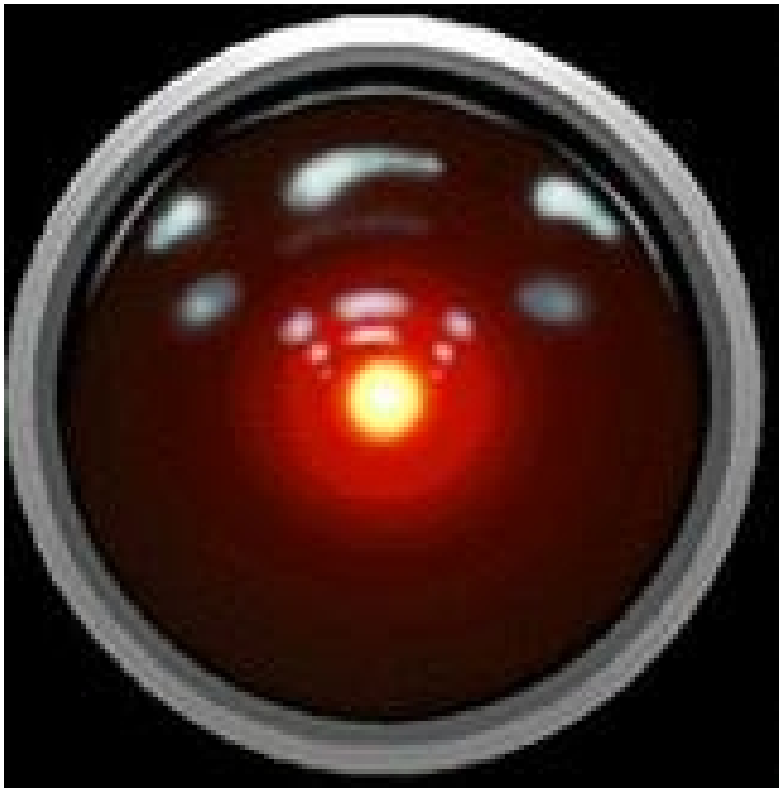


CS 378: Autonomous Intelligent Robotics

Instructor: Jivko Sinapov

http://www.cs.utexas.edu/~jsinapov/teaching/cs378/

Affective Computing and Human-Robot Interaction

Announcements

FRI Survey – please take the time to respond

Announcements

My own end-of-semester survey:

http://goo.gl/forms/rOmW8o4d6I

Announcements

Final Projects Presentation Date:

Thursday, May 12, 9:00-12:00 noon

Final Project Presentations

- 8-10 minutes talk + 5 min time for questions
- Video or Demo
- Location: Conference room next to BWI lab
- Rehearse your presentation before!

Project Report Structure / Outline

- Abstract
- Introduction
- Background and/or Related Work
- Technical Approach
- Experiments and/or Evaluation and/or Example Demonstration
- Conclusion and Future Work

Project Deliverables

- Final Report (6+ pages in PDF)
- Code and Documentation (posted on github)
- Presentation including video and/or demo
- Post in discussion forum on Canvas

Presentation Schedule

- TO DO

A little bit about next semester...

- New robots: robot arm, quadcopter
- Virtually all of the grade will be based on a project
- There will still be some lectures and tutorials but much of the class time will be used to give updates on your projects and for discussions

Affective Computing and Human-Robot Interaction

Main Reference

Picard, Rosalind Wright. "Affective Computing." (1995). APA

http://affect.media.mit.edu/pdfs/95.picard.pdf

What is “Affective Computing””?

Affective computing is the study and development of systems and devices that can recognize, interpret, process, and simulate human affects. It is an interdisciplinary field spanning computer science, psychology, and cognitive science.

- Wikipedia

Simple affective computing

- Automatic Flatterer

- http://www.cse.unsw.edu.au/~geoffo/humour/flattery.html

Unfortunately this is not always the case

Unfortunately this is not always the case

BIG PICTURE

We're building a dream, one robot at a time.

The dream was simple. Design a robot that, one day, could duplicate the complexities of human motion and actually help people. An easy task? Hardly. But after more than 15 years of research and development, the result is ASIMO, an advanced robot with unprecedented human-like abilities. ASIMO walks forward and backward, turns corners, and goes up and down stairs with ease. All with a remarkable sense of strength and balance.

The future of this exciting technology is even more promising. ASIMO has the potential to respond to simple voice commands, recognize faces, carry loads and even push wheeled objects. This means that, one day, ASIMO could be quite useful in some very important tasks. Like assisting the elderly, and even helping with household chores. In essence, ASIMO might serve as another set of eyes, ears and legs for all kinds of people in need.

All of this represents the steps we're taking to develop products that make our world a better place. And in ASIMO's case, it's a giant step in the right direction.

HONDA

The power of dreams.


ICRA 05
Barcelona

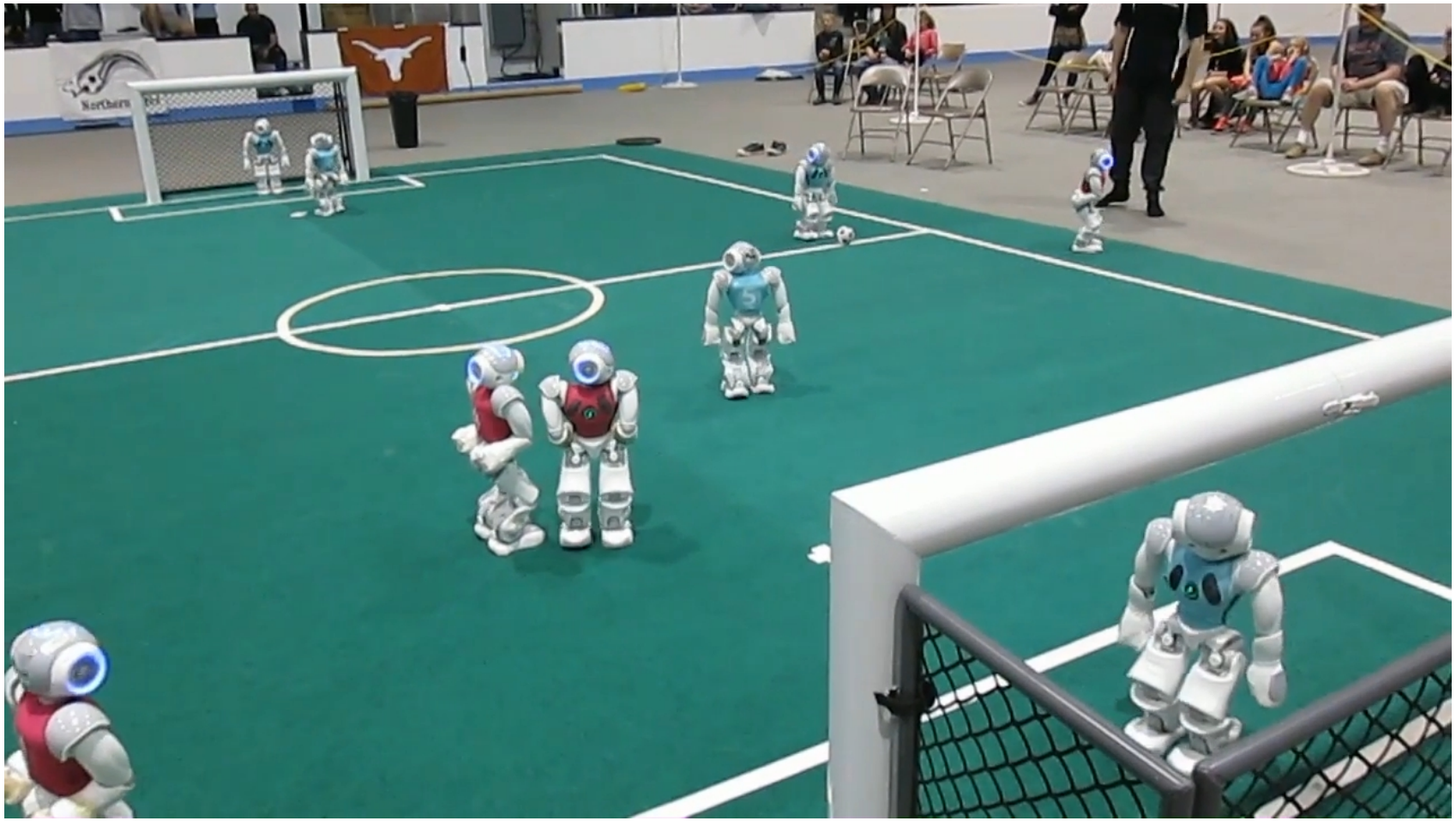
We already have robots in our homes like this vacuuming robot

[Romba, iRobot Inc.]

