

DH2323 DGI18

# INTRODUCTION TO COMPUTER GRAPHICS AND INTERACTION

## **HCI: A brief intro**

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# User Studies for Evaluation

- Human experiments
- Process of evaluating or understanding a technique, tool or idea in terms of needs, preferences and abilities of humans
- Have people use your system or observe stimuli
- Evaluate what they do

# Human Computer Interaction

- Have been considering *interactive* applications
  - Real-time updates of the graphical environment
  - Enables sense of movement through the environment
  - Enables manipulation of objects in the environments
  - Immediate feedback
  - Important prerequisite for interaction

# Human Computer Interaction

- Human Computer Interaction (HCI)
  - Goes well beyond this to focus on the relationship between humans and machines
  - Observe how people interact with computers
  - Design interfaces that allow humans to interact with computers
  - Can we build machines that adapt to human abilities and sensitivities?
    - Instead of the *human adapting* to the machine

# Example User Interfaces

- Mouse
- Keyboard
- Pens and tablets
- Graphical user interfaces
- Voice user interfaces

# Sketchpad



- Ivan Sutherland, 1963
- Pioneered the way for HCI

# Human Computer Interaction

- Have been considering *interactive* applications
  - Real-time updates of the graphical environment
  - Prerequisite for interaction

# Human Computer Interaction

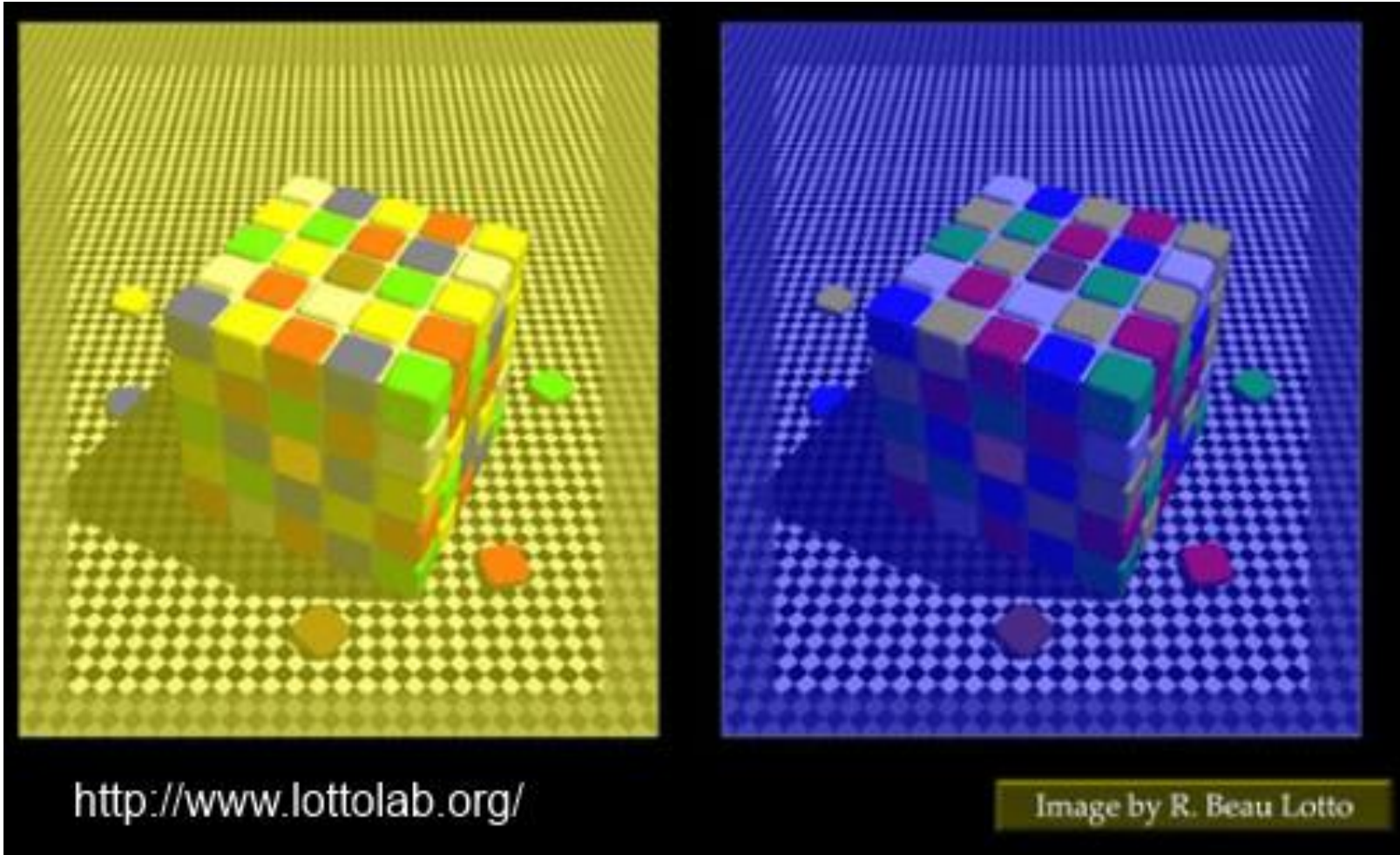
- Have been considering *interactive* applications
  - Real-time updates of the graphical environment
  - Prerequisite for interaction
- Human Computer Interaction (HCI)
  - Goes well beyond this
  - Design and use of computer technology
  - Computer science, behavioural sciences, design, media, etc



