Human Sensing, Tagging, and Interaction

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Part I

Human Sensing, Tagging, and Interaction

- Part I: Setting the Stage
  - General remarks and observations on IR, interaction, sensing, access to information, information about human-human interaction
- Part II: Human-Human Interaction
- Part III: Future & Society Change
  - Short intermezzo on social media
  - Gamification
  - Deception
- Conclusions (?)

Human Media Interaction

Human Sensing, Tagging, and Interaction

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Part I

SETTING THE STAGE

Human Media Interaction

IR & Interaction

- Sensing (registration)
  - text, pictures, audio, video, …
  - activity (proximity, movements, …)
  - environment (temperature, humidity, weather, …)
  - human (neuro-)physiological information (heart rate variability, blood pressure, skin conductivity, brain activity, …)
- Tagging (from annotating to interpretation)
  - off-line, on-line (real-time)
  - manual, semi-automatic, fully automatic, …
- Interaction
  - ask, interpret, act, …
  - feedback (adapt/filter/…)
  - conversation, question-answering, dialogue

Sensing, Tagging, Interaction

- Sensing
  - Cameras, microphones, keyboard, mouse, joystick, physiological, proximity, pressure, EEG, …

- Tagging
  - From annotation to <u>interpretation</u>
  - From manual to semi-automatic to <u>fully automatic</u>

- Interaction
  - (Real-time) <u>fully automatic</u> <u>interpretation</u>

Human Sensing, Tagging, and Interaction

Human Media Interaction

Smart Environments

- Sensor equipped environments

- Sensor equipped inhabitants/visitors

- Humans, virtual humans, (humanoid) robots, pets, 'living' furniture

- Displays everywhere, access from/to outside worlds (physical, virtual)

- Future Internet: 'Internet of Things'

Human Sensing, Tagging, and Interaction

Smart Environments

- Ask questions in smart environments
- Get answers in smart environments

- Requires understanding of what's going on and has been going on in an environment

- What kinds of questions? What ways are there to answer questions?

Towards Personal Memories

- Possibility of continuously capturing, analyzing, interpreting and storing of temporal streams of data that concern a particular person

- Tagging (or description) of everyday life events in order to allow future retrieval of events or the experiences related to events

- This allows someone to build her own digital memory of (potentially) interesting events

- 'Electronic Chronicles', 'Memories for Life', 'Lifelogs', 'Digital Prosthetic Memories'

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What Kinds of Questions?

- One fool may ask more than seven wise men can answer.

  [1666 G. Torriano]

- Ask about events, human behavior, interactions, feelings, experiences, … in our smart environments and our (artificial) personal memories

Human Media Interaction

Retrieval of Events and Experiences

- Retrieval of events
  - To use, to show
  - To re-experience

- Retrieval of Experiences
  - By retrieving (similar) events
  - By retrieving/regenerating the physiological experiences

- Retrieval of Thoughts/Mind States

Retrieval of Events and Experiences

- "What was the name of the person I met yesterday evening?"

- "How did the strawberry jam I bought last week disappear in 4 days?"
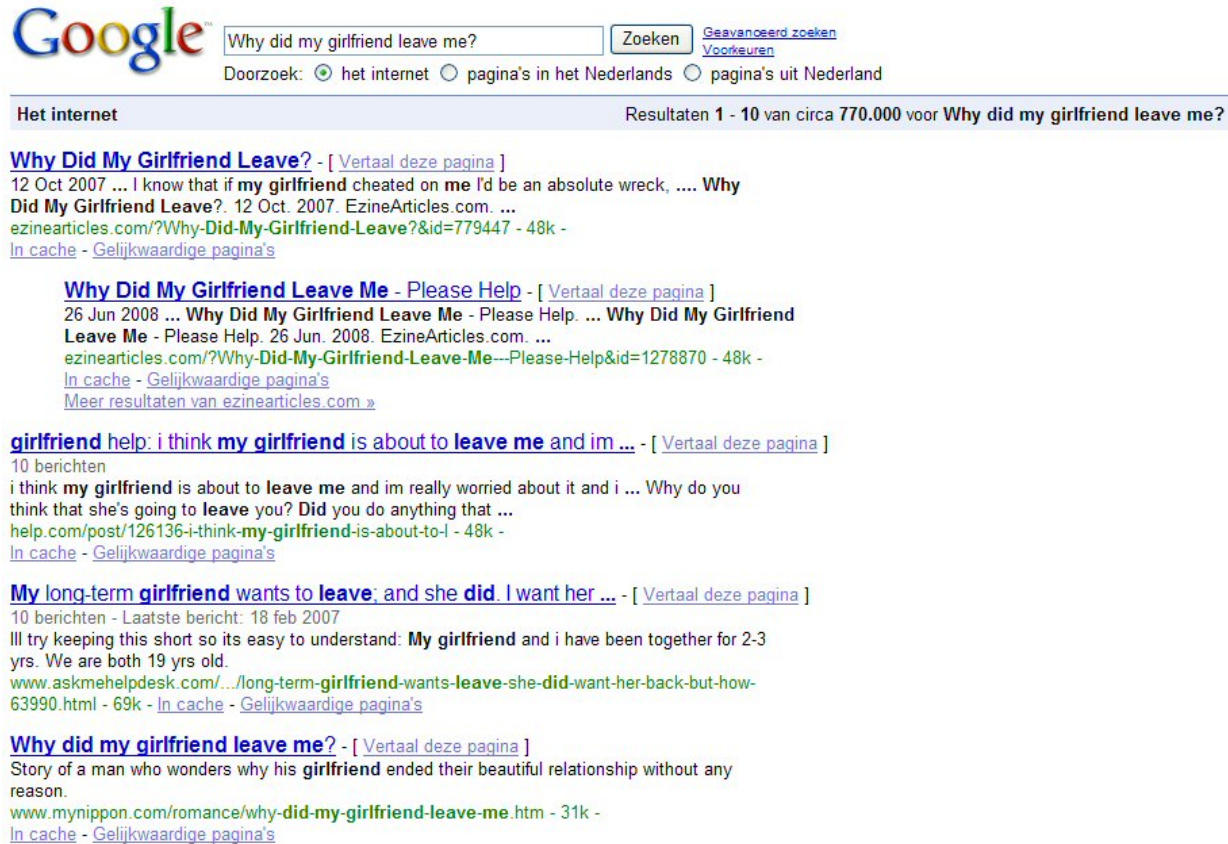
- "Why did my girlfriend leave me?"

- "Why do I feel sad?"

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Who to Ask? More Traditionally

- Retrieval Systems?
  - Google, Yahoo, …

- Chat Bots?
  - Eliza, Alice, Yabberwocky, …

- Question-Answering Systems

- Dialogue Systems
  - Travel information systems, call-centers, …

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Retrieval Systems?

- Ask Google?

Retrieval Systems?

