DEVICES AND TECHNOLOGIES GET CLOSER TO HUMANS: CAN WE HANDLE THEM?

Moderator: Les Miller

Panel: Andrea Mason

Alexander Toet

Hannes Bleuler

Peter Berkelman

Alexandre Alapetite

Devices and Technologies Get Closer to Humans: Can We Handle Them?

- For the time being, the answer seems to be Yes and No
- Yes, most people will naturally use devices that make their lives easier.
  - The emphasis is on well designed devices that people find easy to use.
  - The change has been slowly taking place and people keep moving towards the most helpful devices/software when given an affordable choice.
- No, people will likely struggle for a while with technology that affects them in ways that makes someone else's life easier, e.g. robots used by doctors to assist in surgery.

Devices and Technologies Get Closer to Humans: Can We Handle Them?

- Sadly, most software and devices are still a long way from humans.
- Most software is designed by computer science, software engineers, and computer engineers that have had no training in HCI.
- There are changes occurring in the USA industry as can be seen by the small, but growing, number people applying for online degrees in HCI.

DEVICES AND TECHNOLOGIES GET CLOSER TO HUMANS: CAN WE HANDLE THEM?

Panel Structure

First 30-45 minutes

5-7 minute presentation by each member of the panel

Remaining time

Questions to the panelists and comments from audience

Panel

Andrea Mason, University of Wisconsin-Madison, USA

Alexander Toet, TNO, The Netherlands

Hannes Bleuler, EPFL, Switzerland

Peter Berkelman, University of Hawaii, USA

Alexandre Alapetite, Technical University of Denmark, Denmark

Advances on gaze interaction

Alexandre Alapetite
Department of Management Engineering

Technical University of Denmark

New needs

Link to video

New usage

Link to video

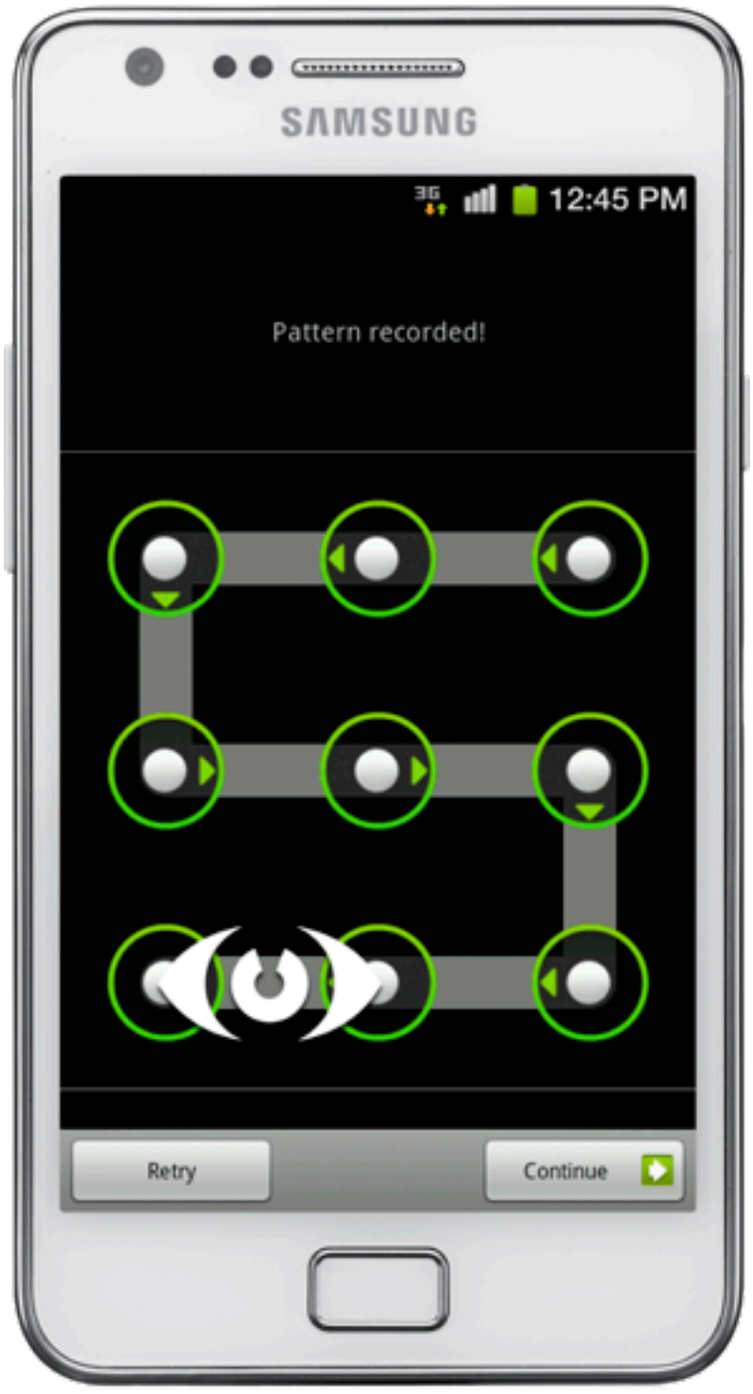
New hardware for gaze interaction

- For desktop
  - Old, many choices
- For laptops
  - Tobii (integrated)
  - Eyetech (standalone, 3000 USD)
- For TVs
- For **tablets** and **smartphones**
  - The Eye Tribe (Not affiliated with DTU)