Entertainment Robots

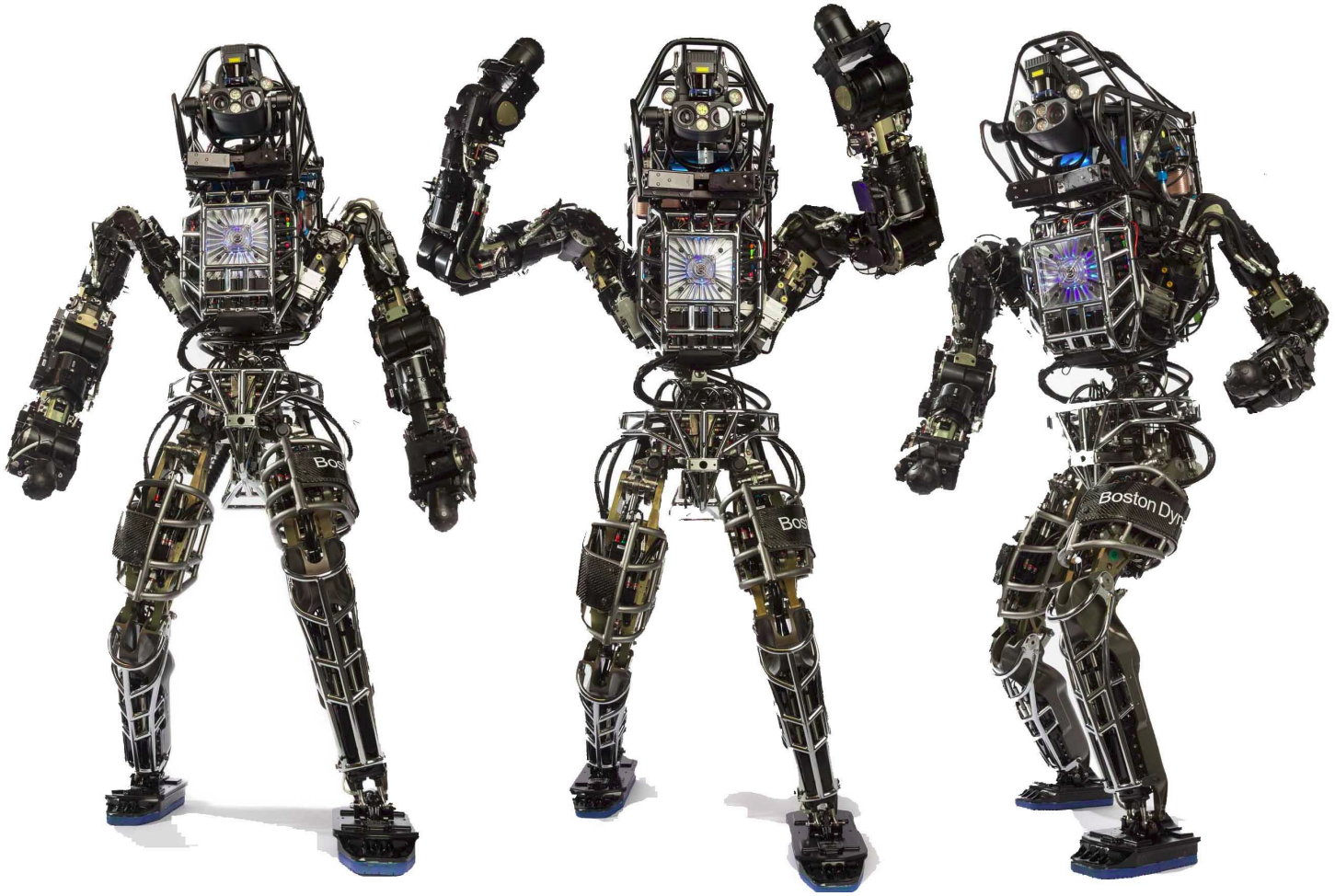
[Sony]