# User Studies

- Relevant to systems that have components that interact with users
- Bring in human participants
- Get them to use the interface
- Use their feedback to elicit requirements and guide design
- Evaluate whether solution is fit for its purpose
- **Put the user, rather than the system, at the center of the process**

# Human Perception



# When a UI Goes Wrong

- Example: *Three Mile Island* accident
- Poorly designed UI partially to blame



# User Interfaces

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- Graphical user interfaces
- Voice user interfaces
- Others:
  - The human body?

# User Interfaces

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# Human Body



Minority Report, Twentieth Century Fox Film Corporation

# Affective computing

- Which affective states are of relevance for a specific application?
  - Design problem
- From a machine's perspective, use this information to decide whether and how to:
  - Start interaction
  - Continue interaction
  - Improve interaction



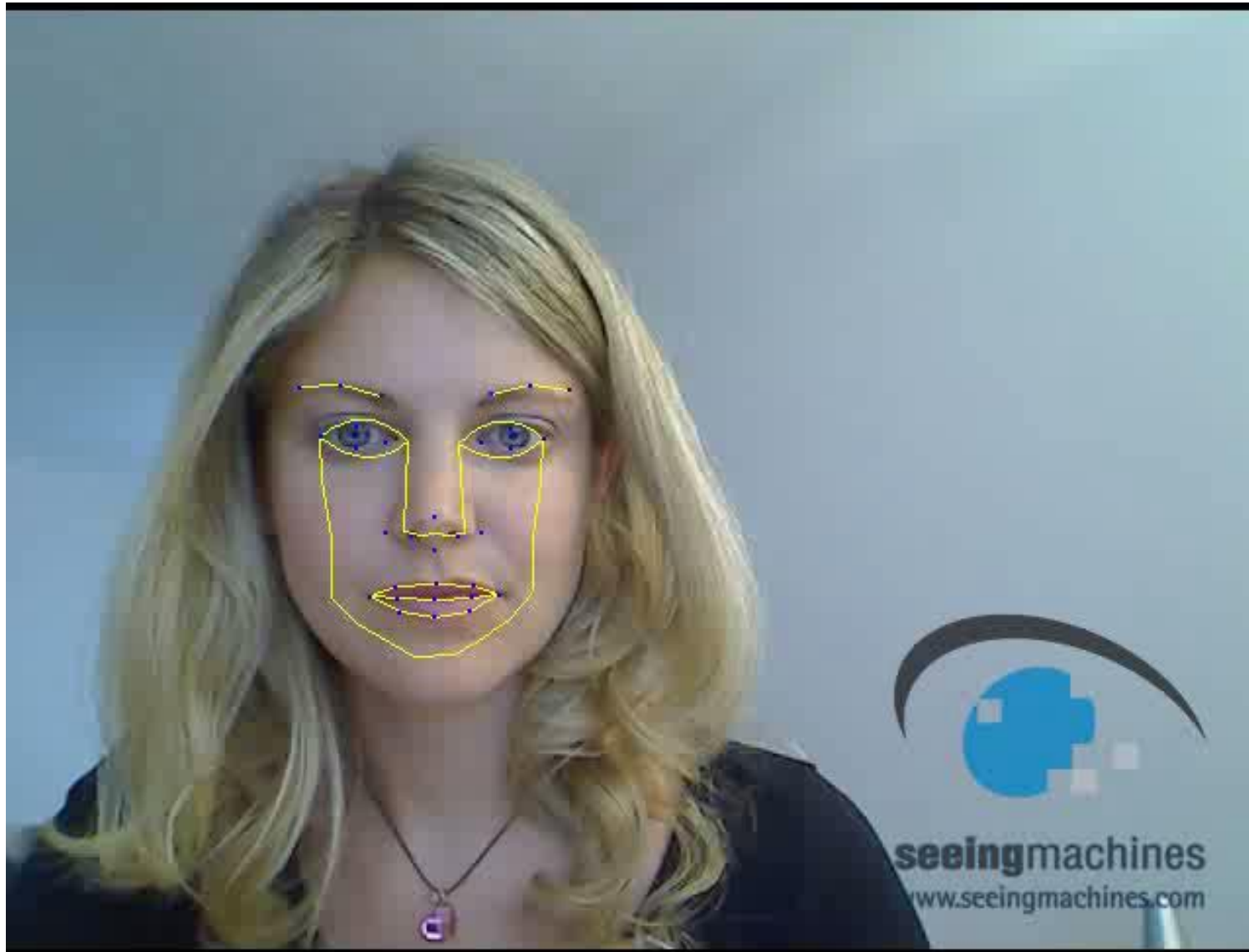
# The Human Face



From Pantic & Bartlett, 2007



# The Human Face



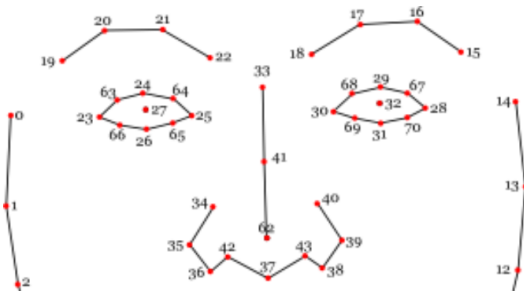
# The Human Face

## clmtrackr

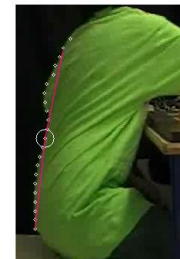
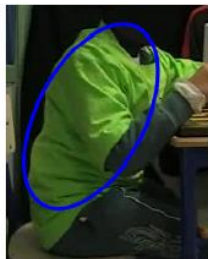
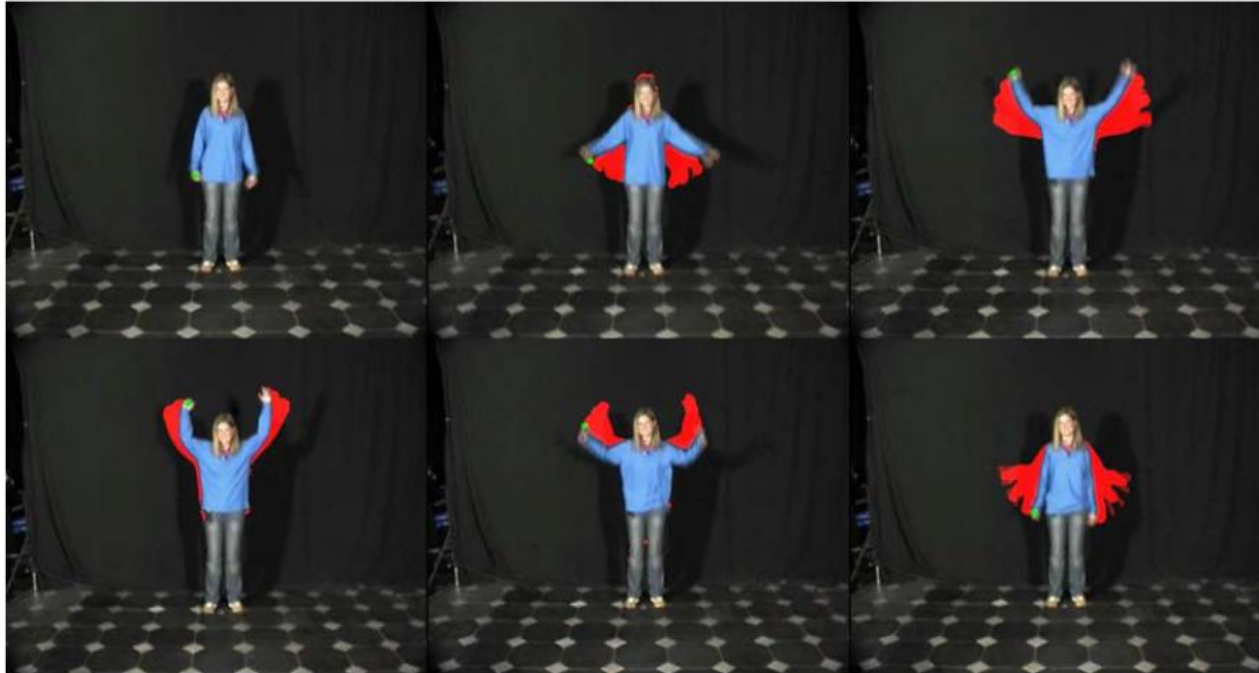
npm v1.1.2