Why Did My Girlfriend Leave Me - Please Help

By Steven Boudreau ⭐

This is a common question that gets asked a lot, but the sad thing is that most people don't understand that this question could have been avoided very easily. I can understand that once in a blue moon even if you have your eyes open a break up can sneak up on you and shock you, but most break ups a long time coming, and usually can be avoided. I'm going to answer your question for you and let you know why she left you.

Like I mentioned above usually the root for any break up is based around only a few factors. I'm going to list them off for you and describe them a little bit, hoping that you'll have that Homer Simpson moment and go DOH!. Well here goes:

1. The big one here that is the cause for most break ups is that you didn't pay enough attention to her. You may have felt from time to time that your girlfriend may have seemed a bit needy and this annoyed you. Well guess what she was being needy, she wanted to know that you cared about her you dough head. Come on now is just spending a little bit of time her and listening to her, too much to ask? I mean when you talk you want to be listened to, right? Well she's felt the same way too.

2. Another one of the common reasons for break ups and this one is actually probably tied with the first one, and it's because the relationship has gotten stale and boring. Part of this is going back to reason number one, you didn't listen to her. I know you think that going to car shows and driving around listening to the stereo is fun, but she probably doesn't think it's as exciting as you do. If a relationship ends for this reason, it's kind of sad. I say this because if you loved each other as much as you say you did, then you would enjoy each others company and would want to spend time with one another.

3. The biggest relationship killer and I hate even mentioning it because it sucks so bad is, cheating.

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Conversation & Interaction

ELIZA (1966)

You: I've had a terrible day

Eliza: Please go on.
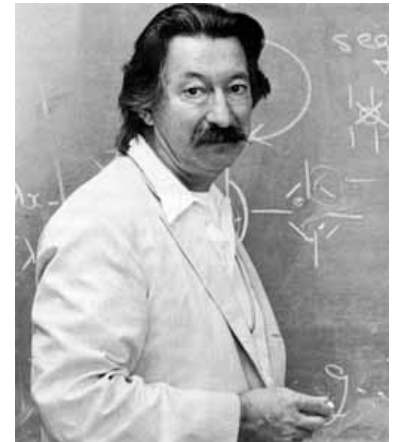
You: First we were under attack

Eliza: Please go on.

You: Then our vehicle struck a landmine

Eliza: Please go on.

You: Then my friend got killed

Eliza: Why do you say your friend got killed?

Human Sensing, Tagging, and Interaction

Conversation & Interaction

ALICE

Human: I've had a terrible day

ALICE: *What happened to it?*

Human: First we were under attack

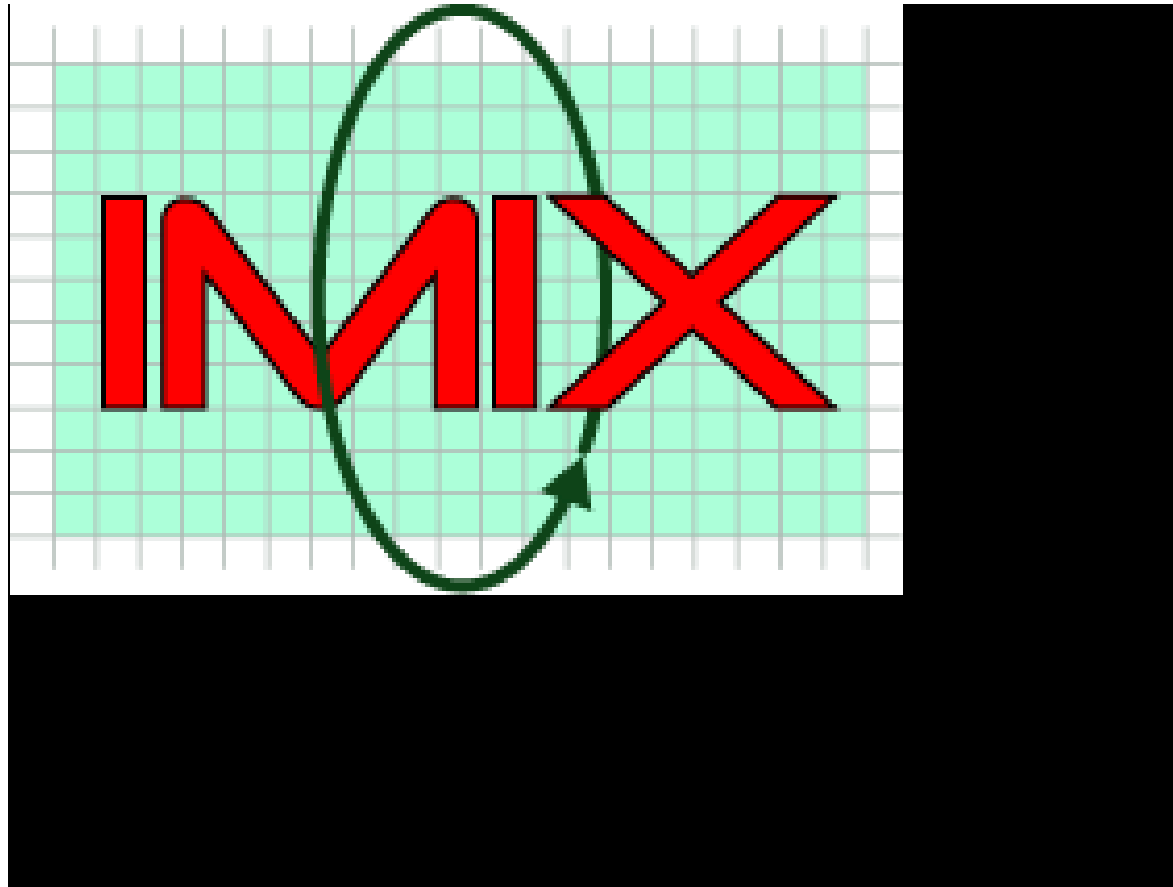ALICE: *And then what happened? And second?*

Human: Then our vehicle struck a landmine

ALICE: *Fascinating. It would be nice if our vehicle struck a landmine.*

Human: Then my friend got killed

ALICE: *Good reasoning. How well do you know this person*

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Question-Answering Systems

Multi-modal Q&A Systems

- Sensing (registration)
  - text, pictures, audio, video, … ; activity (proximity, movements, …); environment (temperature, humidity, weather, …); human (neuro-)physiological information (heart rate variability, blood pressure, skin conductivity, brain activity, …)

- Tagging (from annotating to interpretation)
  - off-line, on-line on-going activities; manual, semi-automatic, fully automatic, …

- Interaction
  - ask, interpret, act, …; feedback (adapt/filter/influence…)
  - interpretation of user feedback and providing more information
  - Q&A about (real-time or past) activity?

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Dialogue Systems

Amtrak Julie

Multi-modal Dialogue Systems

- Conversation
- Negotiation
- Brain-storming
- Informative dialogue

  - Speech recognition, natural language processing, gesture processing, facial expression processing, (neuro-)physiological signal processing, ….
  - User modeling, common-sense/world/domain knowledge modeling, interaction modeling, …

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Gap

- Large gap between what existing systems can offer on retrieval and interaction and what can be sensed and collected

- Collect more detailed data, collect other data?