Robot Soccer

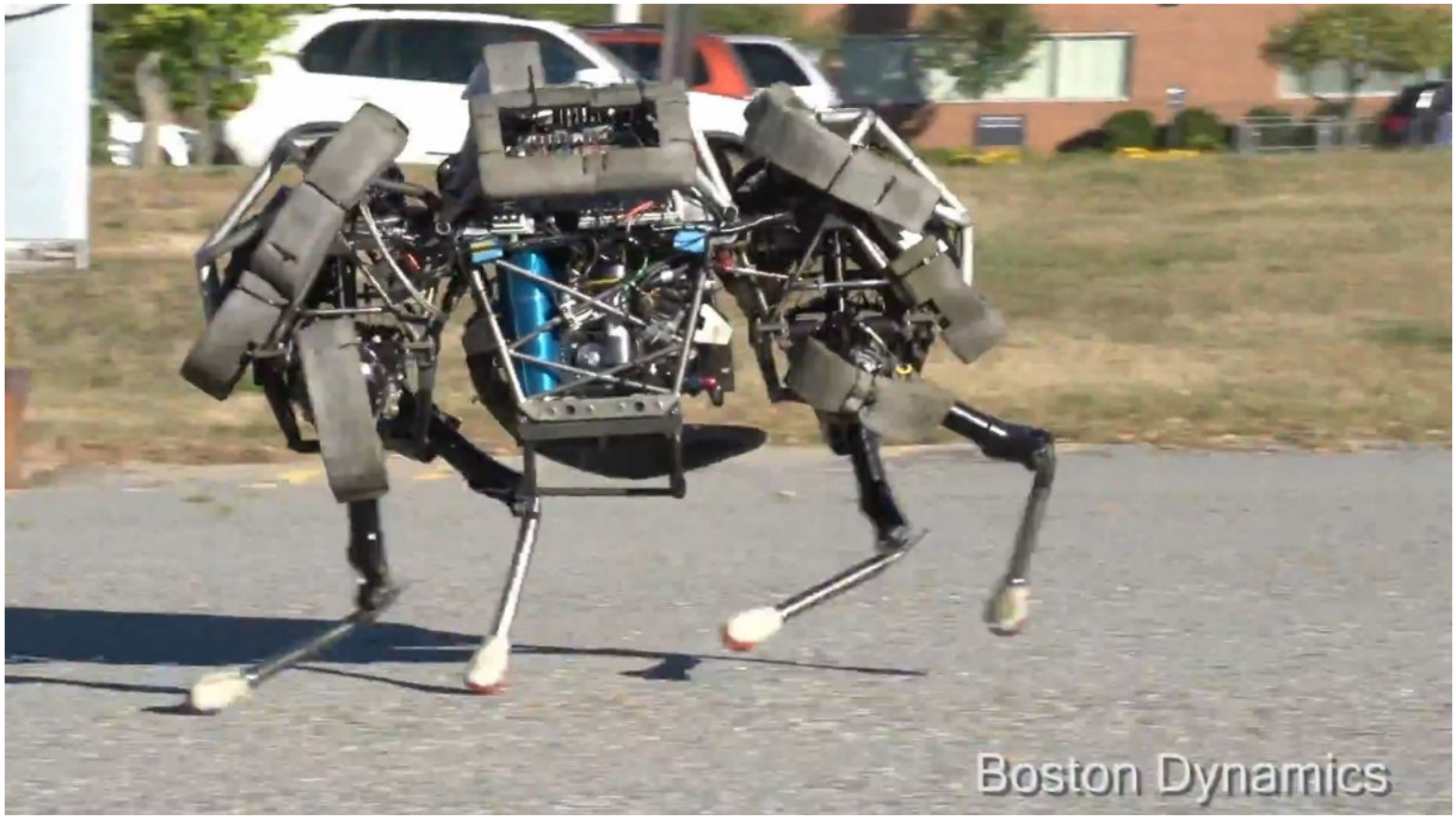


Robot Boxing

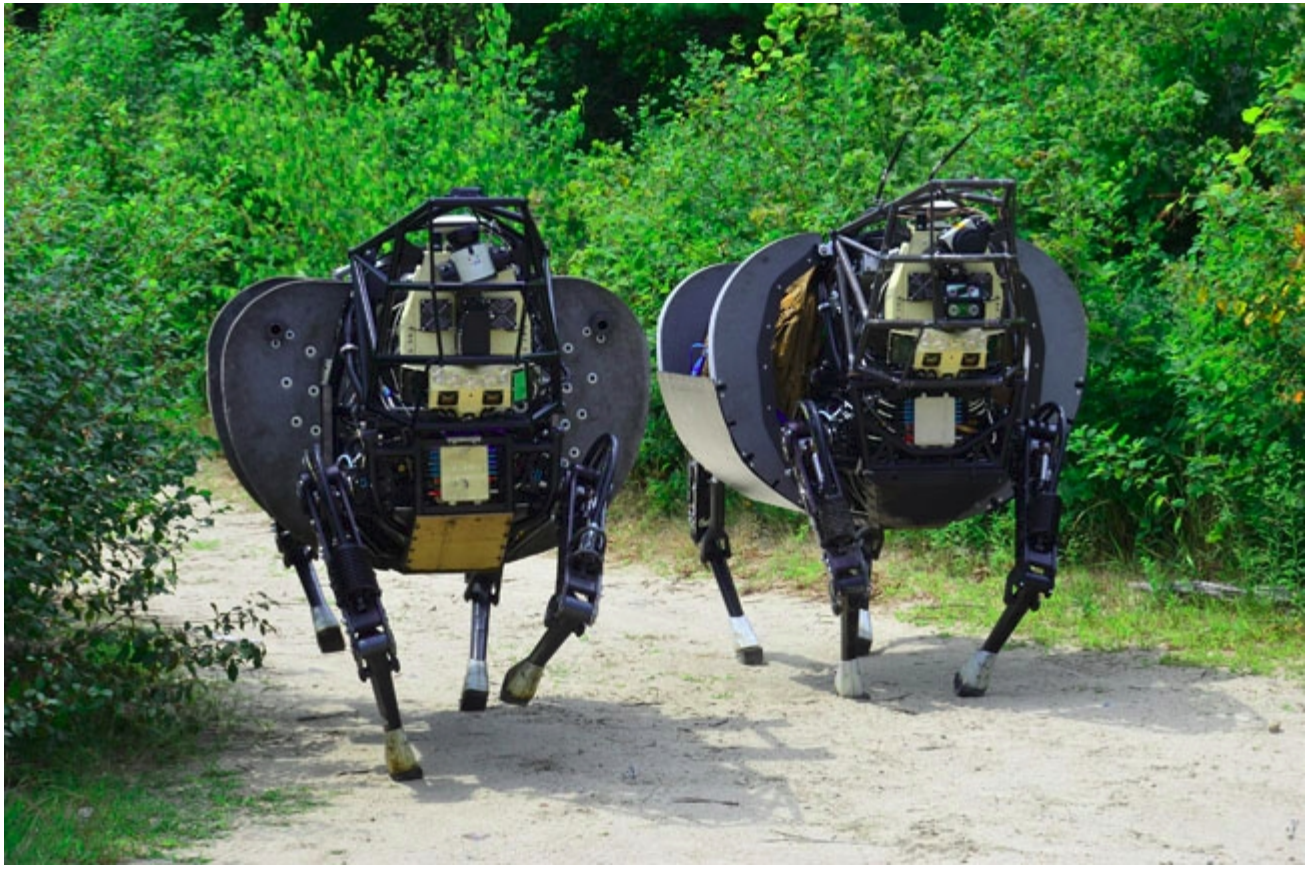
Military Robots



Military Robots



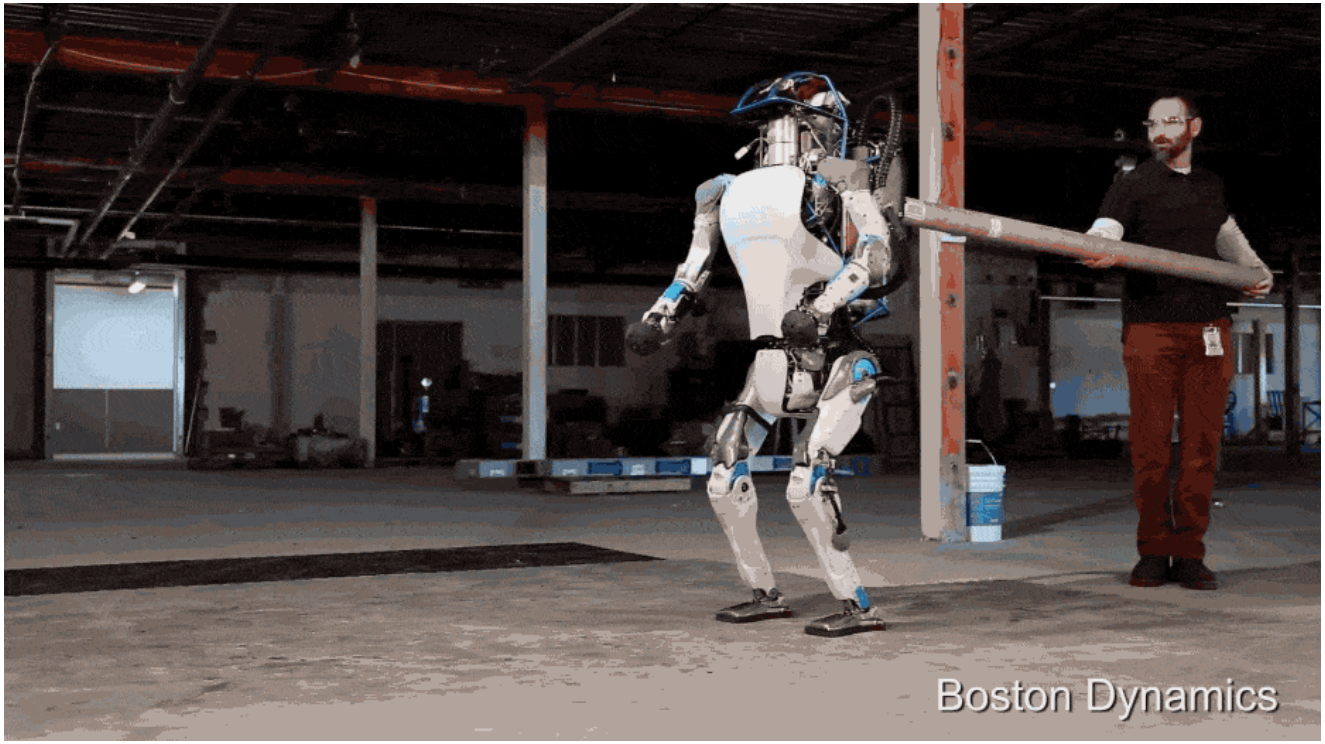
Military Robots



Military Robots

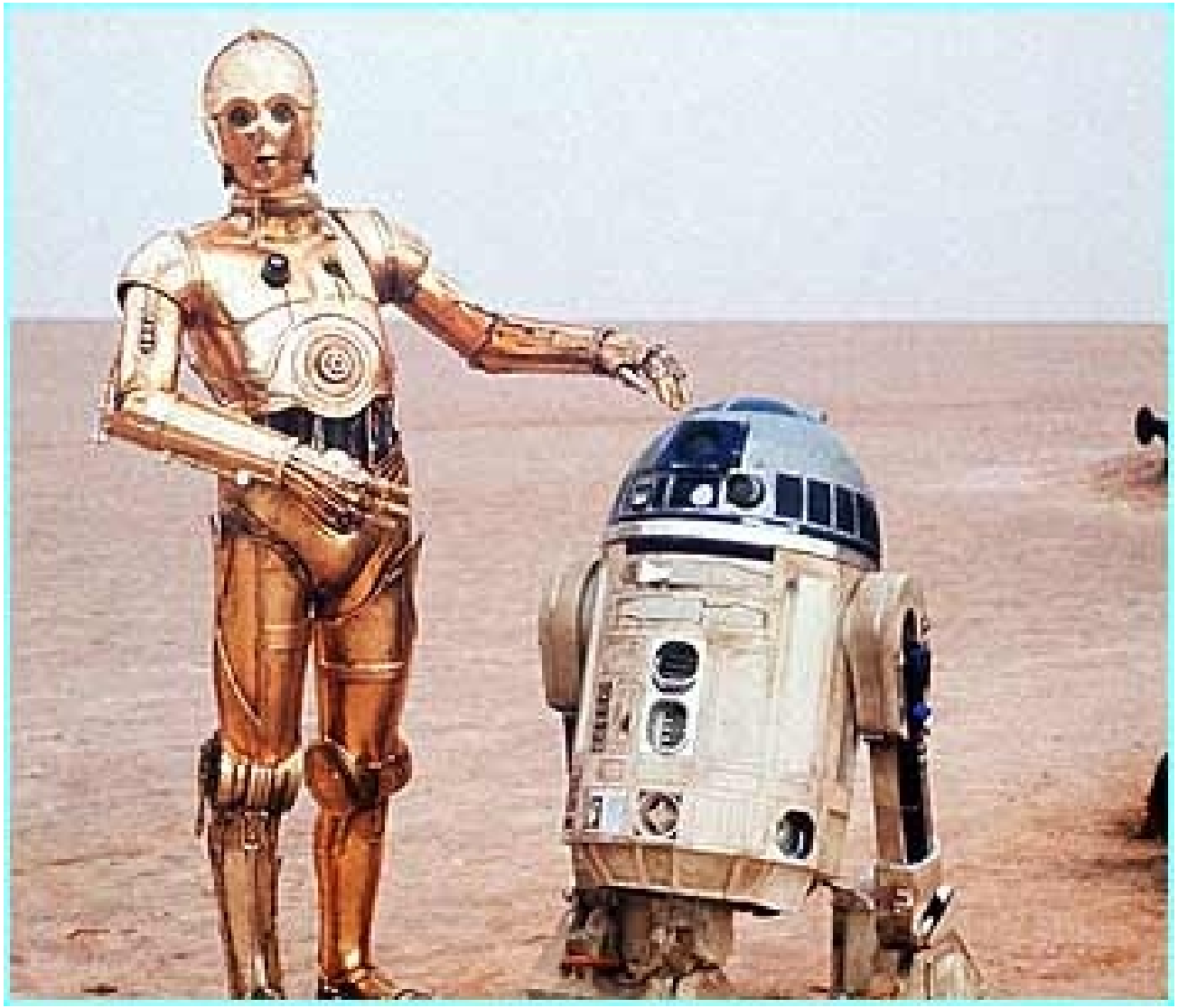
Military Robots

Military Robots



Military Robots

Science Fiction Robots



Honda’s Asimo

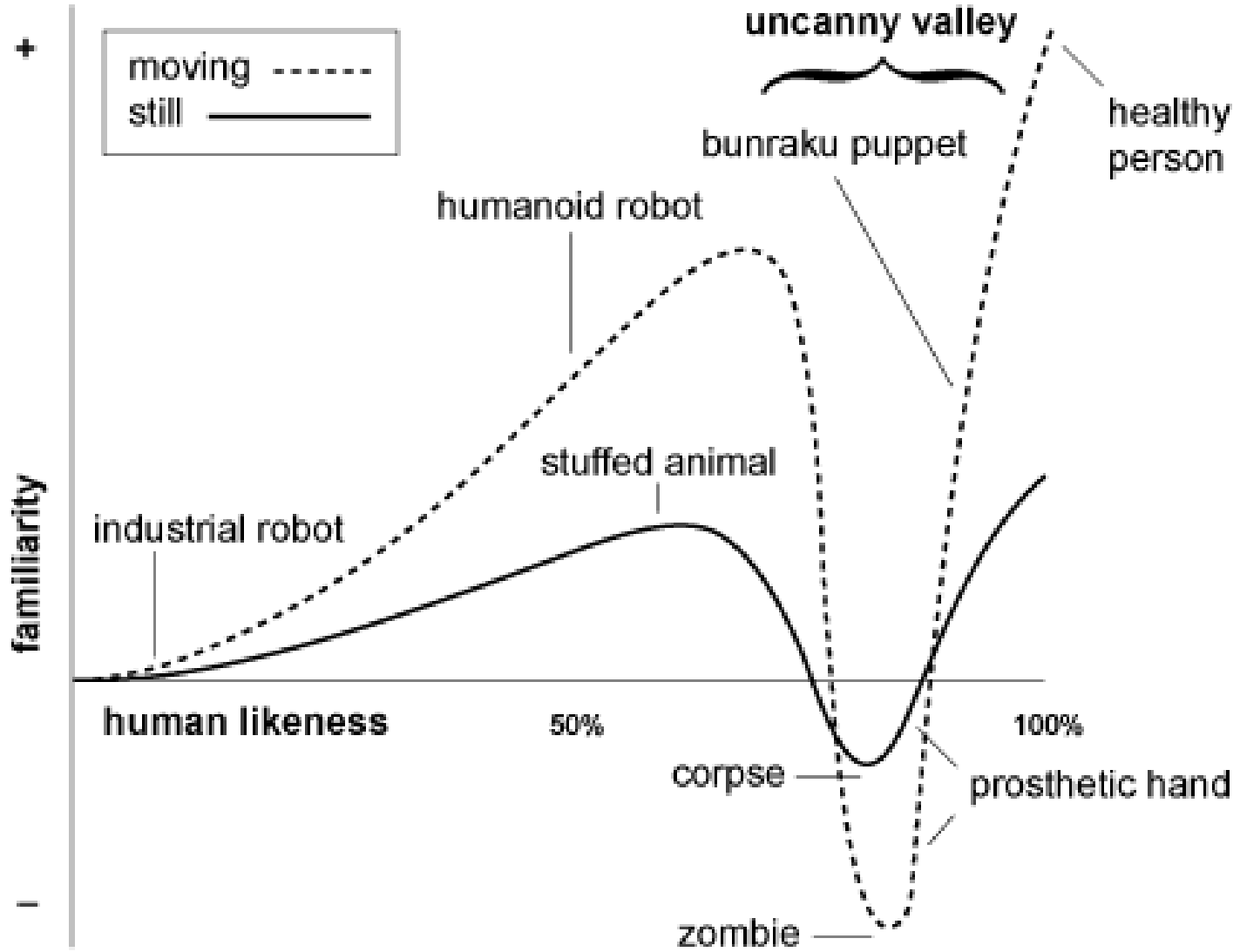
Honda’s Asimo

Androids and Geminoids

[University of Osaca]