**clmtrackr** is a javascript library for fitting facial models to faces in videos or images. It currently is an implementation of *constrained local models* fitted by *regularized landmark mean-shift*, as described in [Jason M. Saragih's paper](#). **clmtrackr** tracks a face and outputs the coordinate positions of the face model as an array, following the numbering of the model below:



# The Human Body



From Sanghvi et al., 2010

# The Human Body

Research Centre scientific and technological research / artistic research and creation / international education

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**EyesWeb**  
Datasets

Mappa del sito



## THE EYESWEB PROJECT

EyesWeb is an open software research platform for the design and development of real-time multimodal systems and interfaces.

### Description

EyesWeb is an open platform to support the design and development of real-time multimodal systems and interfaces. It supports a wide number of input devices including motion capture systems, various types of professional and low cost videocameras, game interfaces (e.g., Kinect, Wii), multichannel audio input (e.g. microphones), analog inputs (e.g. for physiological signals). Supported outputs include multichannel audio, video, analog devices, robotic platforms. Various standards are supported, including OSC, MIDI, FreeFrame and VST plugins, ASIO, Motion Capture standards and systems (Qualisys), Matlab. EyesWeb supports real-time synchronized recordings of multimodal channels, and includes a number of software libraries, including the Non-Verbal Expressive Gesture Analysis and the Non-Verbal Social Signals Analysis libs. Users can develop proprietary software libs using the EyesWeb development environment. The EyesWeb software includes a development environment, a distributed run-time system (supporting Windows, Linux, and mobile platforms) to create distributed or networked real-time applications, and an open set of libraries of reusable software components. The development environment supports the design process of multimodal interactive systems, enabling users to build systems by means of a visual programming language, which presents some analogies with computer music languages inspired to analog synthesizers or to software systems like Simulink. EyesWeb is conceived, designed and developed by InfoMus Lab. The EyesWeb project started in 1997, as a natural evolution of the HARP Project. The current release of the open software platform is EyesWeb XMI (eXtended Multimodal Interaction). The EyesWeb software platform has been adopted in EU projects in the 5th, 6th and 7th Framework Programme (ICT), and by thousands of users worldwide for scientific research, education, and industry applications. For example, EyesWeb was selected by INTEL in 2008 for their hardware for "independent living", and was adopted at the New York University Summer Program on "Music, dance and new technologies" (2004 - 2006).

