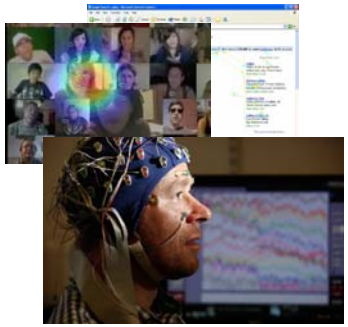
case studies in design informatics

Lecture 1: Introduction



design informatics

NRlabs neuropolitics research

Robin Hill

Institute for Language, Cognition & Computation,
School of Informatics
and
Neuropolitics Research Lab,
Politics and I.R.
www.robin.org.uk
r.l.hill@ed.ac.uk

Course Goal

- How would you do it differently (and better)?
- Every time a design decision is made to pursue one course of action, other routes are closed off.
- The goal is:
  - to work in groups to see why specific project design decisions were taken, and
  - to envisage a different service or product that could be built from the same components.

Fusion of Realities

- Management speak: “think outside the box”
- There is no box… there is no spoon.

Live The Matrix

Or move into industry

cogito

Artificial intelligence powered by behavioral science

- "Grounded in proven scientific theory and validated through millions of real-world data points, Cogito's technology is helping create happier, healthier, more productive people."
- "Whether improving sales performance, enhancing customer service or improving the quality of care, Cogito is the world's first solution that analyzes the human voice and visually guides phone professionals in real-time."

[Quotes from the company website: www.cogitocorp.com]

- Spin-out company from a university (MIT). We have many here too.

Course Structure

- There are two linked themes and case studies
  1. Multimodal Systems and Diverse User Groups:
     - SpaceBook [http://www.spacebook-project.eu]
  2. Affective Computing and Behavioural Biophysics:
     - The Harmonium Project [http://www.eif.co.uk/harmonium]
- The link is this:
  - Enhancing, measuring and understanding cooperative natural behaviour and communication.
  - Embodied Cognition: you are part of the environment (integrated not isolated).
  - WARNING – neither people nor machines always behave as expected. Design Informatics has to cope with both sources of trouble.

Course Assessment

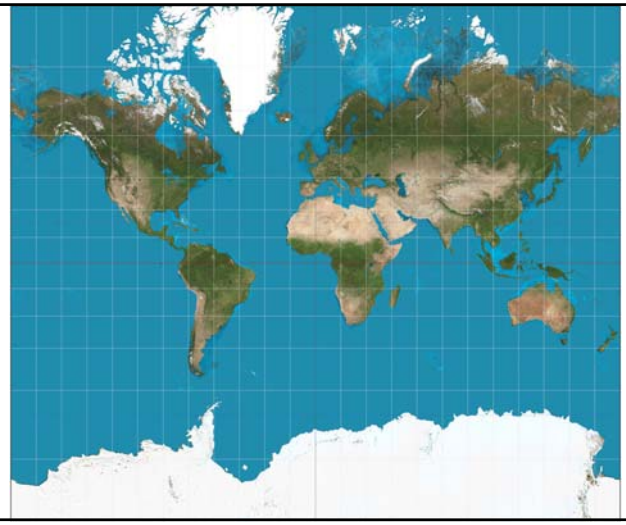
- Assessment is by term paper only; there is no final exam.
  - A1 [30%]: paper on identification and resolution of problems for "technology in the wild" (group). **CDI2 ADI & MFA: placement presentation & report instead.**
  - A2 [40%]: paper and presentation on student-proposed prototype, including Wizard-of-Oz evaluation (group).
  - A3 [30%]: paper on biophysical and affective factors (group).
- Feedback:
  - Summative:
    - Term papers will be marked, and written feedback given.
  - Formative:
    - All tutorials provide formative verbal feedback.

Course Assignments

- Assignment 1:
  - Start: Week 1, Monday, 16:00: 19th September. Available from course page.
  - Submit: Week 4, Thursday, 15:00: 13th October
  - Use Informatics submit, or DVD/thumbdrive/paper copy to Informatics Teaching Office, Appleton Tower. Project leader should also email a copy directly to me.
  - Return: Week 6, Friday, 16:00: 28th October.
- Assignment 2:
  - Start: Week 4, Monday, 16:00: 10th October. Available from course page.
  - Submit: Week 8, Thursday, 15:00: 10th November
  - Use Informatics submit, or DVD/thumbdrive to Informatics Teaching Office, Appleton Tower. Project leader should also email a copy of the **report** directly to me.
  - Return: Week 10, Friday, 16:00: 25th November.
- Assignment 3:
  - Start: Week 9, Monday, 16:00: 14th November. Available from course page.
  - Submit: Week 11, Thursday, 15:00: 28th November
  - Use Informatics submit, or DVD/thumbdrive to Informatics Teaching Office, Appleton Tower. Project leader should also email a copy directly to me.
  - Return: Week 13, Friday, 16:00: 16th December.