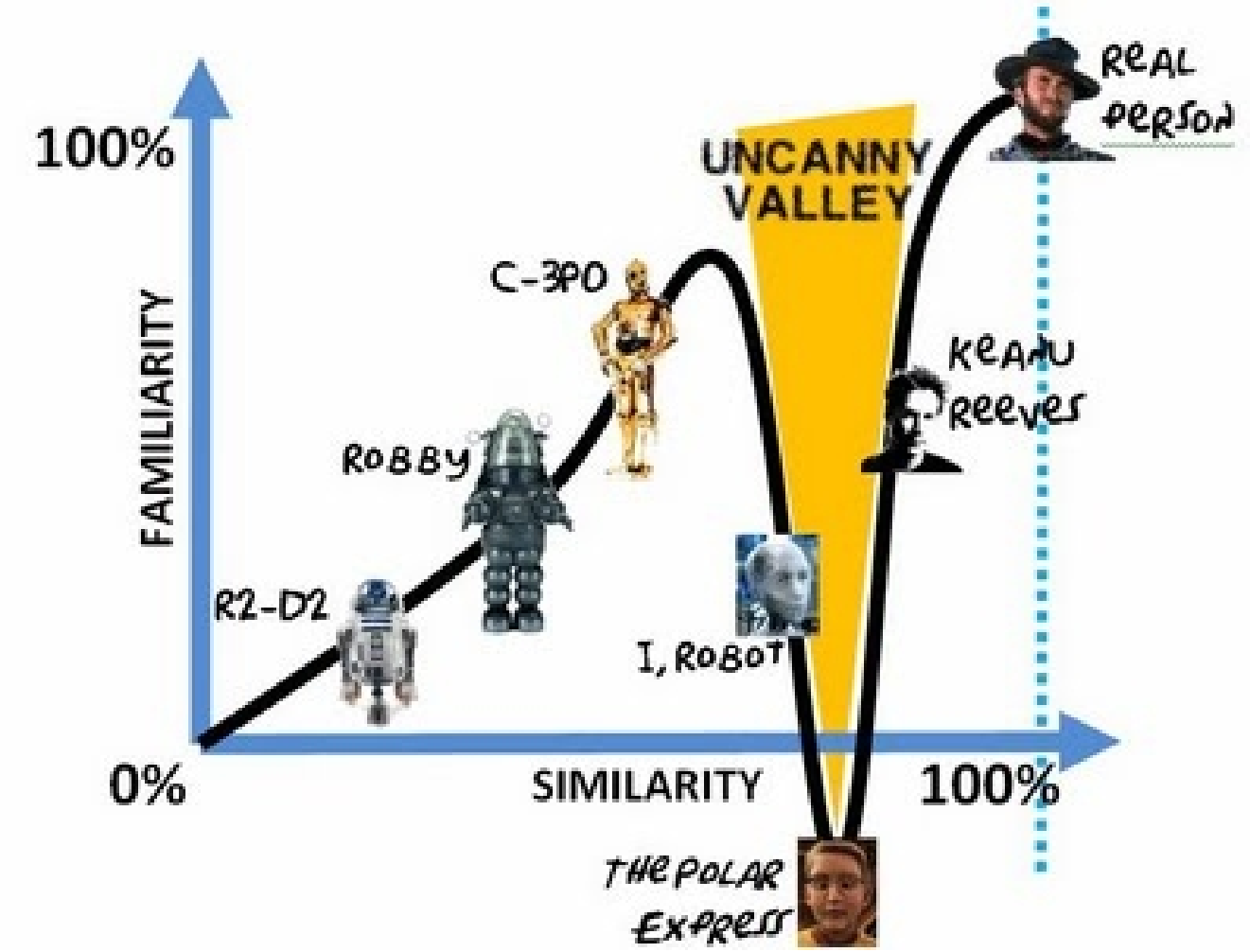
Androids and Geminoids

Uncanny Valley



[http://en.wikipedia.org/wiki/Uncanny_Valley]

Uncanny Valley



http://4.bp.blogspot.com/_Q-VuyJsLVSk/SsTE3EqFtcI/AAAAAAAAAEI/0UrogiOX6Fg/s400/uncnany+valley.JPG

[http://www.technovelgy.com/ct/Science-Fiction-News.asp?NewsNum=2345]

Uncanny Valley

“Emotional response of human subjects is plotted against anthropomorphism of a robot, following Mori's results. The Uncanny Valley is the region of negative emotional response for robots that seem "almost human". Movement amplifies the emotional response.“

[http://en.wikipedia.org/wiki/Uncanny_Valley]


CONTENT
EXPO


YS24X
YS24

Robotic Bride?

Robotic Bride?

" I never realised that cybersex could be so much fun ! "

THE EVOLUTION OF

HUMAN-ROBOT RELATIONSHIPS

LOVE + SEX WITH ROBOTS

DAVID LEVY

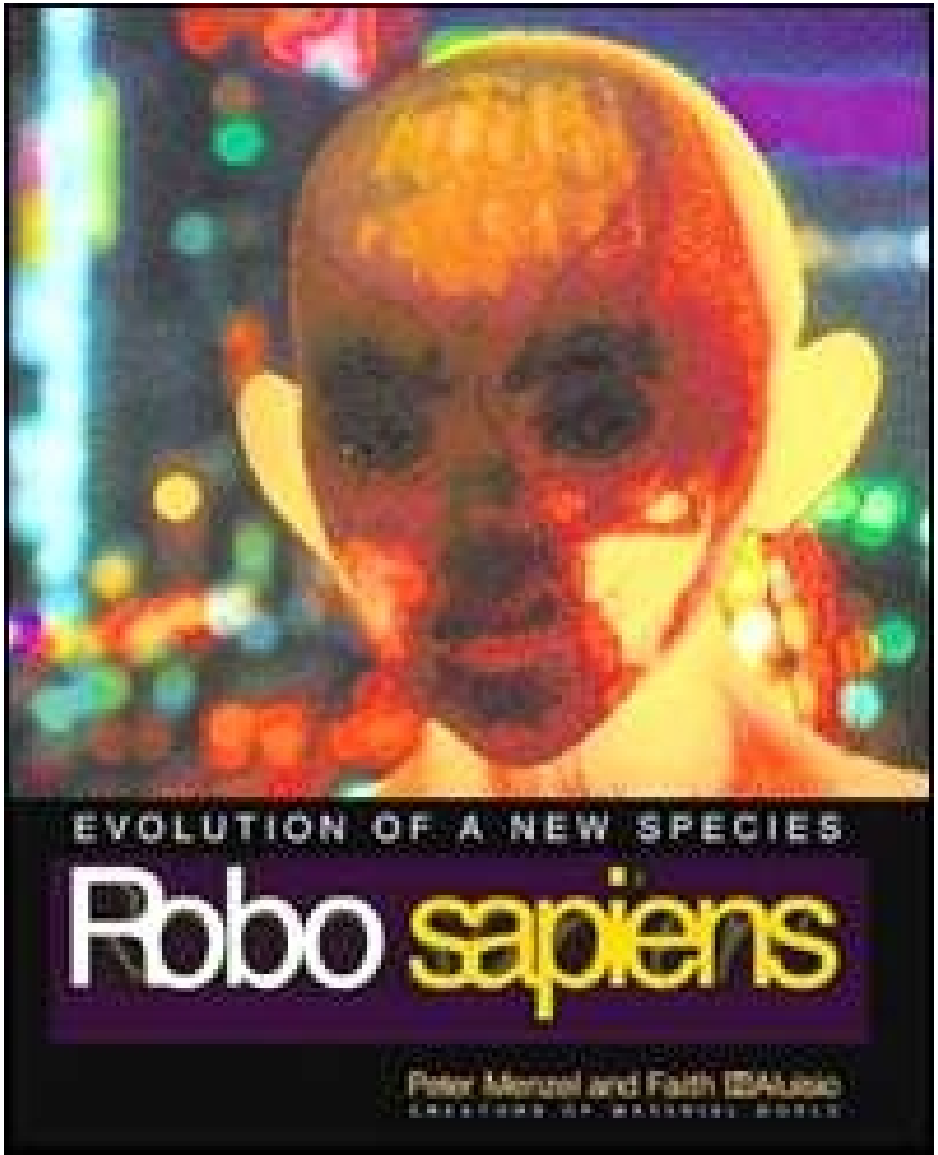
"[A] controversial and troublingly arousing book." —USA Today

Copyrighted material


THE WIVES OF STEPFORD HAVE A SECRET
The Stepford Wives
NICOLE KIDMAN
MATTHEW BRODERICK
BETTE MIDLER
CHRISTOPHER WALKEN
FAITH HILL
AND GLENN CLOSE
StepfordWives.com
IN THEATRES JUNE 11

[From “AI” the movie, Steven Spielberg]