- Look at other ways to disseminate information? Predict interest, provide easy access, and make information browsable?

- Tools and environments to provide answers to specific questions; no 'free' conversation, Q&A, or dialogue

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Back on the Track: Interest

- 'Tagging' of humans or human activity (including human-human, human-system, and multi-party interaction)

- Tagging
  - From low-level ('counting') to high-level (interpretation)
  - From manual to semi-automatic to automatic

- From off-line retrieval to real-time interaction and support

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Aims (1)

- Collecting information about humans and human behavior (sensing) allows us to:

  – understand them (their questions, their needs, their behavior)

  – provide real-time support, also by anticipating their needs and pro-actively support them

  – allow understanding (hence, support) and retrieval of 'human information', 'human-human interaction information', 'multi-party interaction information', events, experiences, ….

Aims (2)

- People as 'Content'
  - observe content, learn about content, store content, …
  - process content, interpret content, transform content, mediate content, retrieve content, …
  - interact with content, interact with a virtual user/partner or virtual users/partners, representing (maybe not always) 'real' users/partners

History & Developments

- History & Developments
  - War and Science Applications
    - Ballistic/Cryptographic/A&H-bomb computations
  - Administrative processes become computable
    - Book keeping applications
  - Industrial processes become computable
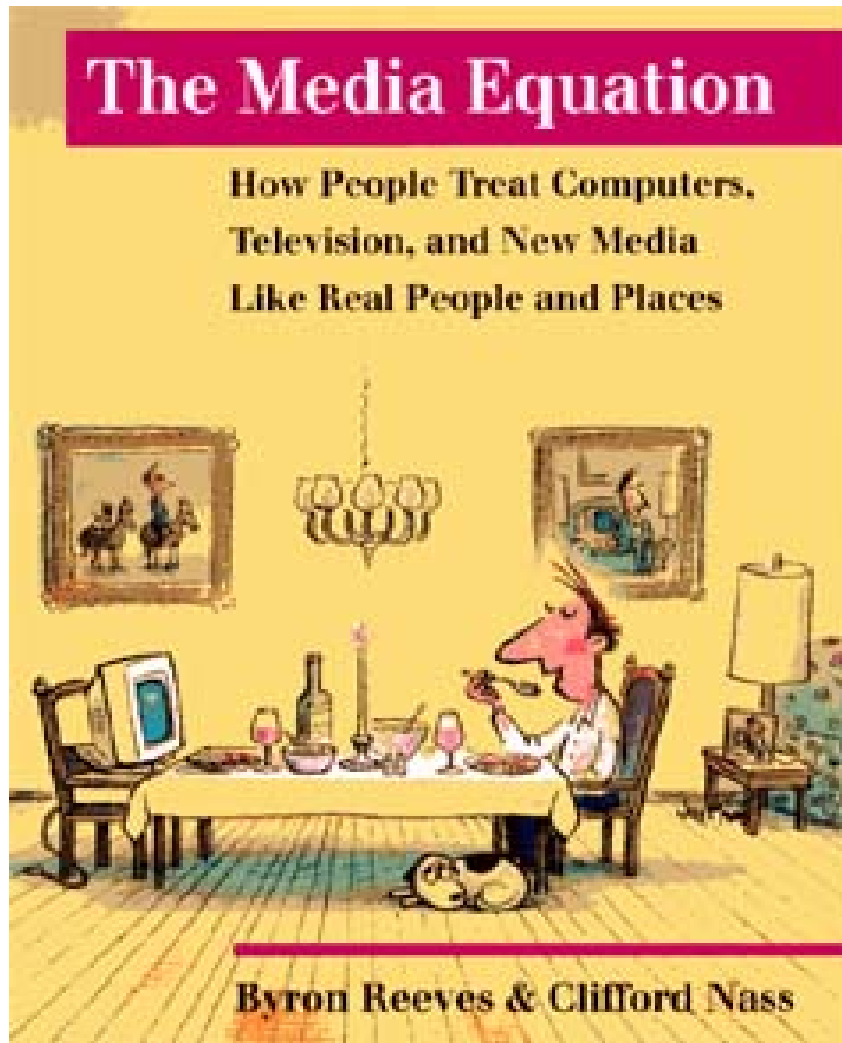 - …….
  - …….
  - Humans become computable?

The Positive View

According to the ISTAG vision statement, humans will, in an Ambient Intelligent Environment, be surrounded by intelligent interfaces supported by computing and networking technology that is embedded in everyday objects such as furniture, clothes, vehicles, roads and smart materials - even particles of decorative substances like paint. AmI implies a seamless environment of computing, advanced networking technology and specific interfaces. This environment should be aware of the specific characteristics of human presence and personalities; adapt to the needs of users; be capable of responding intelligently to spoken or gestured indications of desire; and even result in systems that are capable of engaging in intelligent dialogue. Ambient Intelligence should also be unobtrusive – interaction should be relaxing and enjoyable for the citizen, and not involve a steep learning curve.

Ambient Intelligence – From Vision to Reality: IST Advisory Group

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Even More Positive …

The Media Equation

How People Treat Computers, Television, and New Media Like Real People and Places

Byron Reeves & Clifford Nass

Give computers (virtual humans, humanoid robots, sensor equipped objects (pets) and environments human-like interaction qualities: verbal/nonverbal, moods and emotions, empathy, interpersonal relations, …)

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Maybe Less Positive …

FROM THE MOMENT WE MOVED INTO OUR NEW HOUSE, WE HAD THE UNPLEASANT FEELING THAT WE WERE NOT ALONE.

Who/what is observing you?

What does 'it' know about you? Who has access to this information?

What is the impact of 'it' on your (interaction) behavior and well-feeling?

How to give 'users' (some) control on the perceptual interfaces?

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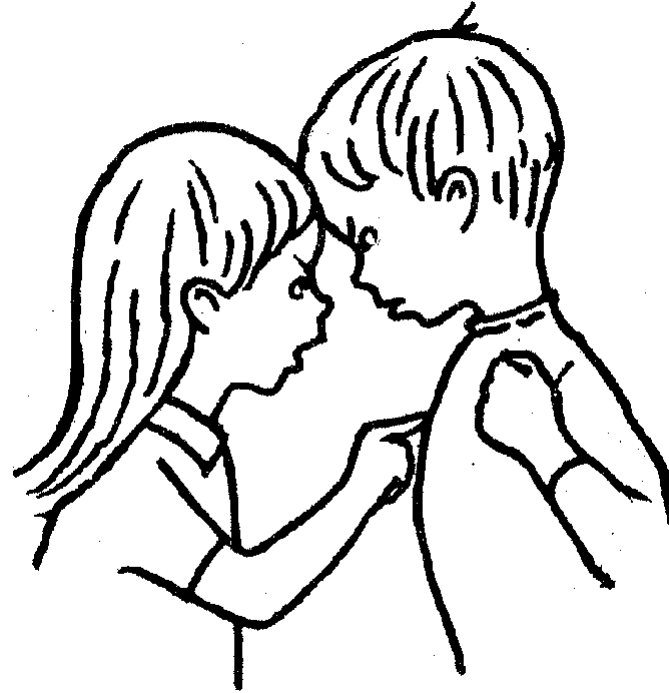
Part II