Course Timetable

Week	Topic	Mon	Mon	Topic	Thu	Submit 15:00 Thu
1	MMS	Introduction (RH)	Tutorial	MMS	When Smart Things Go Wrong (RH)	
2	MMS	Speech & Dialogue Systems (RH)	Tutorial	MMS	Wizard-of-Oz Testing (RH)	
3	MMS	Year Two Placement Presentations		MMS	Inclusive Design in SpaceBook (AD)	
4	Eval	Approaches to Evaluation (MW)	Tutorial	Eval	Approaches to Evaluation (MW)	A1
5	Peer	Peer Project Time (No lectures)				
6	MMS	Machine Translation (RH)	Tutorial	Practical	Wizard-of-Oz Practical 1	
7	Practical	Wizard-of-Oz Practical 2		Practical	A2 Peer Presentations 1	
8	Practical	A2 Peer Presentations 2		AC&BB	The Harmonium Project (RH)	A2
9	AC&BB	Affective Factors (RH)	Tutorial	AC&BB	Biophysical Measurement (RH)	
10	AC&BB	Biophysical Data Analysis (RH)	Tutorial	AC&BB	Affect in Text (CL)	
11	AC&BB	Affective Interaction (RH)	Tutorial		Reflection (RH)	A3



DI Map: Design with added data

- Nothing is random
- Data
  - Look at clustering and spread of student origins on our map
- Design
  - Look at central location of UK (Time Zone: GMT)
  - Distorted size of UK (Previous map: Mercator projection)
  - Viewpoint of the Northern Hemisphere

Australian view of the world

McArthur's Universal Corrective Map (1979)

- Stuart McArthur drew his first South-up map when he was 12 years old. At age 15, after being tormented for coming from the ''bottom of the world,'' Stuart resolved to one day publish a map with Australia at the top. Six years later, while at Melbourne University, he produced the world's first ''modern'' south-up map and launched it on Australia day in 1979.
- Putting Australia at the top half of a map may seem like the work of some prankster in the Outback, but in fact, there is no intrinsic reason to put the Southern Hemisphere at the bottom. Nor is there a universal mandate that requires the "Prime Meridian" to pass through Greenwich, England. Instead, these are choices based on mapmakers' objectives and biases. Like other choices in mapping, they show how individuals in a particular time and place perceived their world.

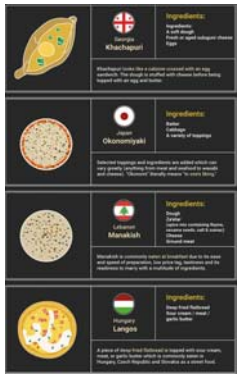
[Source: http://odtmaps.com/detail.asp?product_id=McA-23x35]

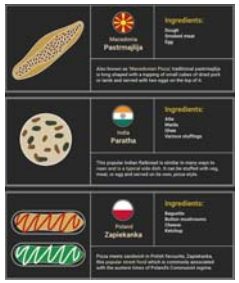
User diversity

One for all, and all for one?

- Design for homogeneity or diversity?
- Everybody thinks they are above average.
- Users may be:
  - Blind; can't speak; physically disabled, in wheelchairs; unable to speak your language; young; old; autistic; dyslexic; suffer from allergies; deaf; colour blind; etc. or even just fussy and awkward (teenagers).
- Users may have different motivations and attitudes:
  - Cultural, religious, racial, sexual, moral and ethical beliefs.
  - Most will probably think differently from you, though.