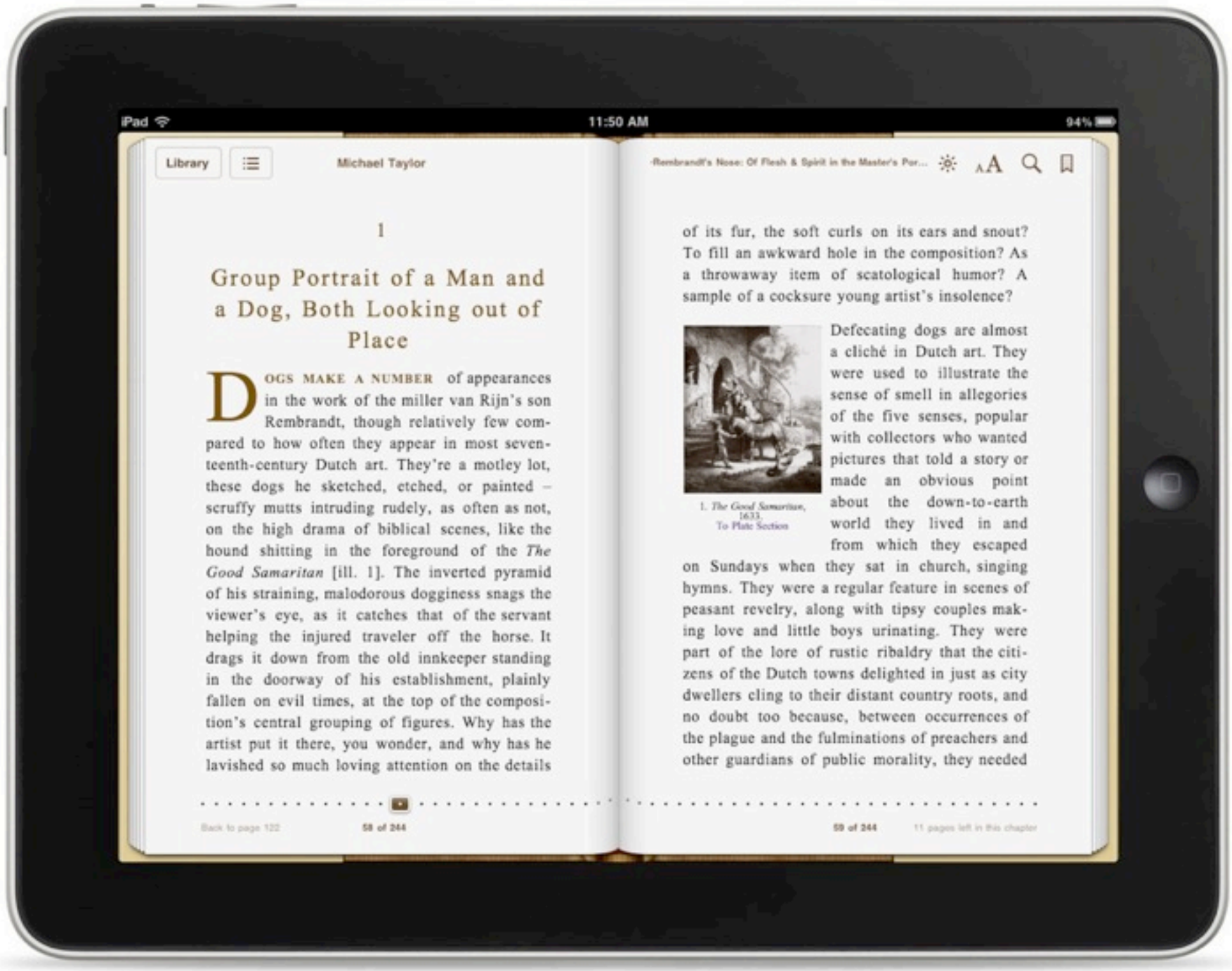
TheEyeTribe

Imagine...