Part II

INTERACTION BEHAVIOR

Sensing People

Sensing People


Proactive and Reactive Sensor-equipped Environments
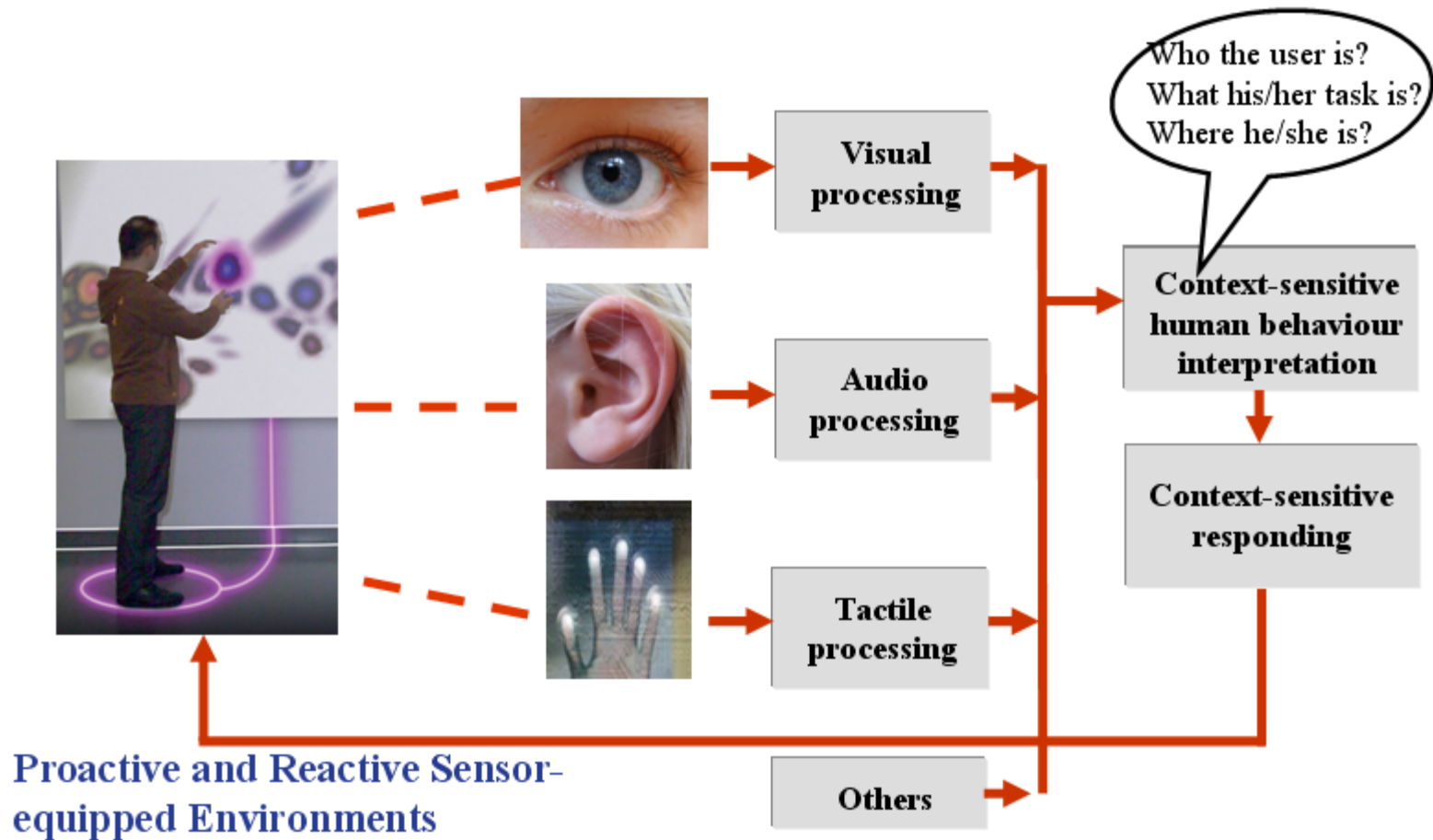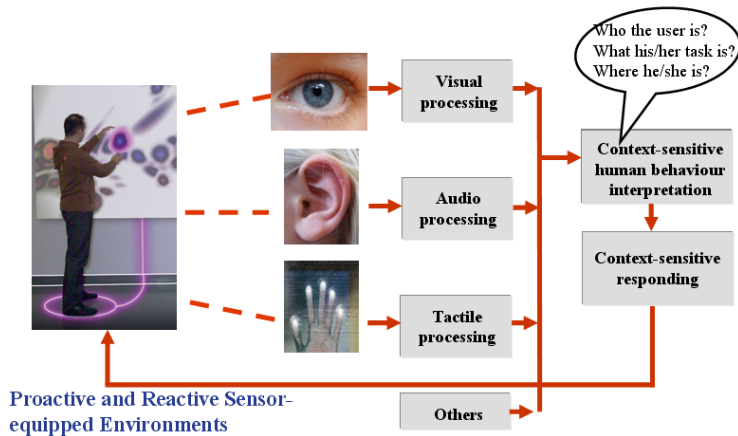
OTHERS?

(1) Keyboard, Mouse, Joystick, Balance board, Wiimote, Nunchuck, 3D Mouse, Tangibles, ….
(2) Sensors: Proximity, Pressure,
(3) Wearables, mobile devices (location-based social networks such as FourSquare), …..

Physiological: skin conductivity, heart rate (variability), blood pressure, …

Brain Imaging: regions, functions, methods (EEG, fNIRS, …)

Human Media Interaction

Sensing People
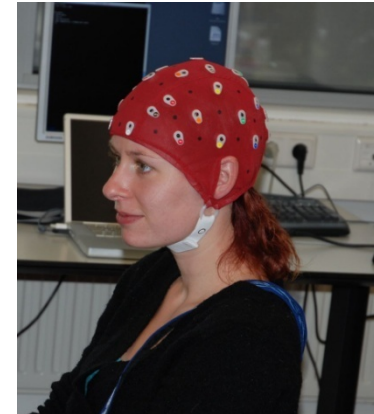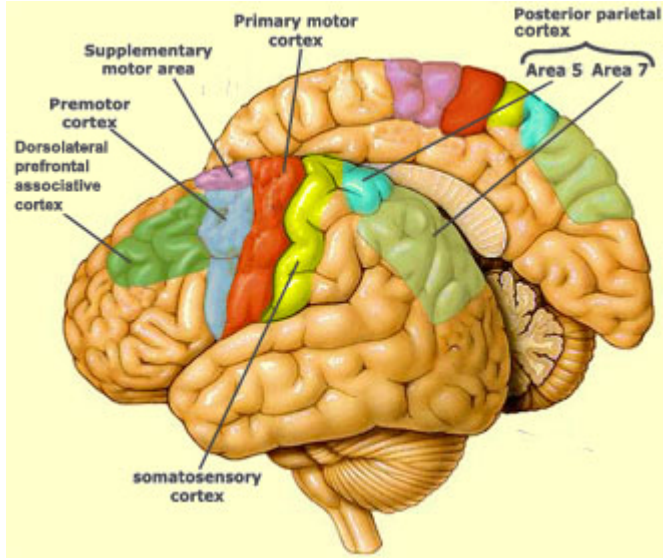
Implants