Cultural diversity – think pizza





http://sublime99.com/pizza-look-like-around-world-infographic/

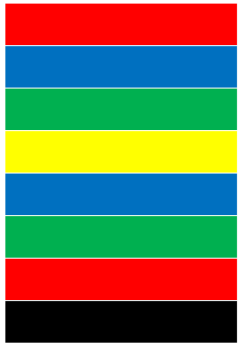
Many methods and modalities of communication

- Typically they interact and combine, so communication is multimodal.
- Think about human dialogue and interaction. How would you help an alien being understand it?
  - Or how you would formally describe it so that a computer, robot, or artificial agent could take part?

Text

- Recognising something as a word is automatic, even if they are in English.
- You cannot not read a word if you see it (you may not understand it, but you will identify a series of letters or ideograms as something meaningful).
- Try the Stroop Test. Can you filter data input?
  - The brain is a multimodal processor.
  - Used as a test of literacy (Russian Spy detector).
  - [e.g. http://cognitivefun.net/test/2/]

Quickly name the colours you see



Name the physical colour (not the word)

RED

BLUE

GREEN

YELLOW

BLUE

GREEN

RED

BLACK

Name the physical colour (not the word)

RED

BLUE

GREEN

YELLOW

BLUE

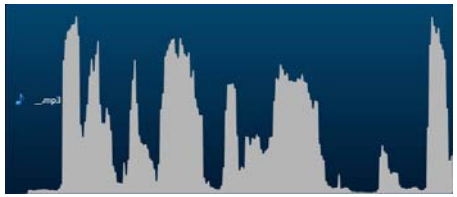
GREEN

RED

BLACK

Speech (and audio/music)

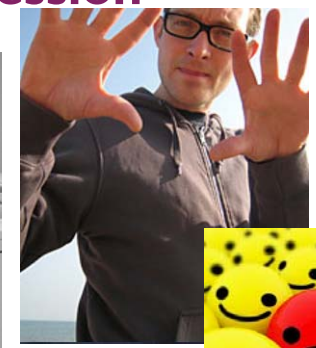
Identify the speaker and what they are saying.

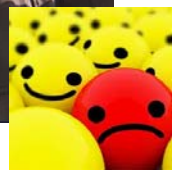


Yet who can doubt that Iraq is better for being free – G W Bush

Gesture and actions

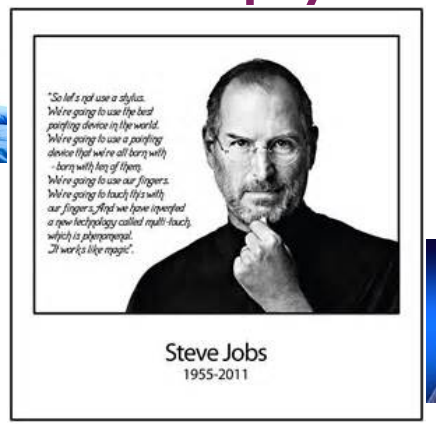
Facial expression





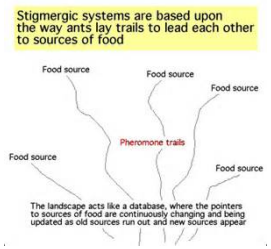
More in the Affective Computing part of the course

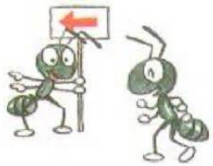
Tactile – direct physical touch

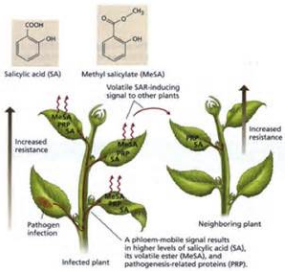


Olfactory (smell)

- Good (pleasant) → bad (disgusting)
- Pheromones & chemical communication
  - Humans, ants, plants, …







Research & Design programme

- Examine human to human communication and interaction first.
- Monitor people to understand, emulate and predict their behaviour. Know your user.
- Enables more natural and easy interaction with technology.
- Test and adapt.
- Increases trust and uptake; improves the user experience.
- Most people **choose** to use things rather than have to.

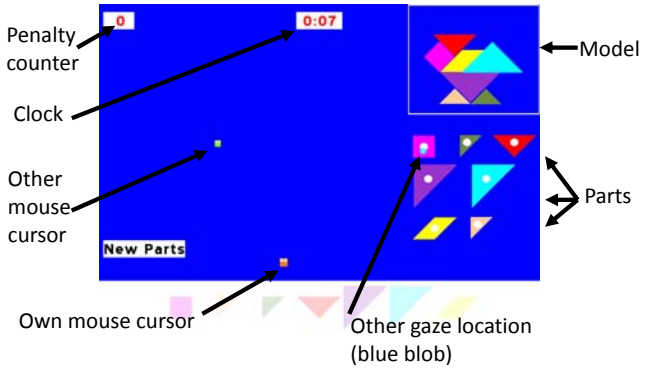
Example: Joint Action

Multimodal: combines gaze tracking, motor control (actions), problem solving and dialogue.