Unlocking your phone with eyes



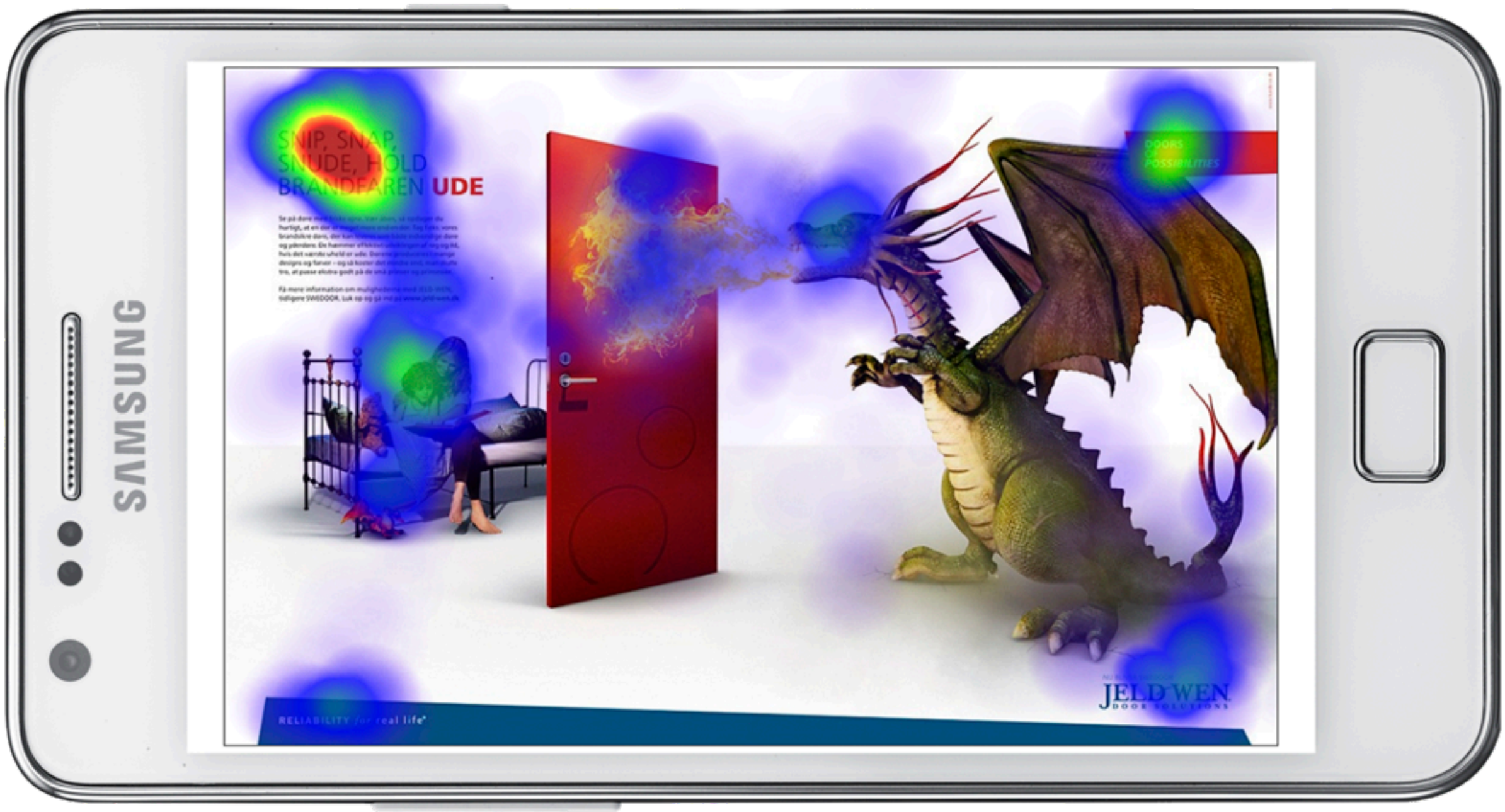
Automated scroll and page-turn



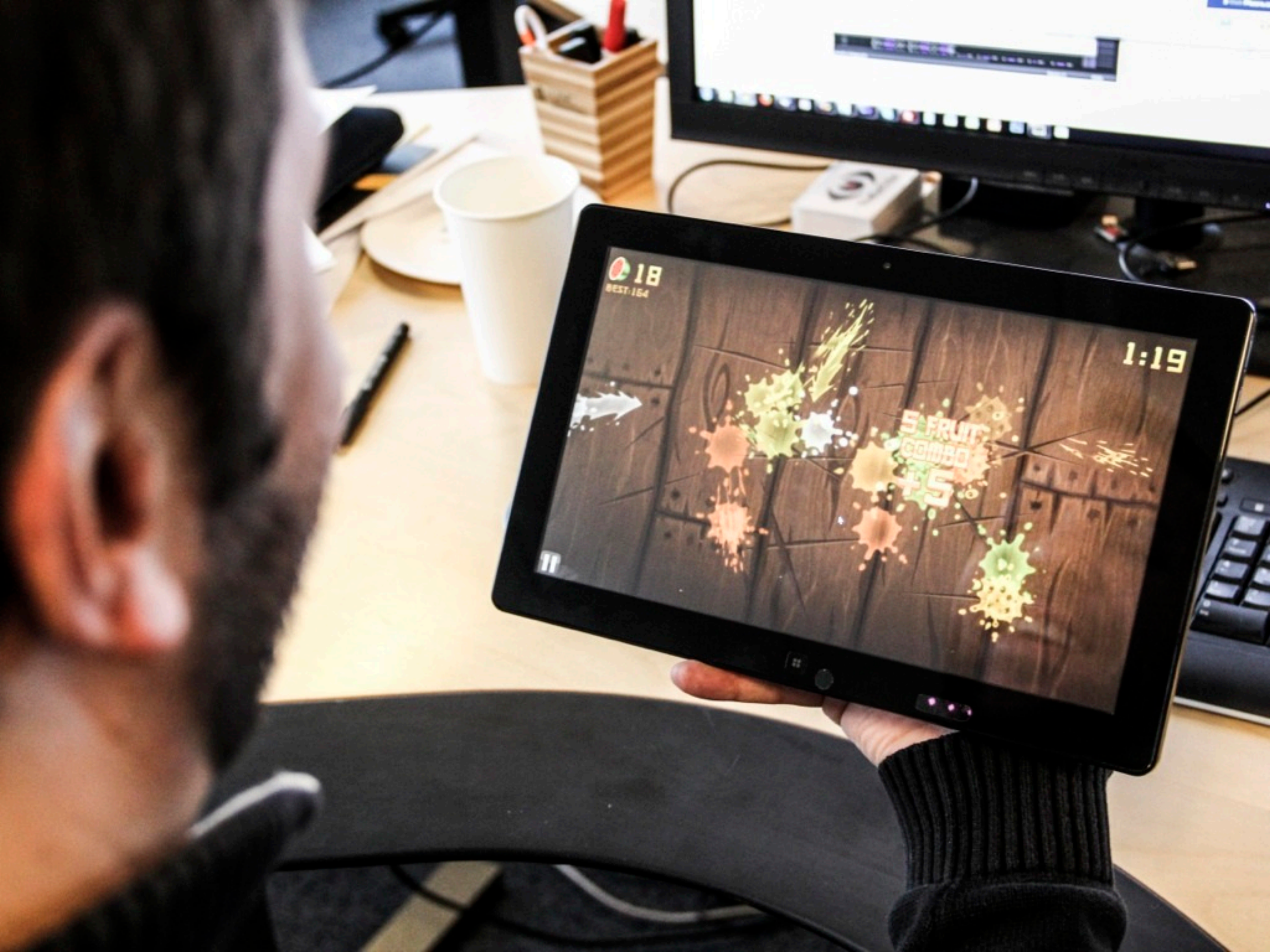
Eye controlled games

Control heads-up display

Analyzing add efficiency and design



It is possible...