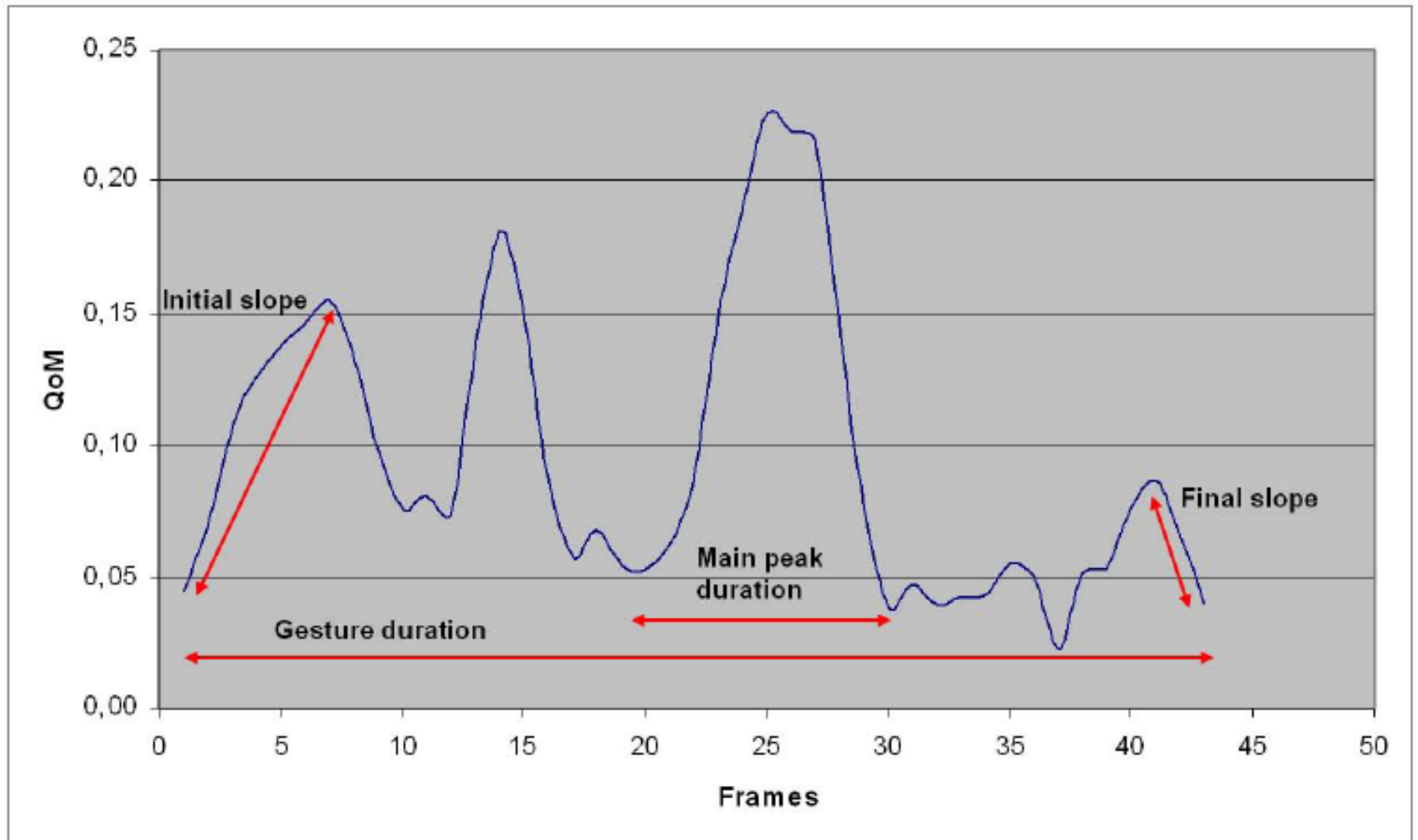
### Downloads:

By downloading any of the software below you agree with the [license agreement](#). |

DIBRIS - Dipartimento di  
Informatica, Bioingegneria,  
Robotica e Ingegneria dei Sistemi



# Expressivity Dynamics





# Databases of affective expressions

- Many corpora and databases contain posed expressions
  - Currently shift to collection of naturalistic data
- Examples of publicly available databases with visual modality include:
  - Cohn-Kanade
    - (Kanade et al., 2000)
  - MMI database
    - (Pantic et al., 2005)
  - FABO database
    - (Gunes & Piccardi, 2006)
  - Mind Reading DVD
    - (Baron-Cohen et al., 2004)



From Gunes & Piccardi, 2009

# User Interfaces

- Computer
- Mouse
- Keyboard
- Pens and tablets
- Graphical user interfaces
- Voice user interfaces
- Others:
  - The human body?
  - Artificial bodies?