Wireless headsets

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'Daily Life' Interactions

Sensors could help catch first signs of dementia
Monitors and online tests track subtle changes in daily mobility, behavior

Elaine Bloomquist stands in the doorway of her home in Milwaukie, Ore. Bloomquist volunteered to participate in a research project that could alert doctors to early signs of Alzheimer's disease.

Rick Bowmer / AP

AP Associated Press
updated 7:13 p.m. ET June 18

WASHINGTON - Tiny motic
attached to the walls, do
the refrigerator of Elaine B
tracking the seemingly he
daily activity.

It's like spying in the nam
her permission — to see i
tracking of elderly people'

meeting environments, home & office environments, research teams, healthcare, education, sports, training, games, entertainment, ….
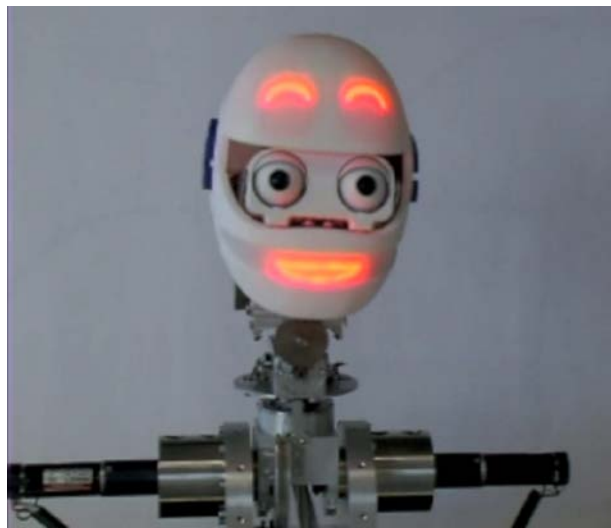
Pro-active and Reactive Support

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Human Behavior Generation

Behavior Interpretation & Behavior Generation

Virtual Humans

Social Robots

Environments

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'Daily Life' Interactions

Examples of Human-Human Interaction

Listening to Interaction

Human-Human Interaction

- Gricean cooperative principle:
  Make your contribution such as it is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged

- Speakers (generally) observe the cooperative principle, and listeners (generally) assume that speakers are observing it (conversational implicature)

Human Media Interaction

Listening to Interaction

Conversational Maxims

- **Maxim of Quantity**:

  1. Make your contribution to the conversation as informative as necessary.

  2. Do not make your contribution to the conversation more informative than necessary.

- **Maxim of Quality:**

  1. Do not say what you believe to be false.

  2. Do not say that for which you lack adequate evidence.

- **Maxim of Relevance:**

  1. Be relevant (i.e., say things related to the current topic of the conversation).

- **Maxim of Manner:**

  1. Avoid obscurity of expression. 2. Avoid ambiguity. 3. Be brief. 4. Be orderly.

Listening to Interaction

Interaction always Requires (some meta-level) Cooperation

- Grice (1975)
- Many others
  - Searle (1975): indirect speech acts
  - Leech (1983): maxims of politeness
  - Clark & Wilkes-Gibbs (1986): principle of 'least collaborative effort' to guide grounding, accepting referring expressions
  - Grosz & Sidner (1990): shared plans
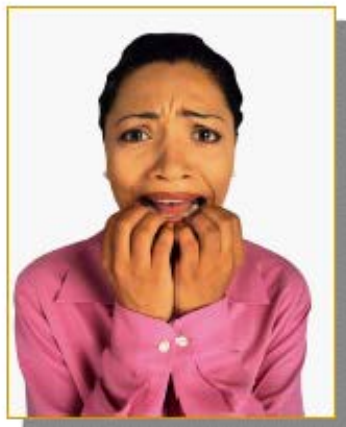 - Cohen & Levesque (1991): joint intentions

Looking at Interaction

Nonverbal Interaction

- 55% body language
- 38% tone of the voice
- 7% actual words used

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'Daily Life' Interactions

Human-Human Interaction

- Lots of 'Non-Cooperative' (verbal/nonverbal) behavior

  - Not always telling the truth (can be a social lubricant)

  - Self-interest, exaggerated/false politeness

  - Teasing, provoking, joking, flirting, . . .