18
BEST: 164
1:19
5 FRUIT
COMBO
+5

The Vision

*"**The Eye Tribe** vision is to become the **leading software provider** for eye control to **mass market applications**."*

We make software

The software is unique, because it relies only on **standard low-cost components** that are easily integrated into next generation **smartphones and tablets**.

c|net First Look

from

CES2013

TheEyeTribe

Thanks

Alexandre Alapetite
Senior researcher
PhD in informatics
http://alexandre.alapetite.fr/research/
Technical University of Denmark

Devices and Technologies Get Closer to Humans:

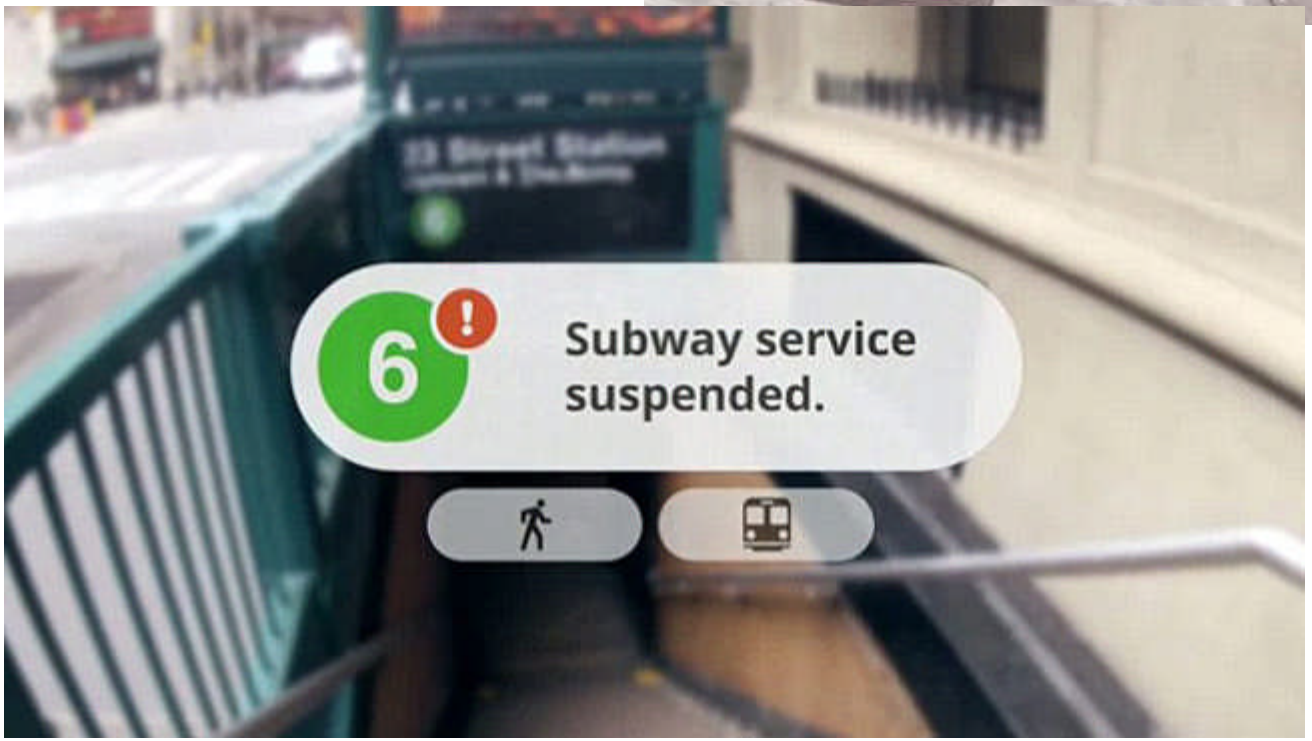
Can We Handle Them ?

At first computers were remotely stored and only accessible to those who could handle them

Miniaturization makes that everyone can now embrace technology

Wearable displays …..

May provide useful Information …..

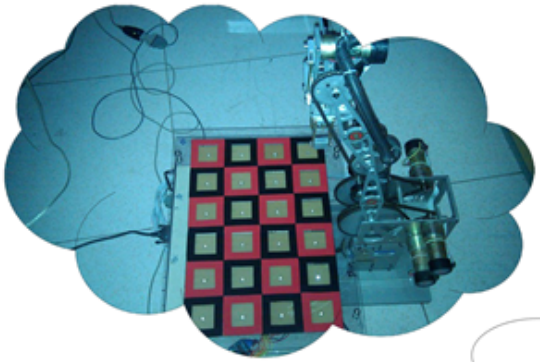


Or may lead to information overload and stress ……

Or even to dangerous situations if we don't know how to handle them.