For more info and some great pictures check out

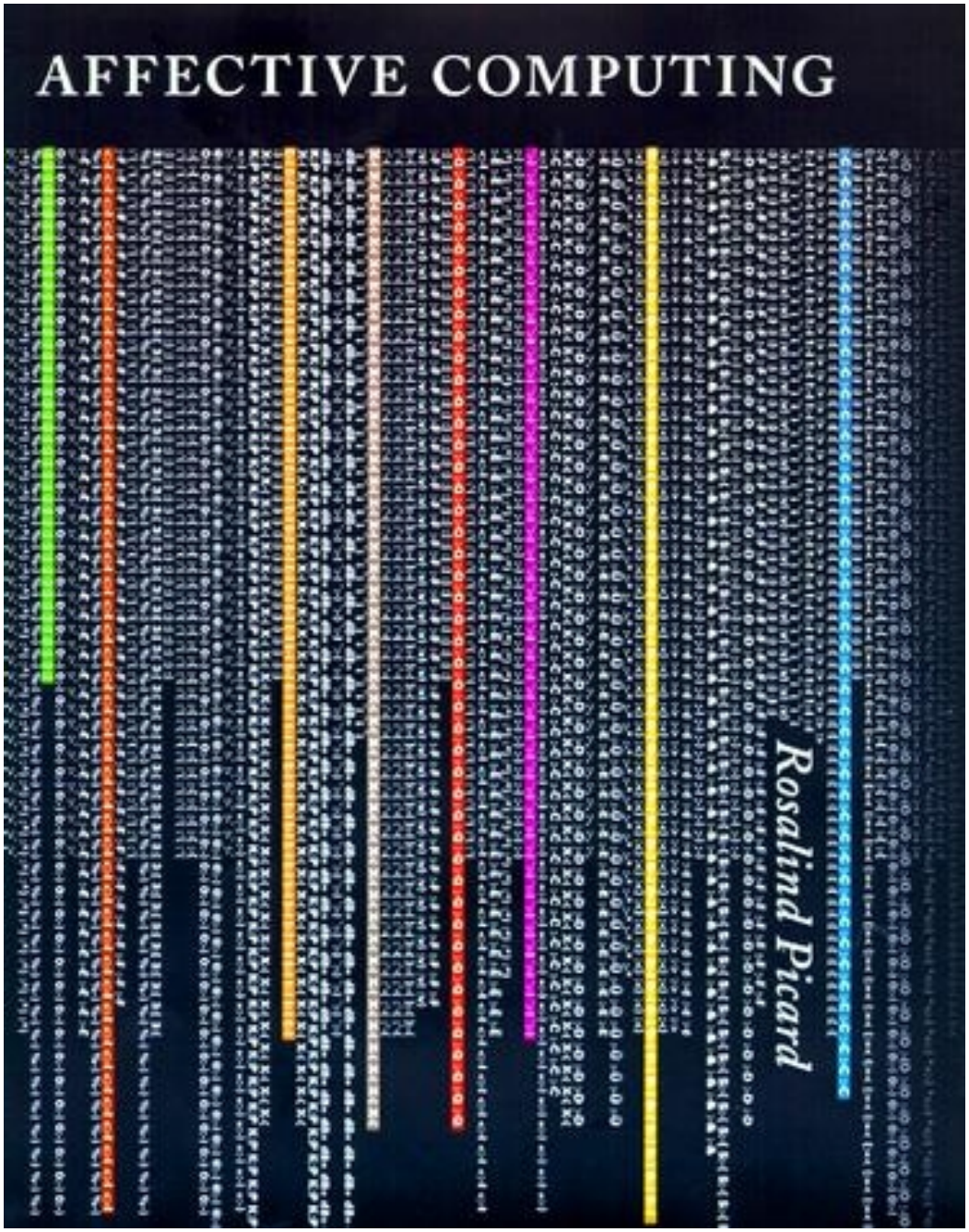


DESCARTES' ERROR

Emotion, Reason, and the Human Brain

"Antonio Damasio is a profound thinker and an elegant writer... *Descartes' Error* is a fascinating exploration of the biology of reason and its inseparable dependence on emotion."
—Oliver Sacks, author of *An Anthropologist on Mars*

ANTONIO R. DAMASIO

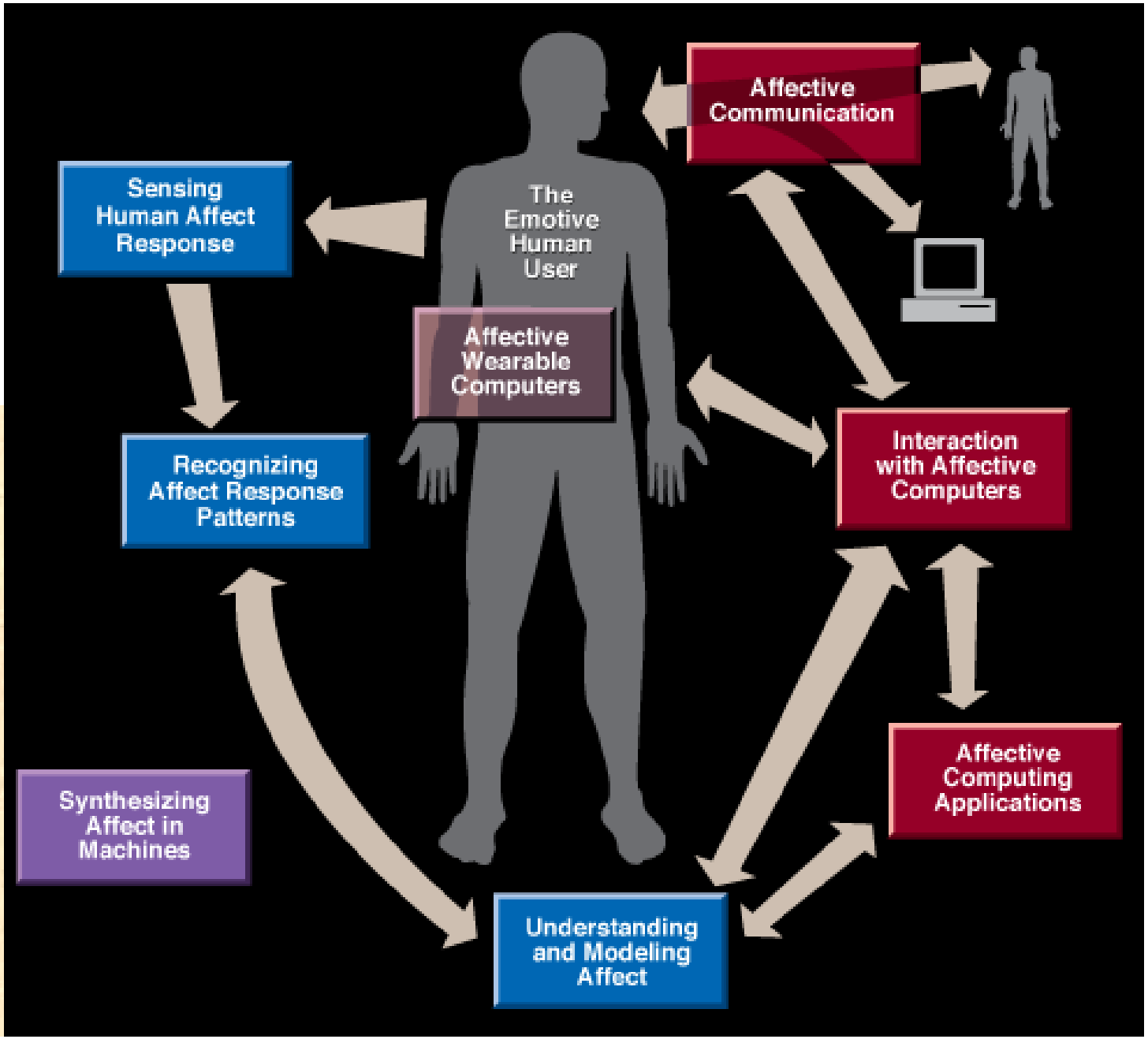

AFFECTIVE COMPUTING
Rosalind Picard

Why do you think these toys were so popular?

[Furby]

[Tomagotchi]

Why do you think this car is so popular?



[http://www.agent.ai/img/upload/200312/AffectiveComputing_rendszer.jpg]

Sensing Human Affect Response

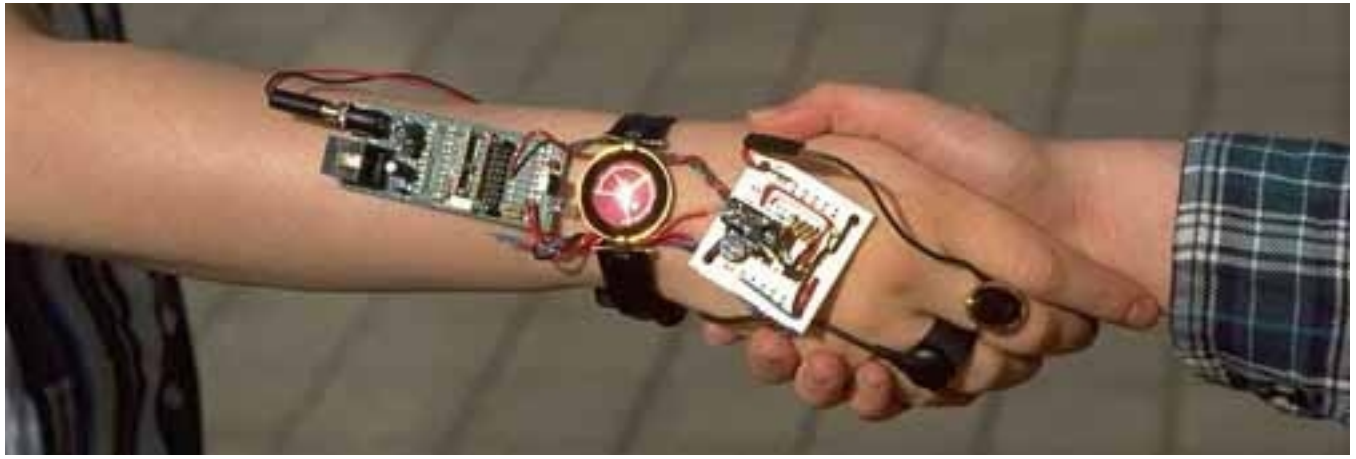
- Brain patterns
- Autonomic nervous system affecting body:
  - Blood pressure
  - Blood flow
  - Sweating
  - ...
- Facial expression
- Voice intonation
- Body posture
- Skin color

} communication

Affective Computing (Rosalind Picard, MIT)