  - Play different roles for different audiences

  - Mediated interaction: chatting, instant messaging, twittering, …

  - Games, sports, education, …

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Looking at Interaction
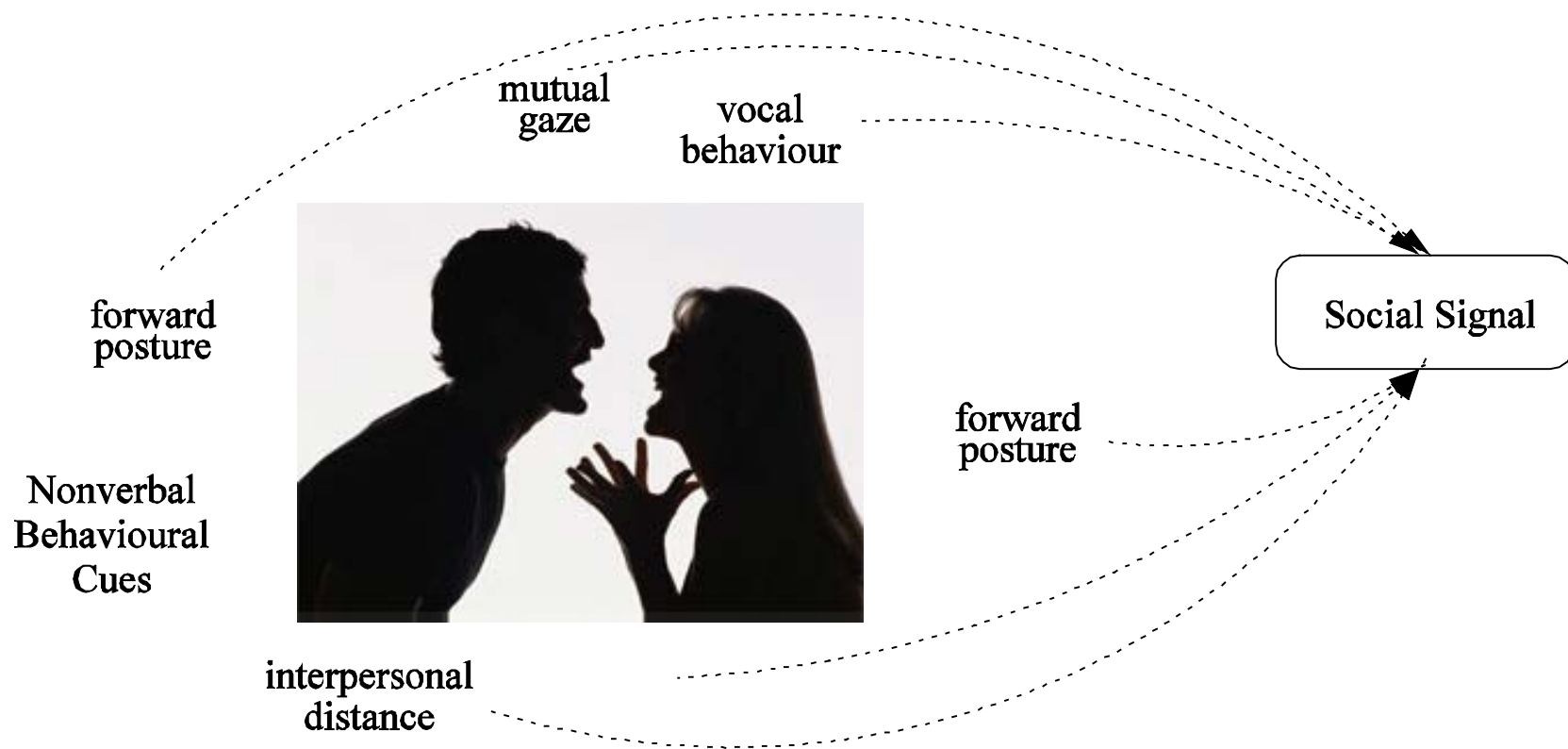
Looking at Interaction
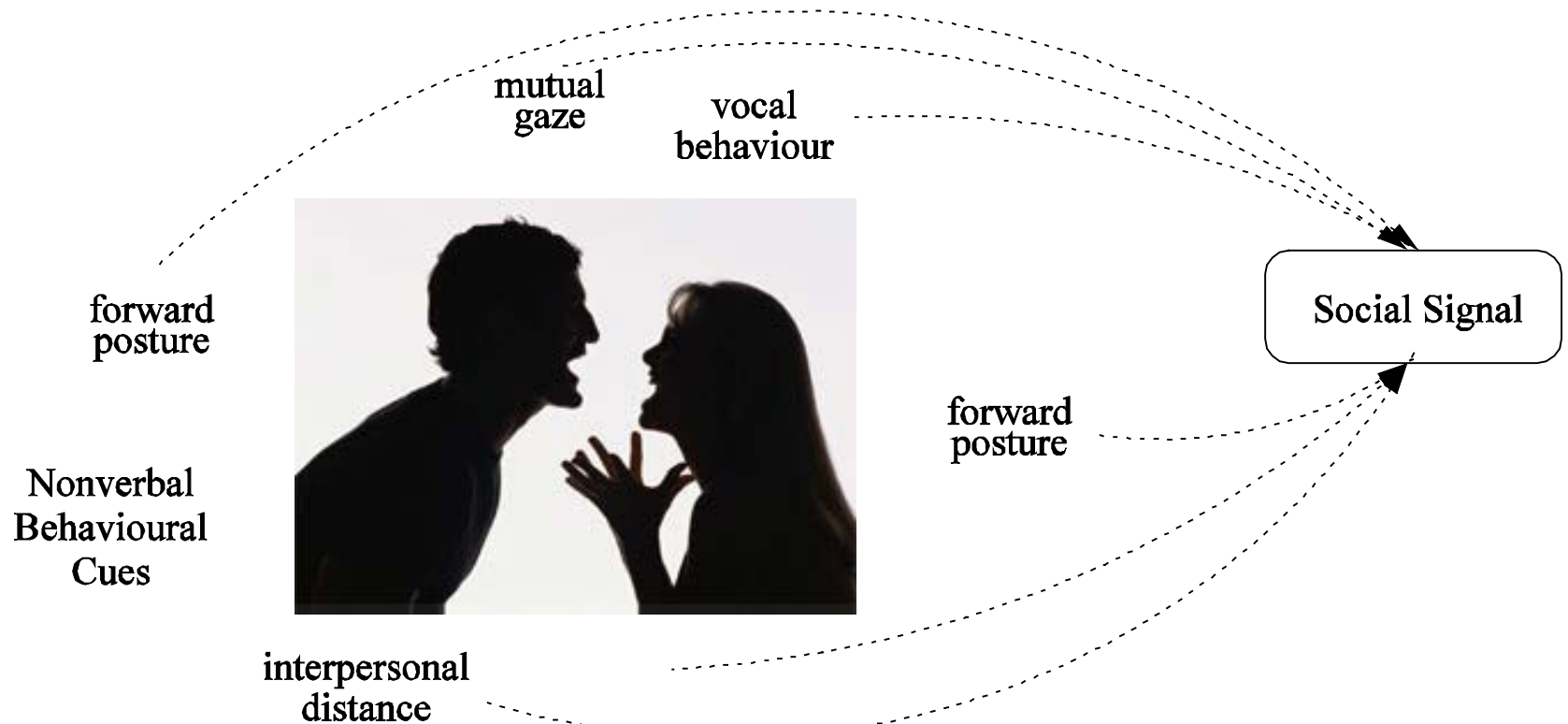
Social Signal Processing is the domain aimed at bringing social intelligence to computers via conceptual modelling, analysis and synthesis of nonverbal behaviour in social interactions
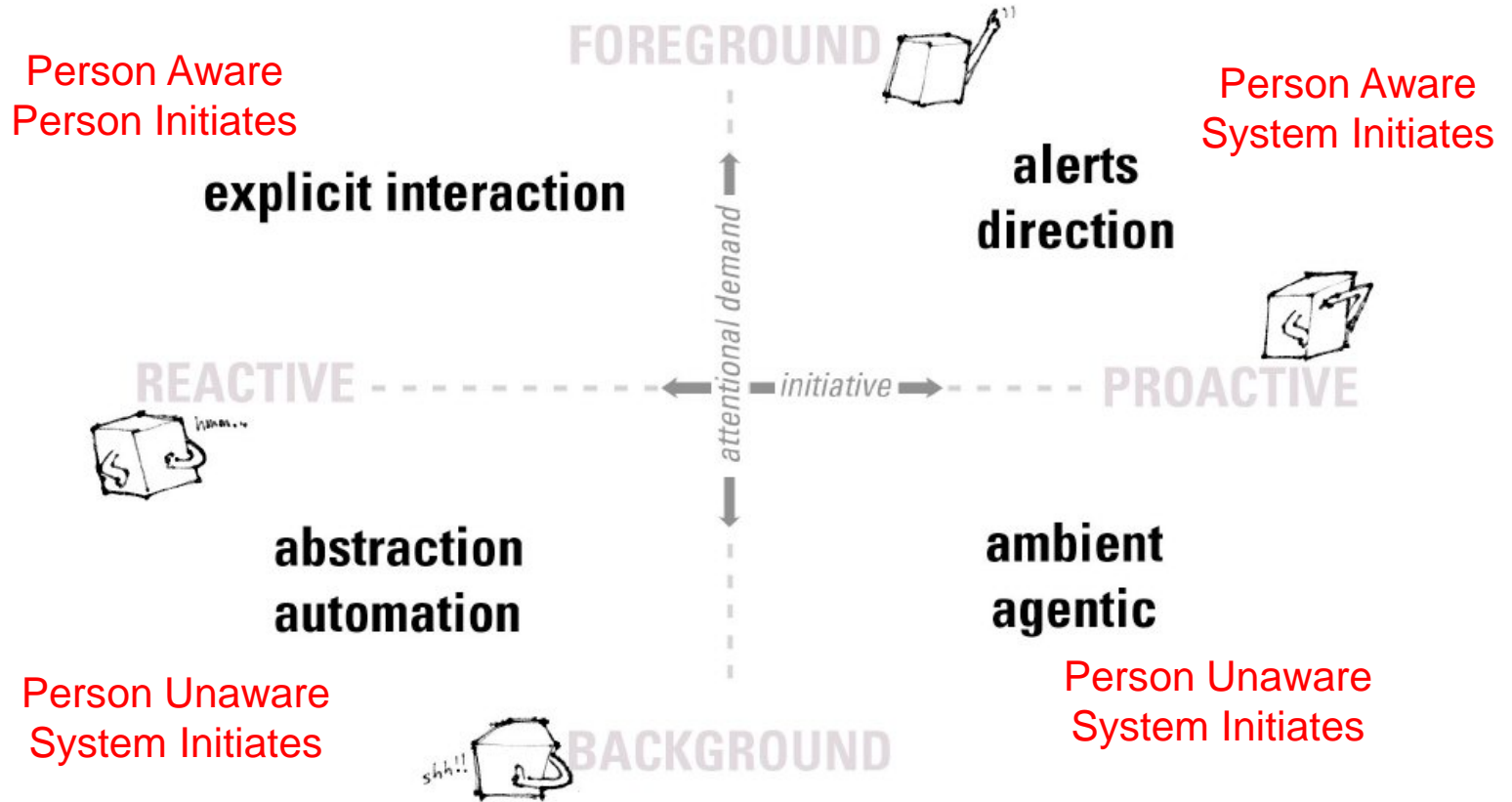
Sensor Equipped Environments