Brain-Machine Interfaces

Control Your World

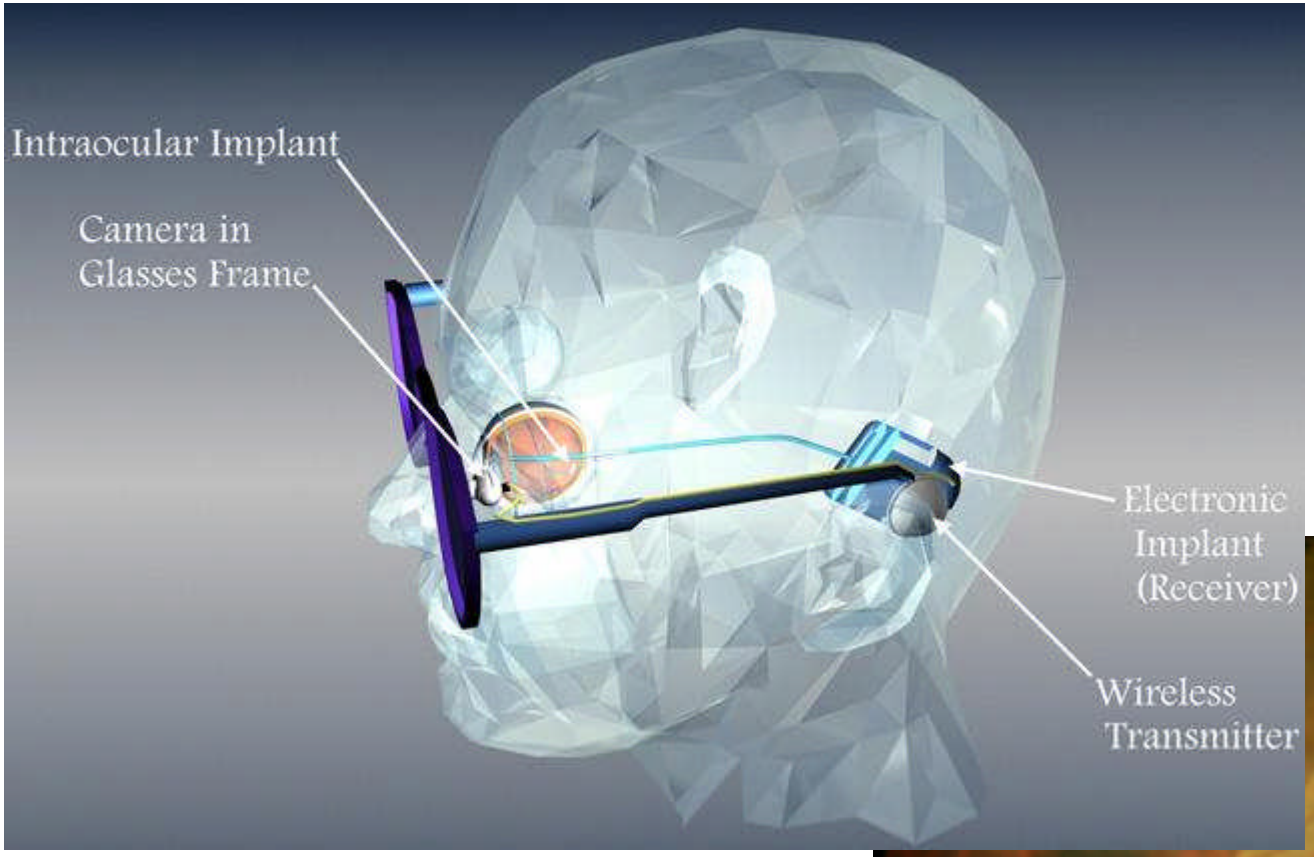


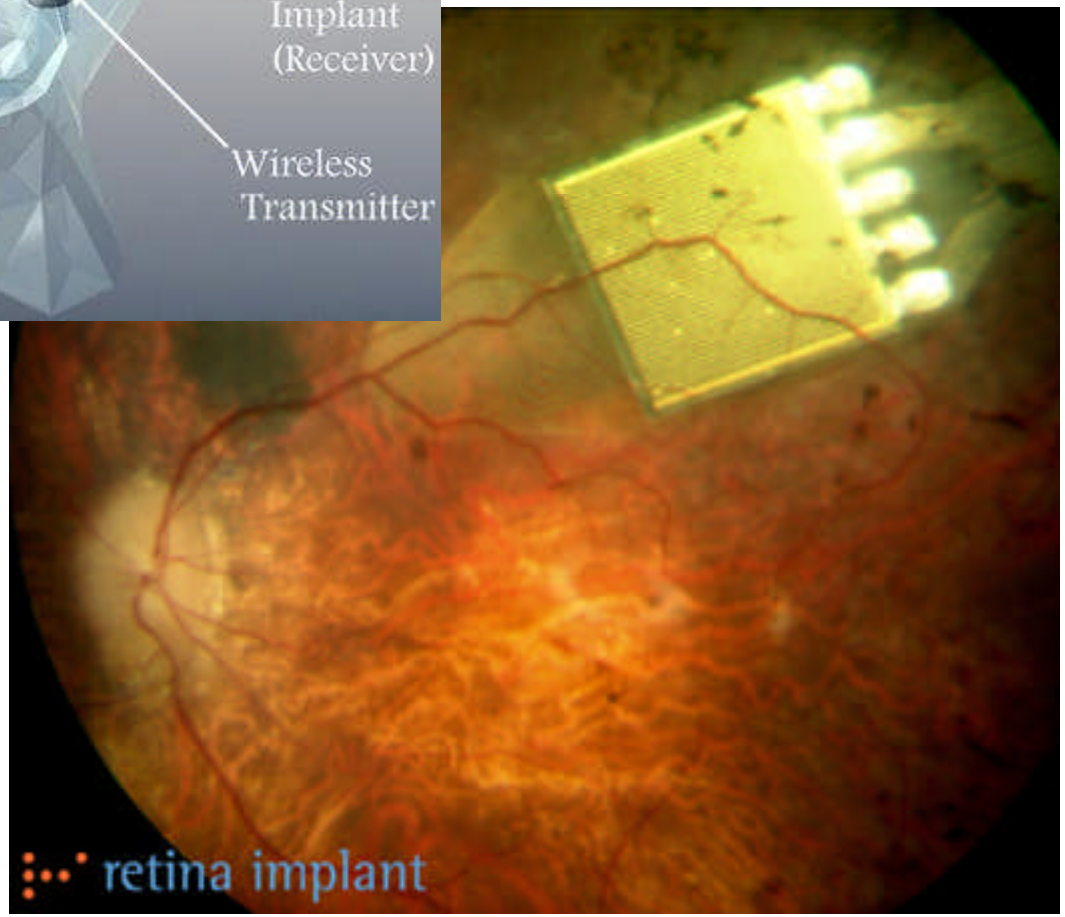
Electroencephalograph (EEG) headsets, like the Emotiv EPOC to the left, record the electrical activity from the neurons in your brain when worn on your head. When you think of specific things, like moving left or right; or look at specific objects, like a blinking light, we can analyze the signals from the EEG to determine what you were thinking or looking at.