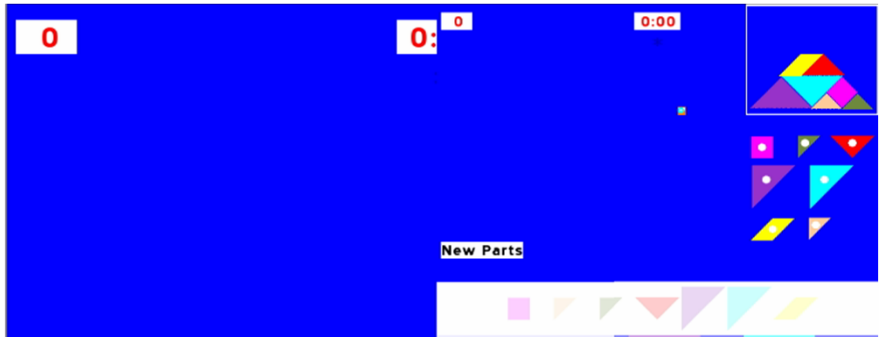
JAST Joint-Action Science and Technology

http://wcms.inf.ed.ac.uk/jast

Human multimodal collaboration



Parallel video example



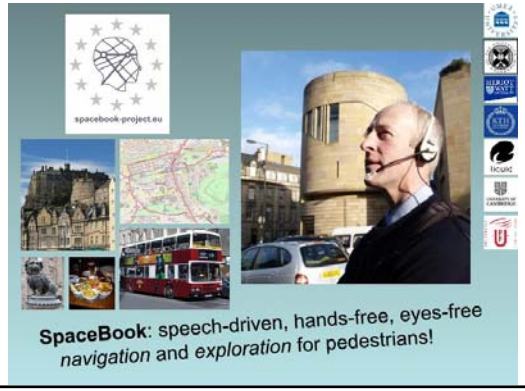
Richness of human language

"I'll hold on to this bit and you put the hat on."

1. The listener is not about to place something on their head.
2. There is no hat. This refers to a red triangle that is at the top of the model.

- The person's partner had no problem understanding this but how easy is it for an artificial agent?
- Visual context!

Spatial & Personal Adaptive Communication Environment: Behaviours & Objects & Operations & Knowledge



The Dream: Research + Product

- *Imagine you are visiting an unknown European city. You arrive at the central train station toward night fall. Now you must find your hotel. You feel uncomfortable asking for directions from random people on the street. You are not so skilled at using maps, and in any case you don't want to be bothered looking down or having to read street signs as you navigate. You are lucky to have an Android phone with the SpaceBook app that speaks directions into you ear as you navigate your way to your hotel. With your eyes free and while pulling your suitcase, you listen as it guides the way: ``OK continue another 100 meters, and turn right into the alleyway immediately after passing a Tesco on your right.''...*
- *Now after a good night's sleep, you want to explore the city, learning about its history, attractions and other features. As you walk down the street from the hotel, a stunning neoclassical building on your left comes into view. Without pushing any buttons, you simply say ``SpaceBook! What is the building on my left?''. SpaceBook answers, ``That is the National Art Museum. It houses ... (you listen for 20 seconds to the basic introduction)''. Then you interrupt, ``when does it close today?''. SpaceBook answers, ``It closes at 4 o'clock today.'' You continue walking. You have plenty of time (and now enhanced capability) to explore the city on foot.*

Project Member

SpaceBook Artificial Agent

- Speech is the primary modality.
- But the system effectively needs to see through the user's eyes.
- Goal is for natural language processing and human-like interaction.
- "Walk past the red door on your right to see another example of your favourite sculptor."
  - Personalised real-world, real-time geolocated descriptions.

Background casual homework

- While you are exploring Edinburgh think about what you might do to make the experience easier and more enjoyable. Knowledge and education about Edinburgh should also be increasing, but at a self-paced rate (leisure learning).