Blood Volume Pressure (BVP) earring

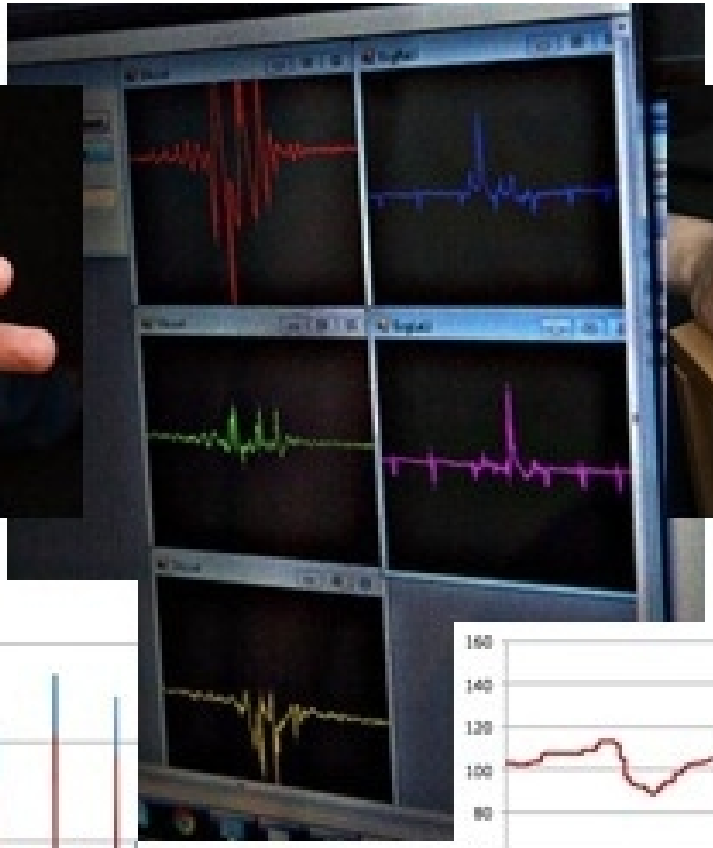
Galvanic Skin Response (GSR) rings and bracelet

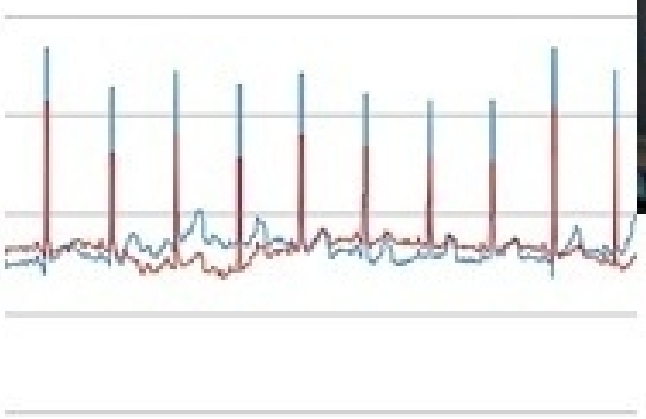


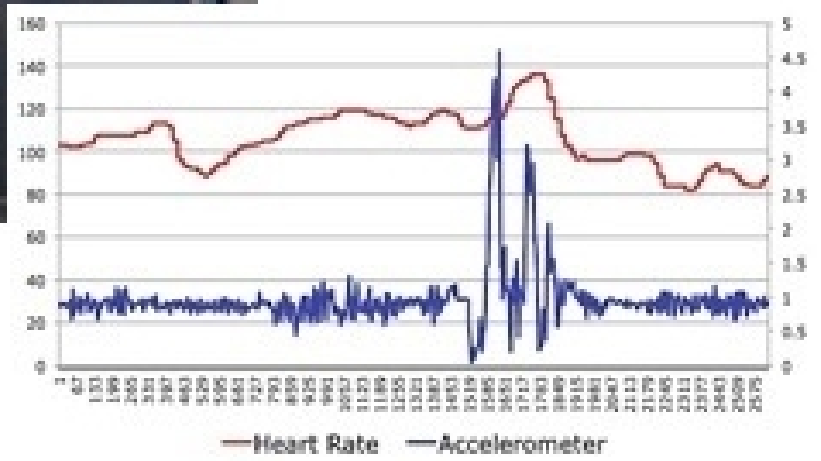
Skin Galvenometry for the Masses

[http://www.medgadget.com/archives/img/legolie.jpg]

And Another One





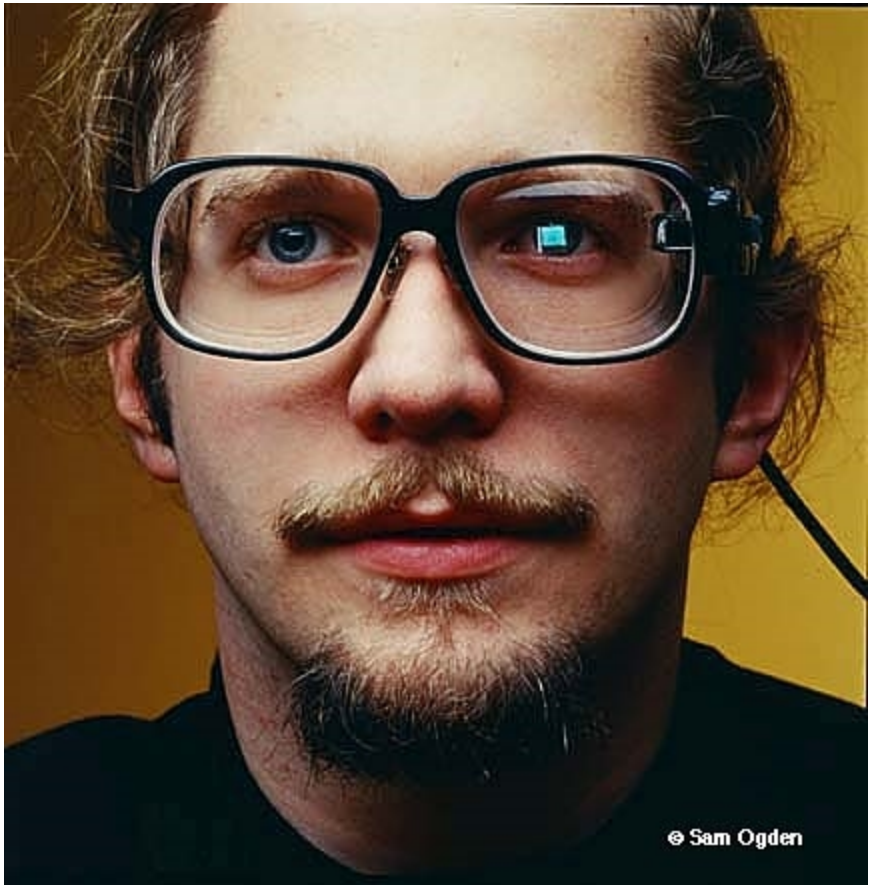

160
140
120
100
80
60
40
20
0
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Heart Rate
Accelerometer

Hardware: "wearable computers"