# Social Machines

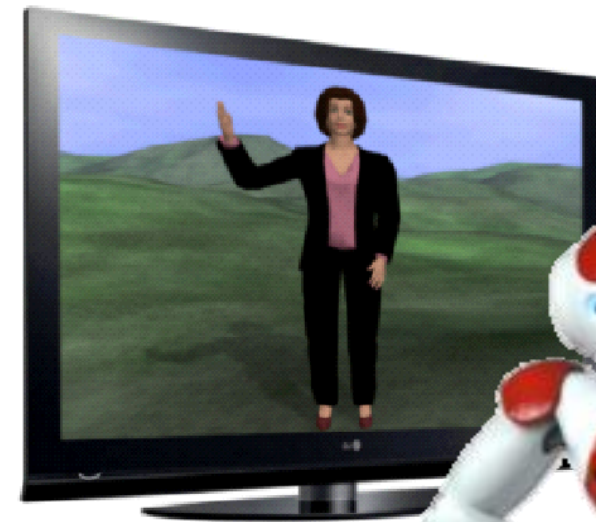
**Robonaut 2,  
NASA**



**Asimo, Honda**



**Greta, ParisTech**



**Nao, Aldebaran  
Robotics**



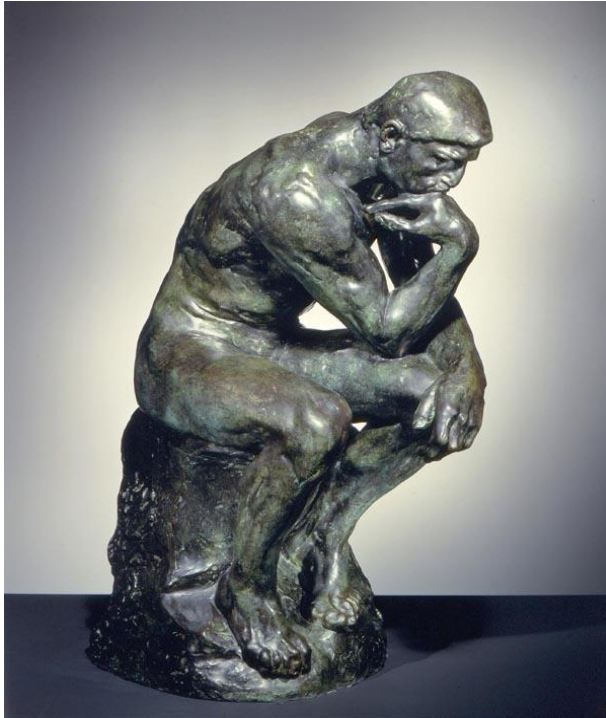


# Moravec's Paradox

*“...comparatively easy to make computers exhibit adult level performance on intelligence tests ... difficult or impossible to give them the skills of a one-year old when it comes to perception and mobility.”*

Moravec 1988

## Easy (-ish)



- Logic
- Algebra
- Chess

## Hard (!)



- Play golf
- Spot a bear in the woods
- Run (or even walk) away without falling

# Advances in mobility



**Big Dog, Boston Dynamics**

# Advances in mobility



**Big Dog, Boston Dynamics**



# Advances in mobility

Functional

*But scary!*



**Big Dog, Boston Dynamics**

# Expressive Behaviour



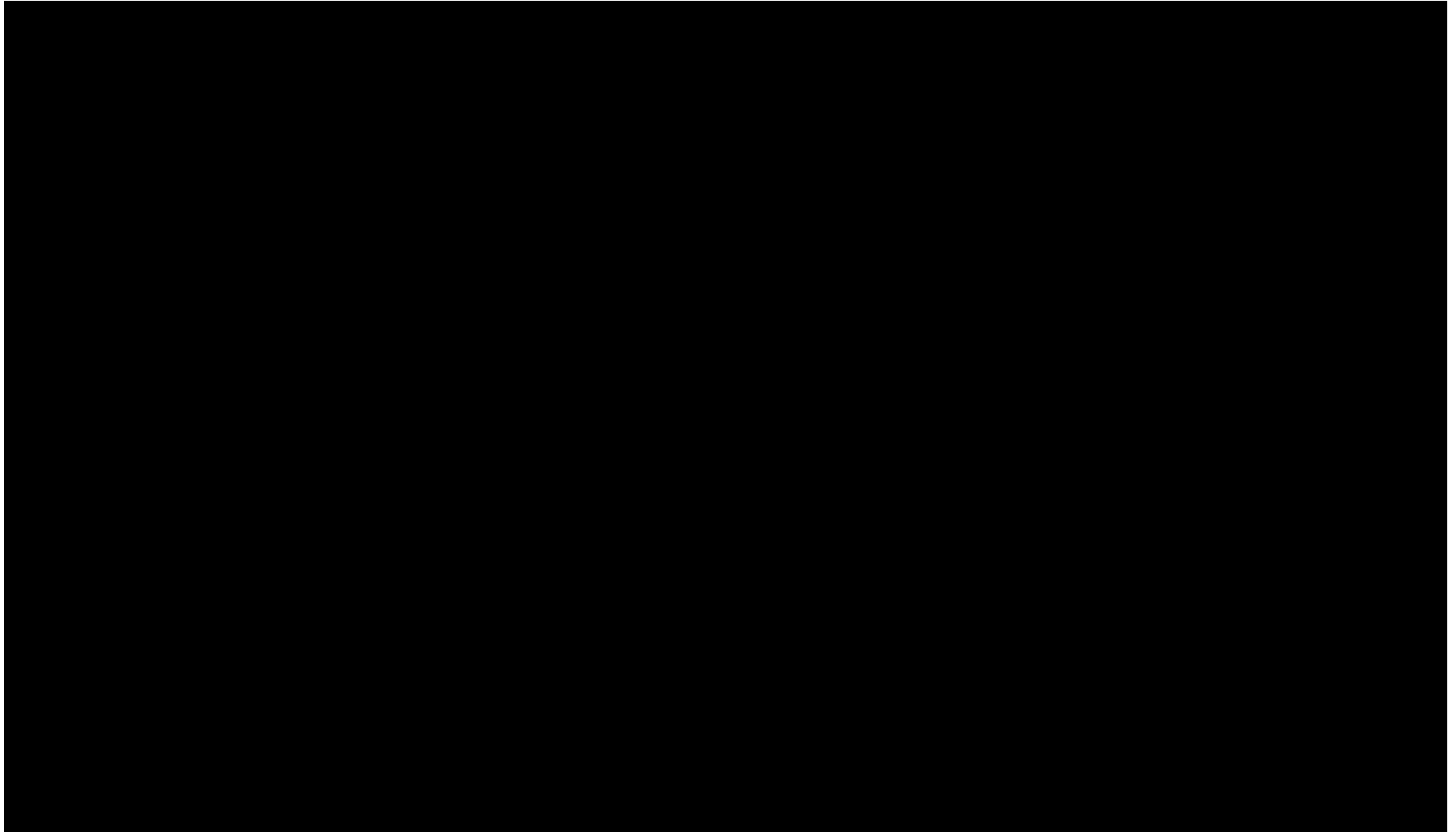
EMYS, University of Wroclaw, Poland  
INESC ID, Portugal