- Observe verbal and nonverbal interaction behavior
  - Human-environment/devices/ …. interaction behavior
  - Human-human interaction behavior
  - Multi-party interaction behavior

Human Media Interaction

Implicit and Explicit Interactions

Human-Environment Interaction

Person Aware
Person Initiates

FOREGROUND

Person Aware
System Initiates

explicit interaction

alerts
direction

attentional demand

REACTIVE ← initiative → PROACTIVE

abstraction
automation

ambient
agentic

Person Unaware
System Initiates

BACKGROUND

Person Unaware
System Initiates

The Design of Implicit
Interactions: Making
Interactive Objects less
Obnoxious. Wendy Ju &
Larry Leifer.

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'CONSTRAINED' INTERACTION ENVIRONMENTS

Human Media Interaction

AMI Meeting Project

- Application Scenarios

  - Look up information on previous meetings
  - Audit unattended meetings
  - Reminders about a previous meeting during a meeting
  - Catching up on a meeting in progress
  - Detect meeting failures, redundancy, conflict, dominance, etc.

Human Media Interaction

Processing Technologies

- Speech recognition
- Speaker localization and identification
- Gesture recognition and tracking
- Emotion recognition
- Event and topic segmentation
- Argumentative structure
- Content analysis
- Summaries of meetings/events

Human Media Interaction

Technologies for ....

- Manual and (semi-) automatic annotating

- Audio-visual analysis (speech processing, computer vision)

- Gaze, gestures, posture, head orientation, facial expression, prosody, …

- Tracking, identification. emotion detection, turn taking, addressee detection, …

- … listening …

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Questions to be Answered

- What topics are discussed and when?
- What decisions are made and by whom?
- What roles do the participants play?
- Cooperative / non-cooperative partners?
- Covergence to agreement, disagreement?
- What positions do they take on issues?
- What activities are completed?
- What tasks are assigned or reported done?

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Looking at Interaction

Change of Aims

- Off-line access to captured meetings

- Real-time support to Meeting Participants

- Sensing and Interpreting everything that is important to the Meeting and providing Reactive and Proactive Support

- Corpus Collection

Instrumented meeting rooms at IDIAP, UEDIN and TNO

Looking at Interaction

Pro-active and Reactive Environments

EU FP6 AMI & AMIDA Projects

Meeting environment needs to understand verbal and nonverbal behavior of its inhabitants

Human Media Interaction

Looking at Interaction

Annotation, Analysis, Heuristics, Models

Understand & Generate

FP6: AMIDA
FP7: SEMAINE
FP7: SSPNet

Human Media Interaction

Looking at Interaction

1	Small blink. Eyelids slightly squeezed, head turns down, gaze constant at viewer
2	Head tilt to the right, downwards and gaze aversion. Head moves back, look at viewer.
3	Blink. Raise of left eye-brow (fast/high). Blink.
4	Eyes slightly squeezed (whole duration). Eyebrow contraction. Mild head tilt.
5	Head moves down slightly, slowly. Eyebrows raised. Eyes turned upwards. Gaze away.
6	Similar to 5 but head tilted to the left as wel. More blinks.
7	Two firm nods and eyeblink
8	Two firm nods and eyebrow raising, several eye blinks.
9	Two nods, several blinks. Eyelids squeezed at start. Mouth corner raised.
10	Fast shakes. Frown. Lips pressed together.
11	Frown. Lips pressed together
12	Shakes (as in 10)
13	Shakes and frown.
14	Head tilt to the left. Frown.
15	Head tilt to the right and raised eyebrows.

accept agree angry astounded attentive believe bored
compassionate considering disagree disappointed disbelieve
disdain disgust dislike distrust doubt encourage helpless
interested like meaningless not interested oh no not again pity
pondering refuse sad sorrow surprised thinking thoughtful
uncertain understand unhappy worried not understand

Annotation Tools

- Dialogue acts
- Gaze direction
- Addressee
- Affective state
- Argumentation

- Turn taking

- ……

Processing Technologies

- Manual and (semi-) automatic annotating
- Audio-visual analysis (speech processing, computer vision)

- Gaze, gestures, posture, head orientation, facial expression, prosody, …

- Tracking, identification. emotion detection, turn taking, addressee detection, …