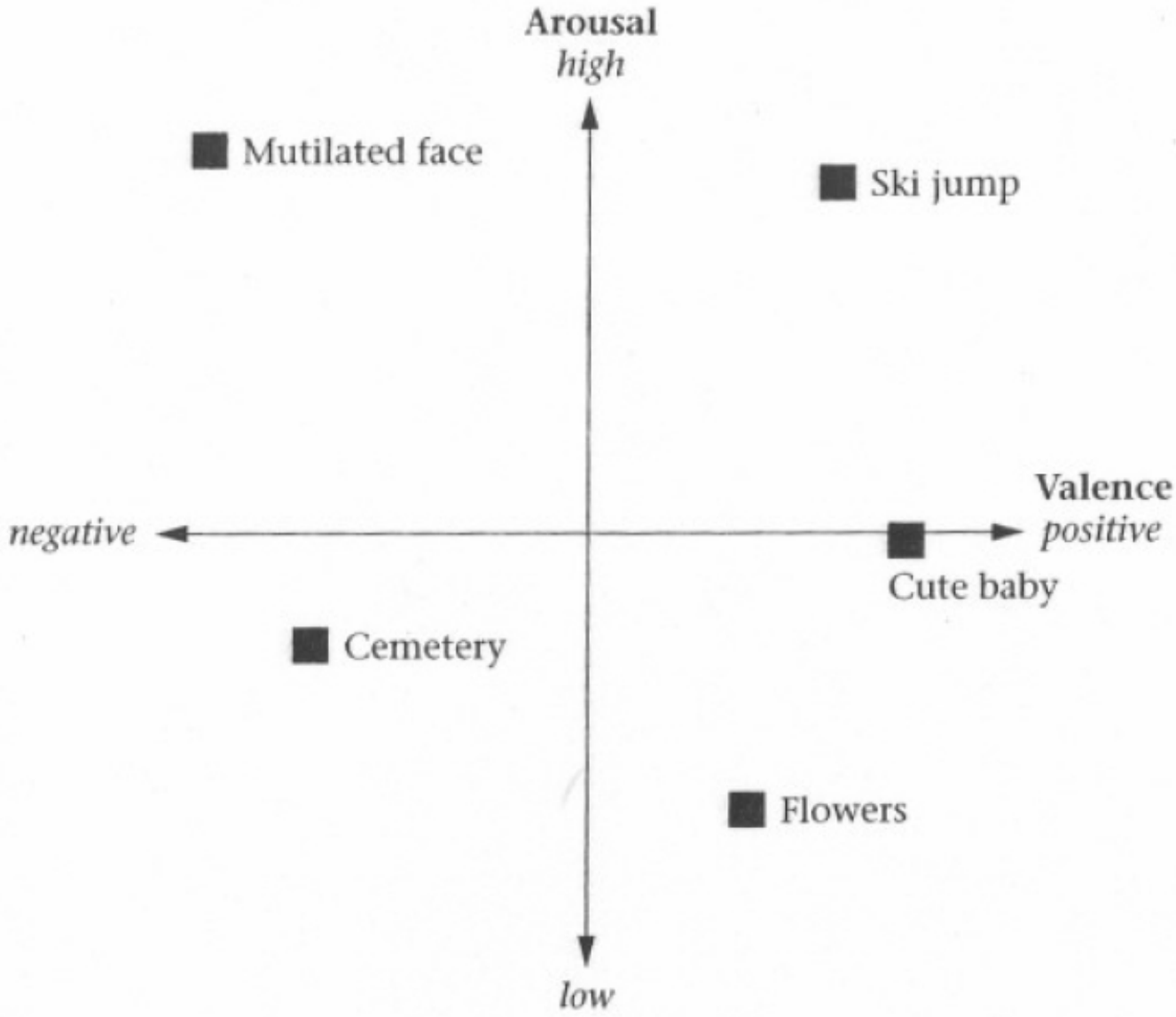
ACM 97

Thad Starner

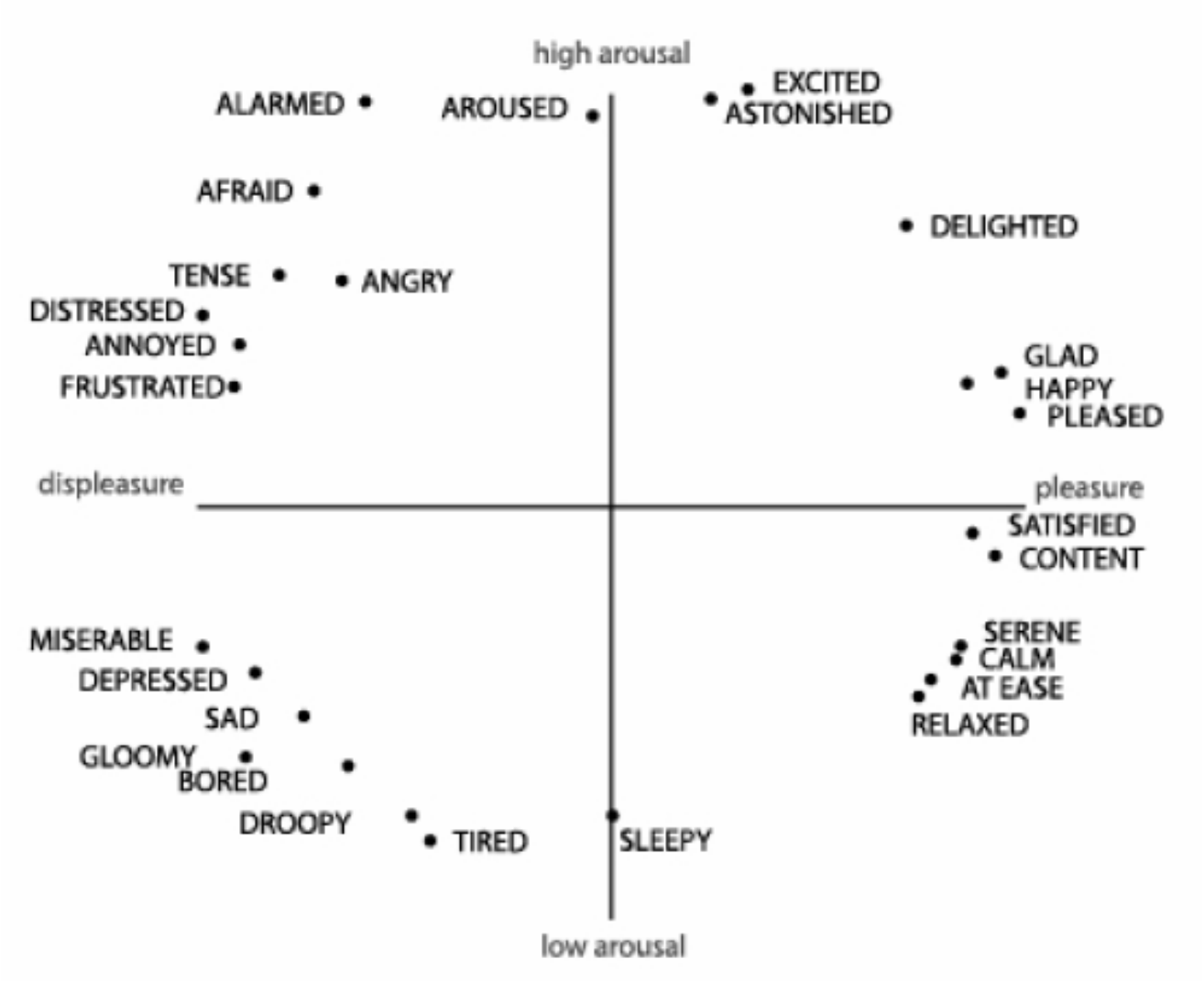
…and his younger brother Eric Starner


© Sam Ogden

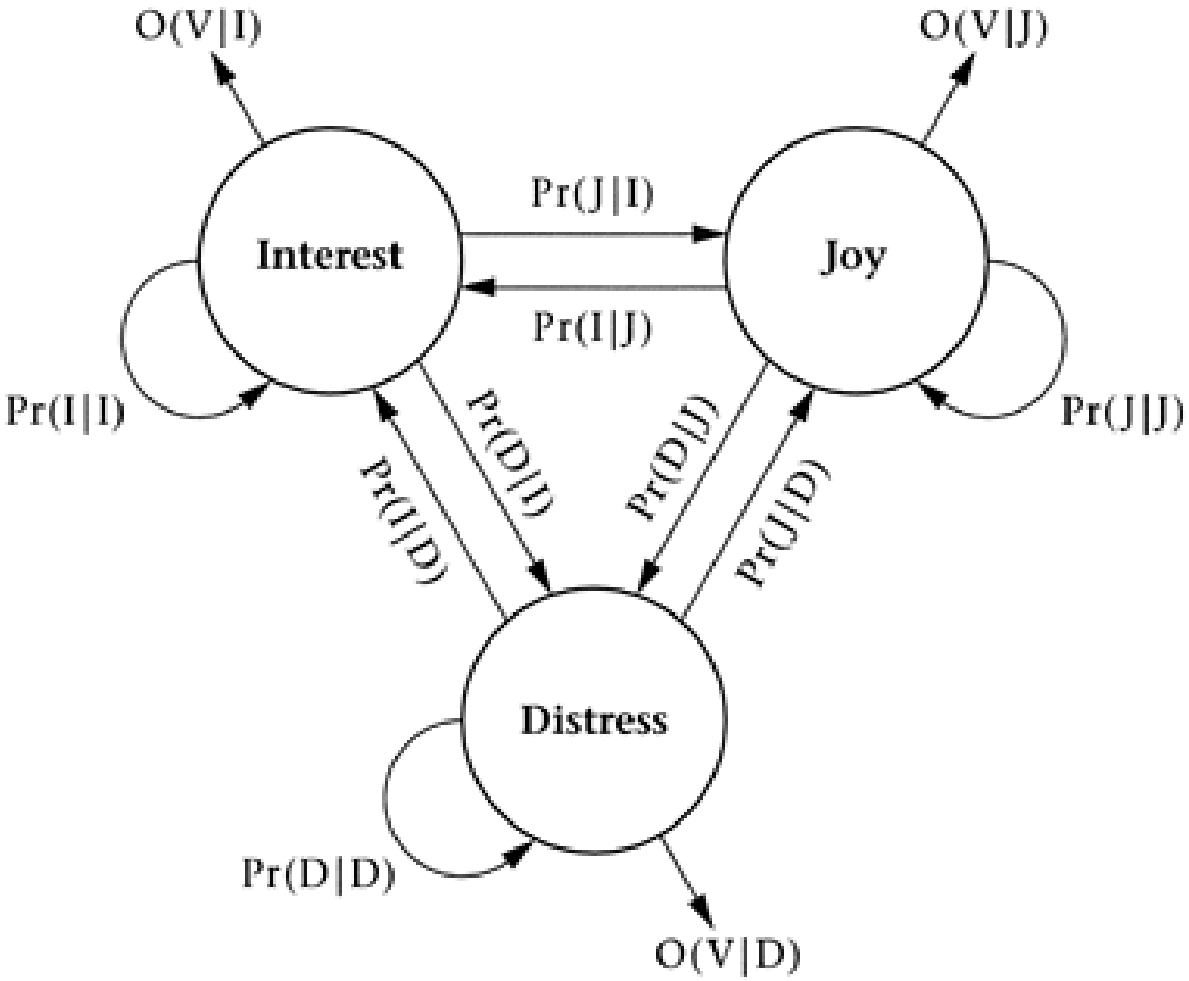
Possible Response Dimensions



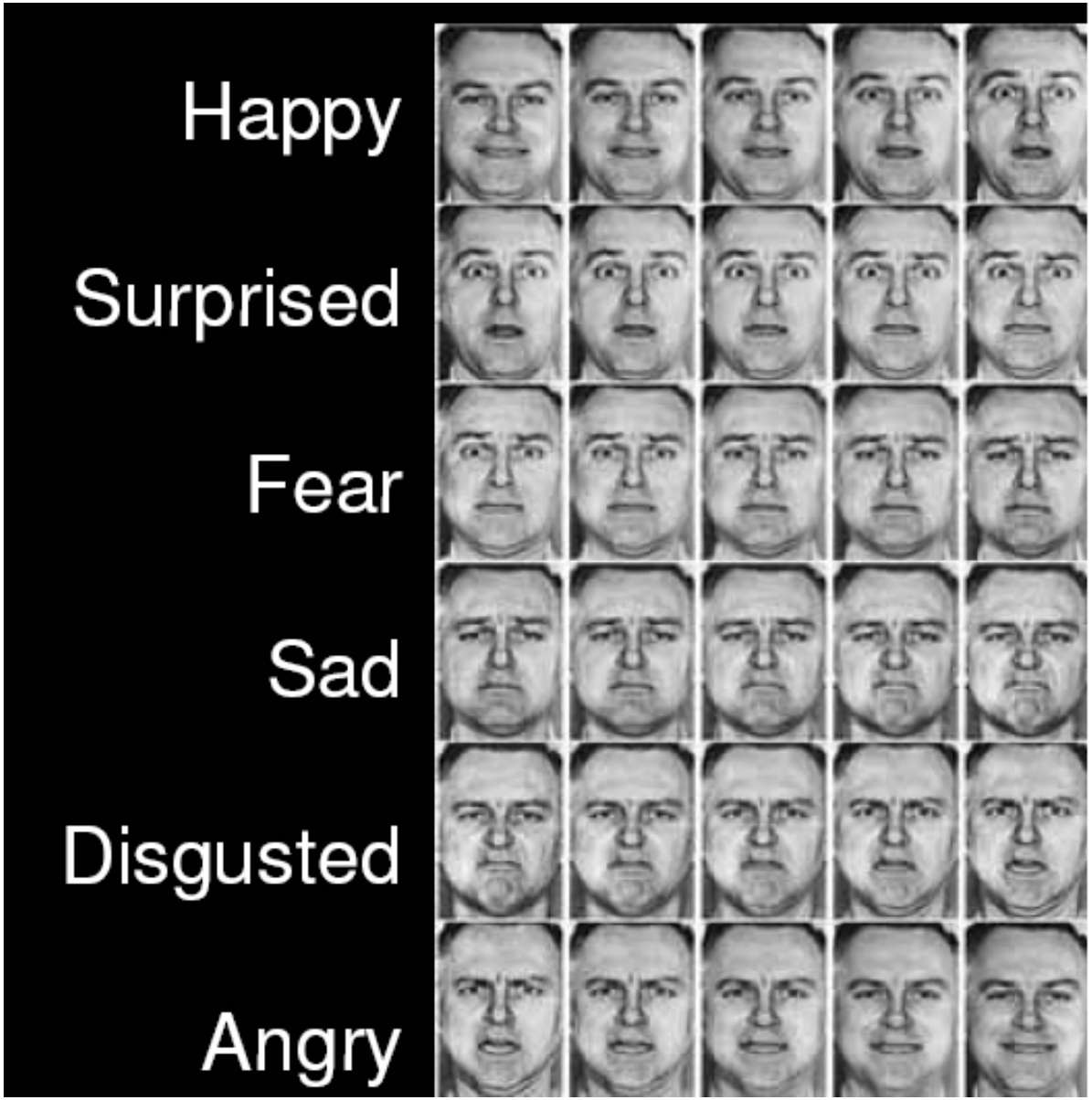
Possible Response Dimensions (Russell)



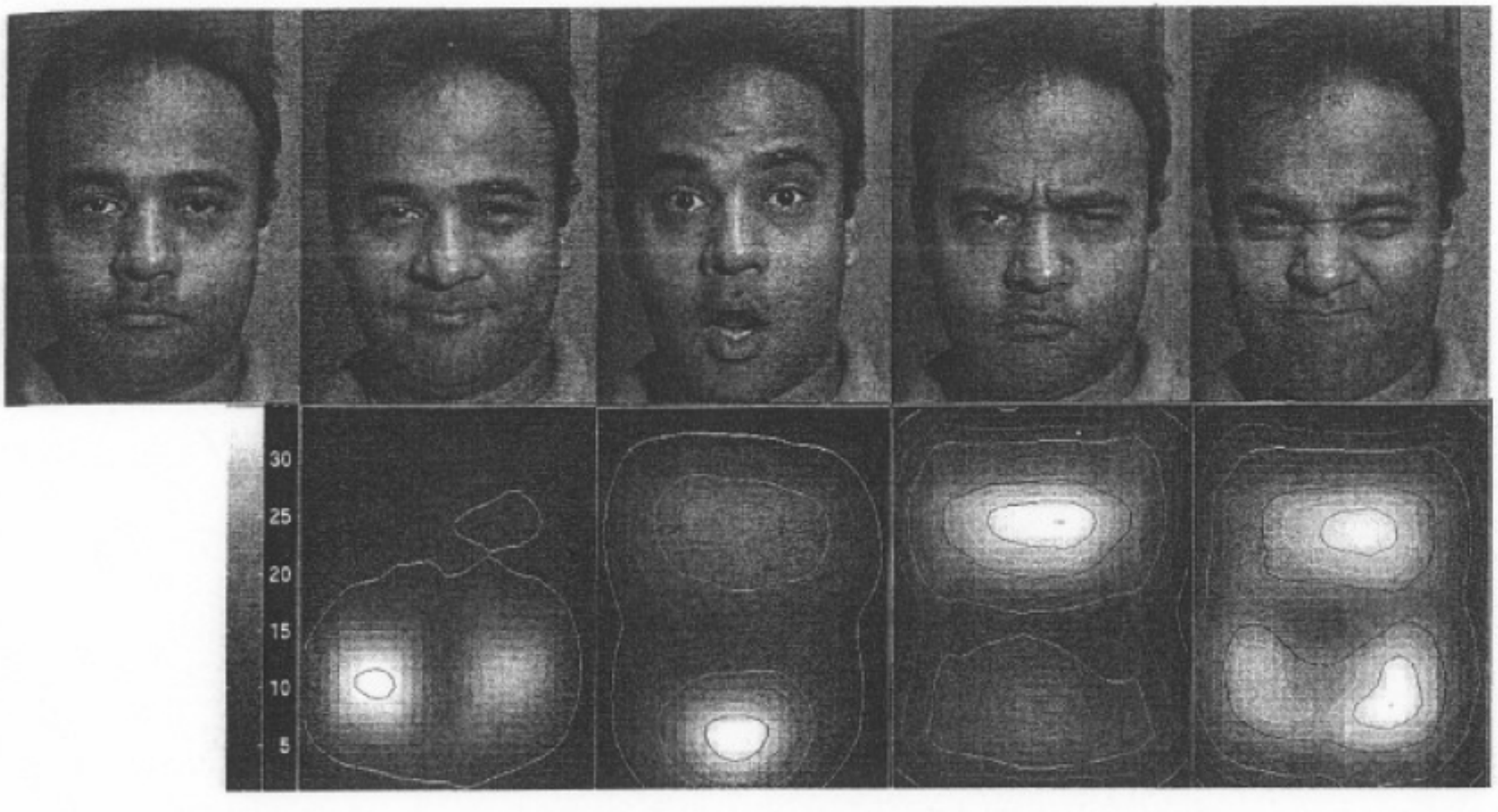
Recognizing Affect Response Patterns



Ekman’s Six Facial Expressions



Facial Motion Energy Maps



FaceReader © Noldus Information Technology 2012

horizon
DIGITAL ECONOMY RESEARCH

Affective Computing

Research Councils UK
Digital Economy
Transforming Business and Society

[http://www.horizon.ac.uk/project/affective-computing/]

Summary of human vocal effects most commonly associated with the emotions indicated. Descriptions are given relative to neutral speech. (Adapted with permission from Murray and Arnott (1993), Table 1. Copyright 1993 Acoustical Society of America.)

	Fear	Anger	Sadness	Happiness	Disgust
Speech rate	much faster	slightly faster	slightly slower	faster or slower	very much slower
Pitch average	very much higher	very much higher	slightly lower	much higher	very much lower
