Live Wire**



Natalie Jeremijenko - artist-in-residence at Xerox PARC

Plastic cord hangs from a small electric motor mounted on the ceiling

Motor is electrically connected to the Ethernet network

Each passing packet of information causes a tiny twitch in the motor, which wiggles the wire in proportion to the amount of traffic on the net

### IxD4loT

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