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OF TECHNOLOGY

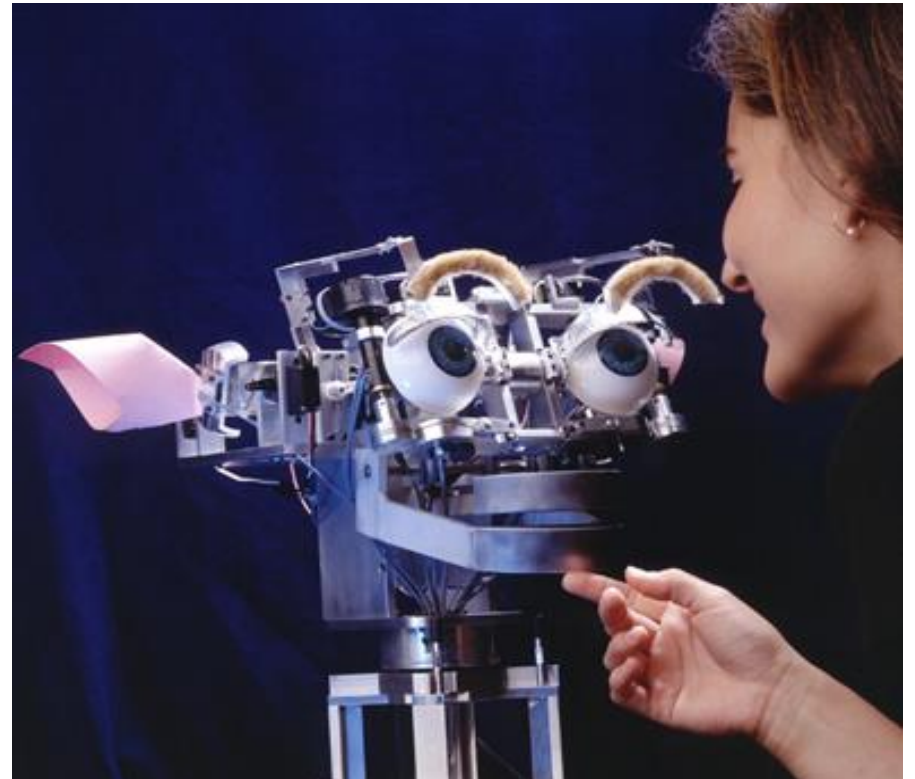
# Expressive Behaviour





# Social machines

- Affective and social intelligence in human-computer and human-robot interaction
- Social perception
  - Analysis of social, affective behaviour
  - Focus on
    - Computer vision-based techniques
    - Non-verbal behaviour