Playing Checkers with Your Mind When you look at a blinking light, neurons in the visual cortex of your brain (located toward the back of your head) are activated. By looking at squares on a checkerboard lit with blinking lights, we can tell which square you were looking at and have a robot arm pick and place pieces on the checkerboard.

Flying an Airplane by Thinking When you imagine moving your arms left or right, the electrical activity in your brain changes in an area called the motor cortex (located towards the centers of both sides of the brain). We can use these thoughts to control the direction an airplane is flying!

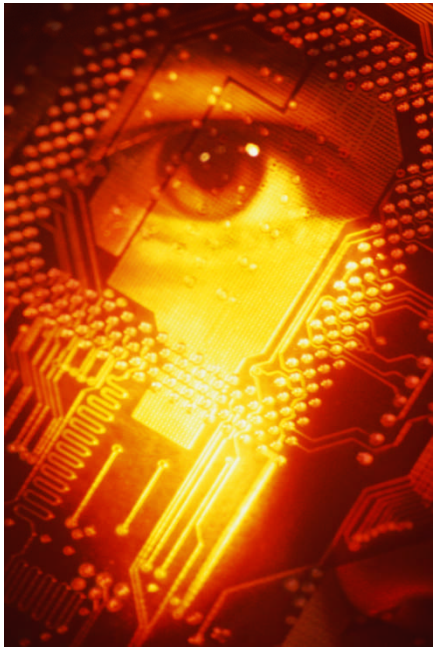
BMI’s may be a blessing for the disabled





Artificial vision may restore sight …

But may also open new possibilities (night vision)




ACCESS PANEL
DANGER
MADE IN CHINA

And will we be able to handle it?

Technology Design: Concepts from Motor Control and Learning

Andrea Mason

Associate Professor, Department of Kinesiology

University of Wisconsin-Madison

Technology use in motor skills learning

- Situations where technologies are used to practice skills that will be performed in different ("real") contexts

rehabilitation

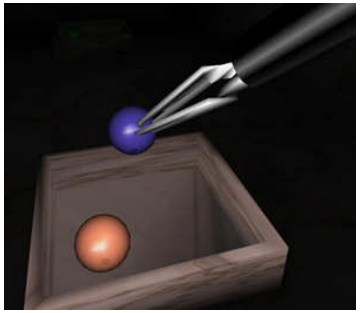
Driver training

Surgical education

- Decades of research in motor behavior addressing variables that affect optimal learning
  - 3 key variables: Specificity, Variability of practice and Sensory Information/Augmented feedback

Concepts from motor learning that can impact whether technologies achieve their goal

- Sensory and Motor Specificity (Henry, 1958; Proteau, 1992, 1995)
  - Best learning experiences are those that most closely approximate the movement components, goals and sensory/environmental conditions of the target skill



  - Should practice conditions always closely mimic actual performance?

Concepts from motor learning that can impact whether technologies achieve their goal

- Variability of practice: practicing skills in a variety of different ways and contexts has beneficial effects on learning
  - An advantage present in the use of technologies

- Sensory and augmented feedback:
  - Distractors
  - Present correct feedback at correct time, but it may not have to be faithful to real task/environment (Mason & Bernardin, 2007, 2008, 2009)

But the bottom line is always …

- Transfer of learning & Learning to learn: influence of practicing one skill on the learning/performance of another skill or the same skill in a new context
  - Positive/Negative/Neutral
  - How do specificity, variability and sensory information interact to influence transfer?
    - Need to test this in a task specific way

References

- Schmidt, R.S. & Lee, T.D. (2011). Motor Control and Learning: A Behavioral Emphasis

- Edwards, W.H. (2011). Motor Learning and Control: From Theory to Practice

- Magill, R.S. (2011). Motor Learning and Control: Concepts and Applications

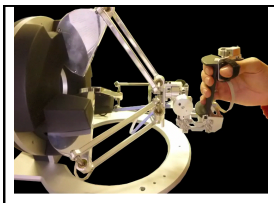
"In the dark, most people can feel
where they're going
or where they are"

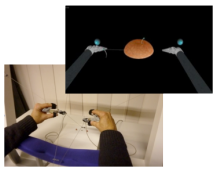
"I can't"

Julie Malloy

Julie Malloy "Out of touch"

"**Out of touch**: A rare disorder affects woman's sense of touch and pain".
"York County Woman Raises money for Prosthetic Hands" Pennsylvania News





Haptics includes
- force sensing
- texture sensing
- kinesthetic sense (sense of position)
- temperature
- balance
- pain (nociception)

It is essential for embodiment;
Haptics links robotics & cognitive neurosciences

Dirk Malzahn's Keynote

MMVR 2012 Medicine meets VR (Newport Beach)
2012: 700 Millions used US civil air transport system