Pitch range	much wider	much wider	slightly narrower	much wider	slightly wider
Intensity	normal	higher	lower	higher	lower
Voice quality	irregular voicing	breathy chest tone	resonant	breathy blaring	grumbled chest tone
Pitch changes	normal	abrupt on stressed syllables	downward inflections	smooth upward inflections	wide downward terminal inflections
Articulation	precise	tense	slurring	normal	normal

Synthesizing Affect in Machines

[http://www.macs.hw.ac.uk/~an22/images/]


baxter
rethink robotics

A ROBOT'S EMOTIONS

Brooks didn't set out to build a humanoid robot, but he found that giving Baxter a face was the most intuitive way to communicate information.

NEUTRAL
Ready for training

ASLEEP
On standby

CONCENTRATING
Learning a task

FOCUSED
Working away without a problem

SURPRISED
A human has approached

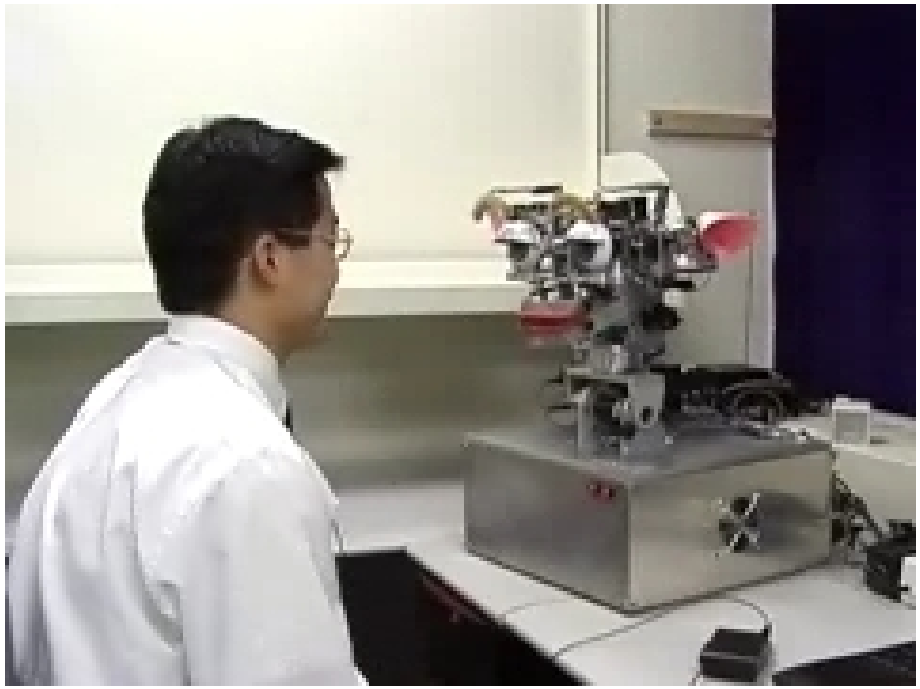
CONFUSED
Having trouble finding an object or otherwise completing a task

SAD
Given up trying to complete a task; there's a problem

Kismet

[Cynthia Brazeal, MIT, late 1990s]

Kismet



[Cynthia Brazeal, MIT, late 1990s]

Leonardo

TEACHING ROBOTS AS A COLLABORATIVE DIALOG

Robotic Life Group
MIT Media Laboratory

THE END