From <http://web.media.mit.edu/~cynthiab/>



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# Expressive Behaviour

TEACHING ROBOTS AS  
A COLLABORATIVE DIALOG

Robotic Life Group  
MIT Media Laboratory

# Expressive Behaviour



# Virtual characters

Computer graphics and animation

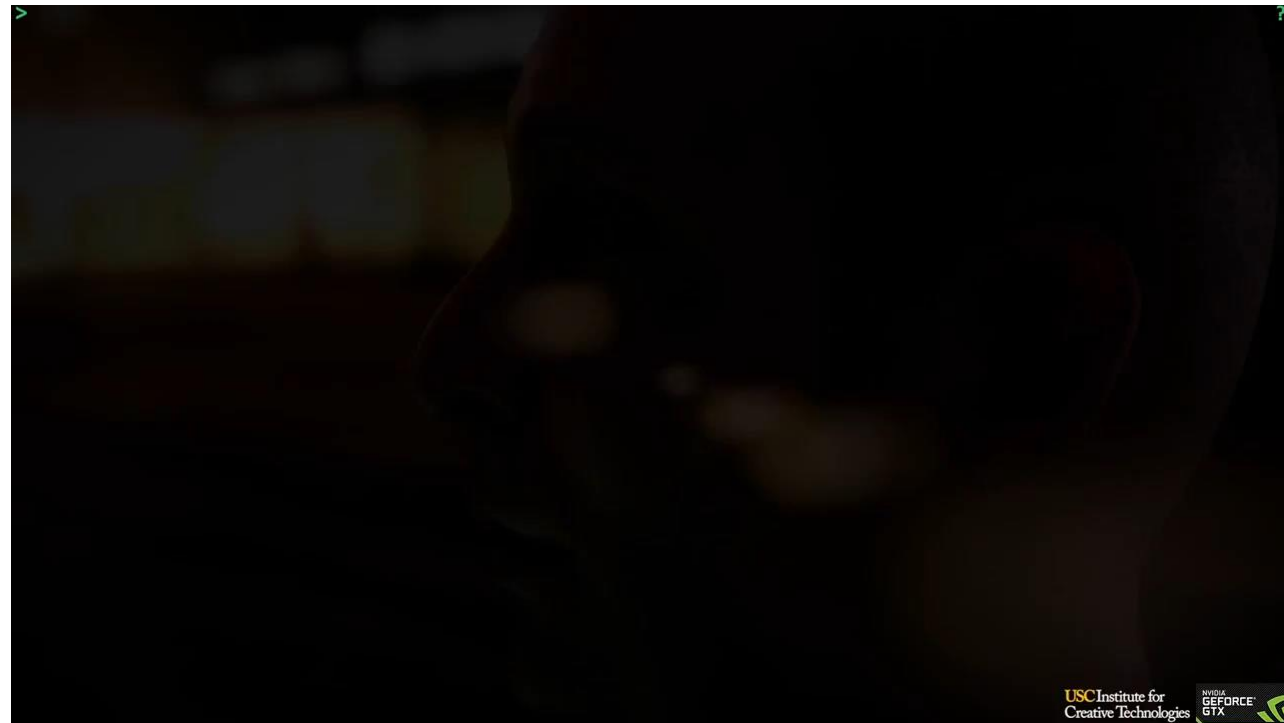
Animation → AI, ALife

Many overlaps with social and mobile robotics

- One to one interaction
- Crowd/swarm simulation

Embodiment raises many interesting issues

Virtual models: cheap



# KTH Social SUDOA

COMPUTER GRAPHICS AND  
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⌵ ⌴ Min/Max

## SUDOA

Information specific to SUDOA 2018 (for Stockholm University students)

### Relevant lectures

[SUDOA HCI Introduction 16th May](#), 13:00-15:00, B2

**TBA 21st May**, 08:00-10:00, D2

Last year's topic by [Catharine Oertel](#): [Intelligent virtual agents](#)

### Assignment

Write a three page report in English using the [Latex](#) document preparation system on a topic of your choice related to HCI.

### Examples

Three examples follow. Many more are possible.

1) Report on a topic of your choice from the lecture series on Interactive virtual agents and robots. Do some further research into the area and reflect on how it could be of importance to your continuing studies or how it may impact society. Example paper [here](#).

2) Review a single paper from a conference such as [CHI](#) (Computer Human Interaction). Note that in this case, you are reviewing the paper itself in terms of its writing style clarity, content, novelty and so on. In terms of personal reflection, you may consider how your analysis has benefited your writing style, structure or perhaps even the report itself.

3) Review a technique of interest to you from a single paper from a conference such as [CHI](#) (Computer Human Interaction). Note that this is different from 2) above, since you are not analysing the paper, but the approach documented in the paper. In this case, you could reflect on why the approach is of relevance to

# Assessment

Write a **three page** report using *Latex*  
*<https://www.latex-project.org/>*

A topic of your choice related to HCI

Example:

Participate in a user study and report on  
the procedure and research area

Submission deadline: Monday 28<sup>th</sup> May

Canvas is now open for your submissions

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# Next Lecture

21st May, 08:00-10:00, D2

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