- Killed
- Injured

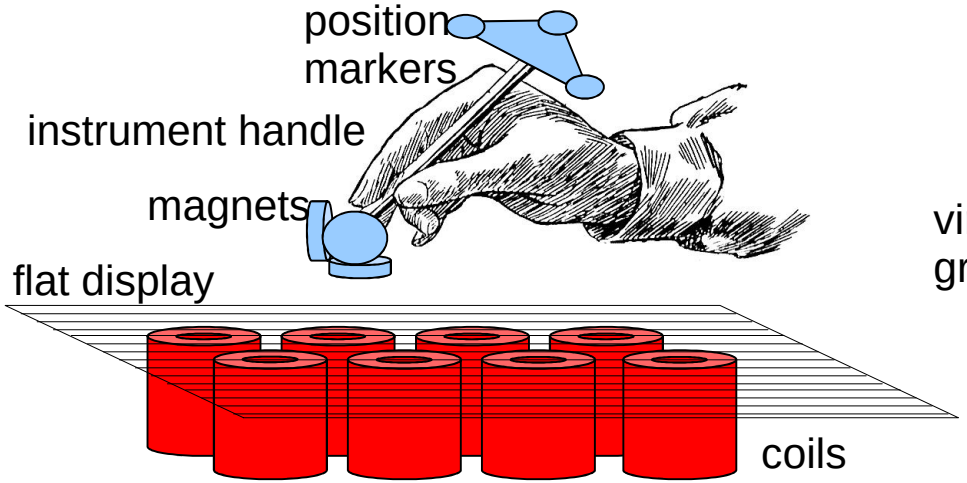
} Zero !

2012: 380 Millions used US Health-Care system

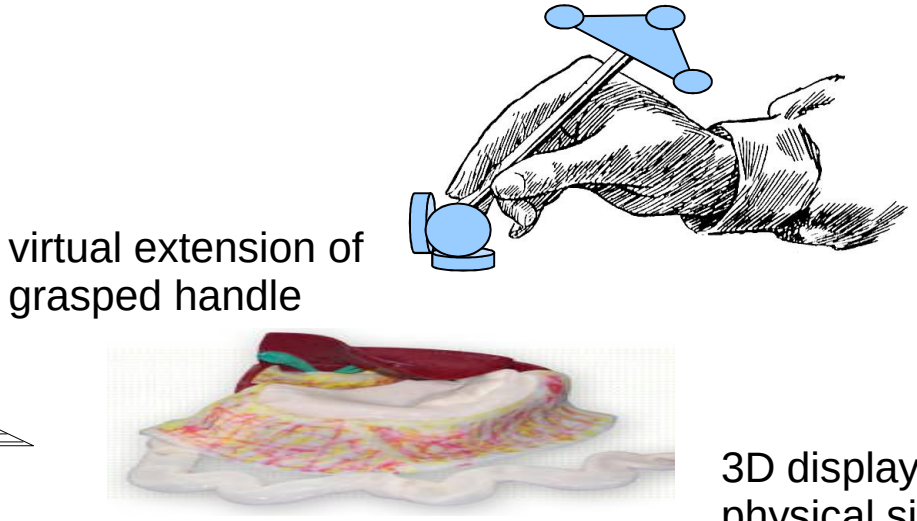
According to different published estimates, between 90'000 and over 200'000 **major avoidable incidents**

What are we going to do about it?

Graphic/Maglev Haptic Co-Location:



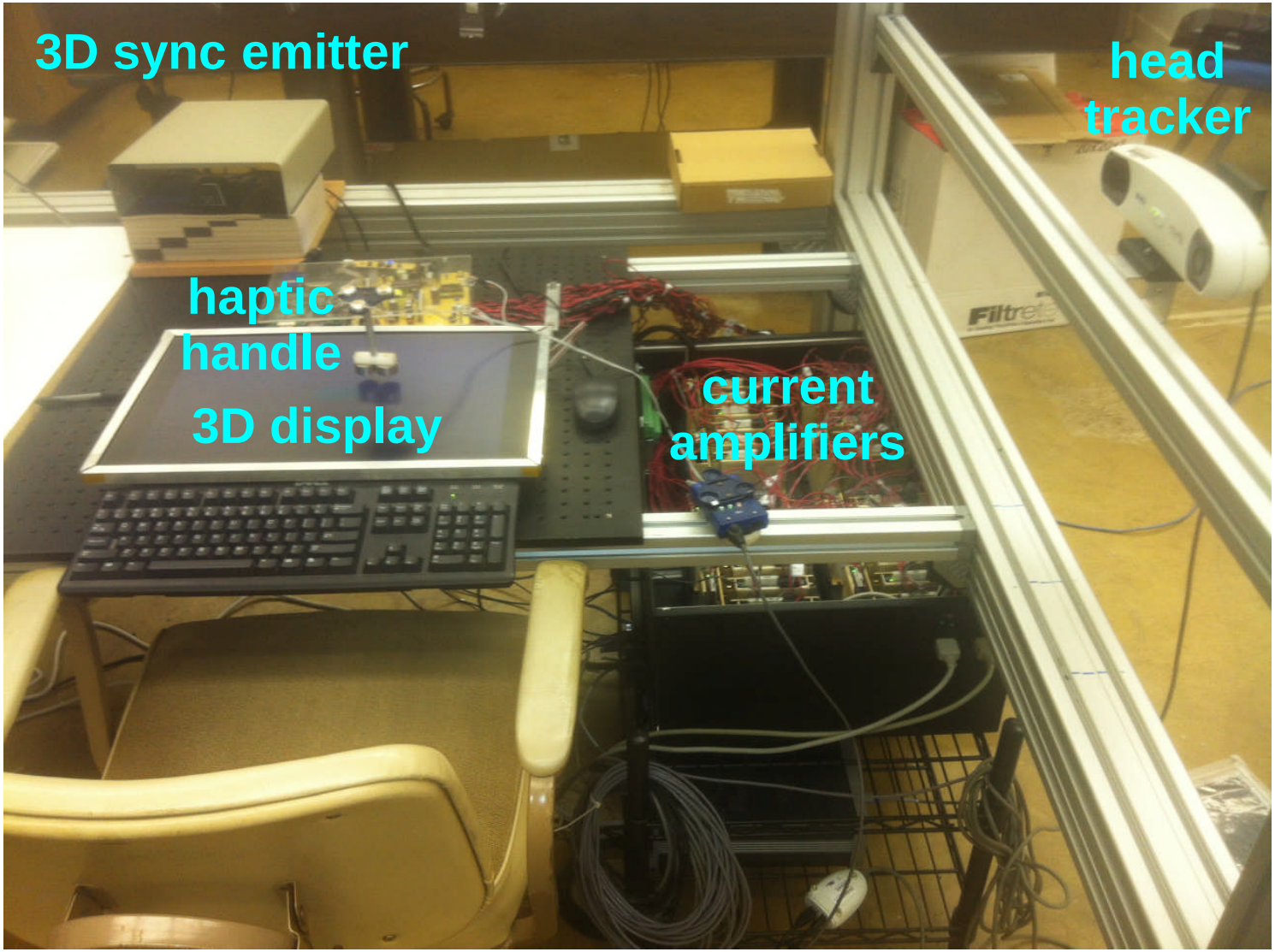
Magnetic Levitation Haptic Interface



3D Display of Virtual Environment

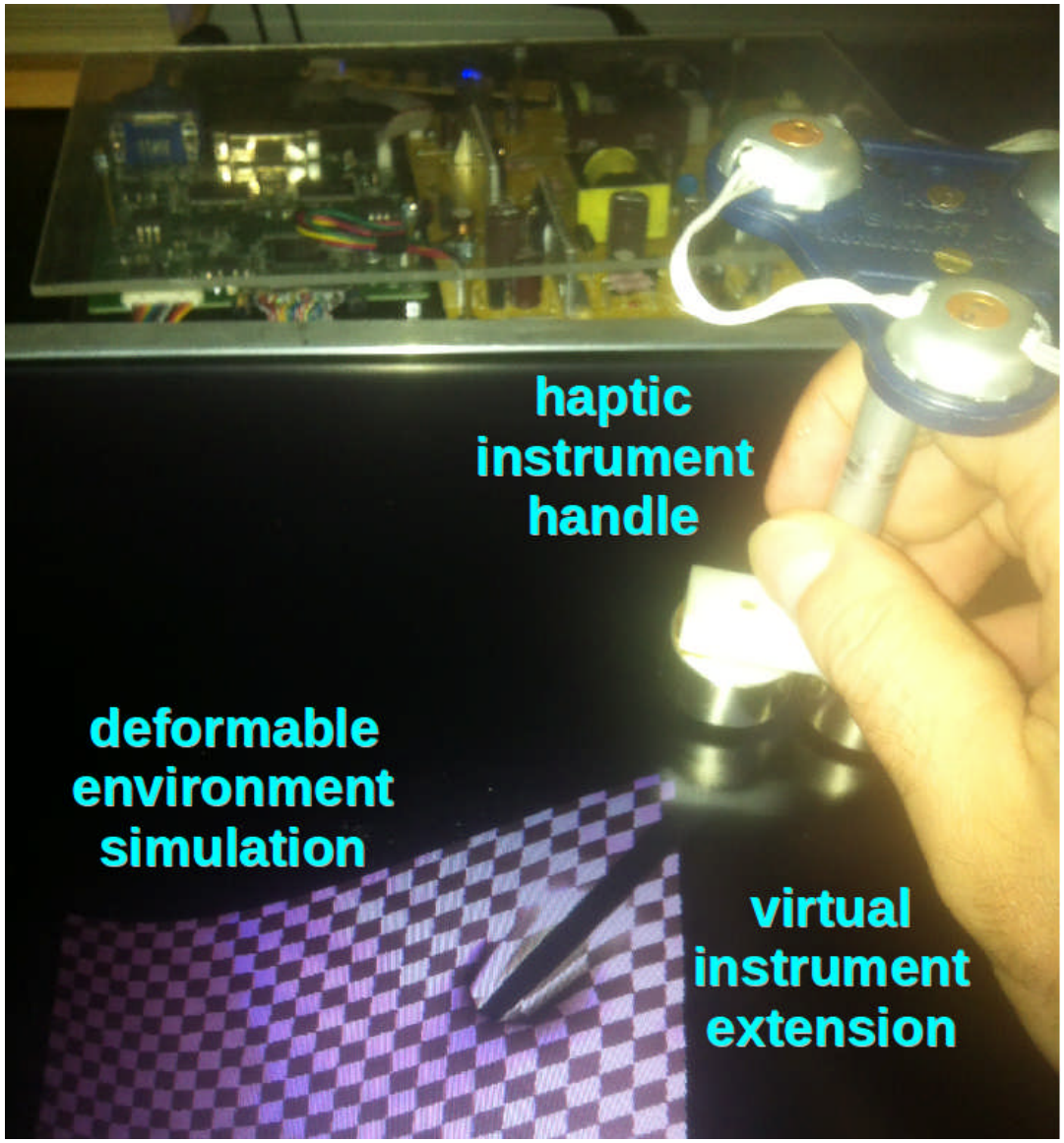
- Magnetic levitation system generates forces and torques on user handle through thin flat display
- 3D rendered environment at real tool tip
- Virtual tool is direct continuation of user handle

Complete System:



Head tracker on side, instrument tracker overhead, maglev coils under display

Interaction with Simulated Tissue:



- 3D displayed surface
- Interaction force and torque generated by coils underneath display
- Deformable environment
- Detailed open surgical simulation in development