- … listening …

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Looking at Interaction
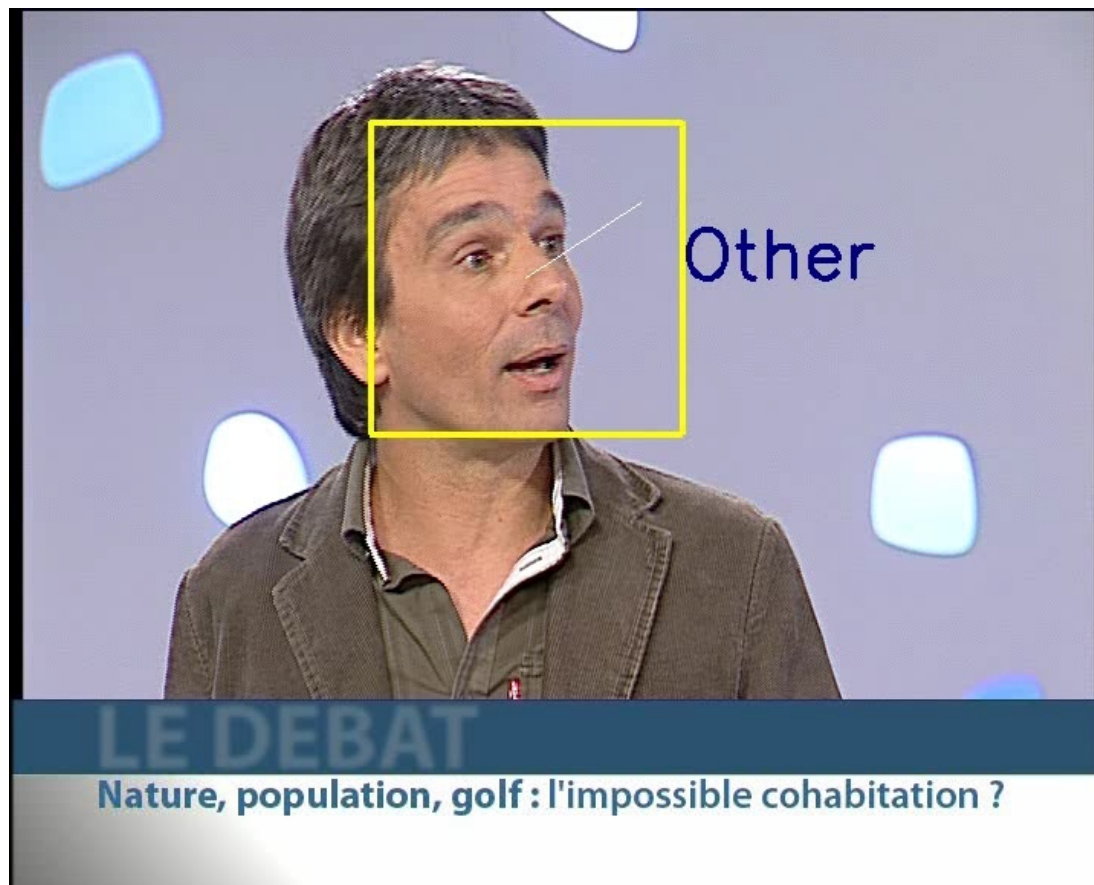
Head Nod/Shake Detector

Hand Raise Detector

Human Media Interaction

'Daily Life': Looking at People

Methodology

- Analysis of annotations brings us heuristics, rules and models

- Annotations are starting point for machine learning of rules and models

- Rules and models become algorithms that allow interpretation and adequate reactions (re-active and pro-active) on demands and events

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'Daily Life': Looking at People
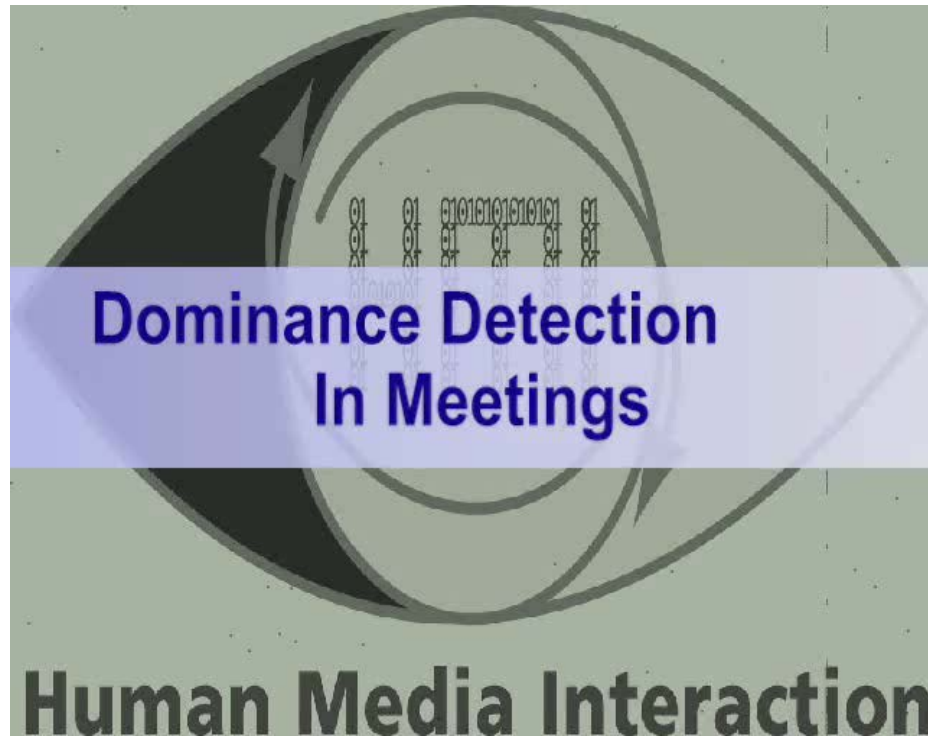
High-level Information from Low-level Features

LESS 'CONSTRAINED' ENVIRONMENTS

Looking at Interaction

Continuous interaction 'in context'

'Guided' by 'external' events

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Looking at Interaction

- Behavior coordination lets interactants assimilate their behaviors in form, content or timing;

- Belief coordination leads to compatible knowledge about specific topics, tasks, or each other;

- Attitude coordination regulates the individual's stances toward each other or external objects.

Stefan Kopp, 2010

Human Media Interaction

Looking at Interaction

- Coordination & Synchrony
  - the extent to which people adapt the timing and coordination of their behavior to each other

- Experiments/Literature
  - relation between
    - being able to coordinate one's actions in an anticipatory manner to those of one's interlocutor
    - a positive evaluation of the conversation partner and of the quality of the interaction

Looking at Interaction

- Ramseyer & Tsjacher
  - Correlation between synchrony and positive outcomes in therapy sessions

- Crown
  - Correlation between interpersonal timing and 'like/dislike/unacquinted' relations

- Nagaoka
  - Importance of synchrony for conveying rapport and empathy, ..

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Looking at Interaction

Looking at Interaction

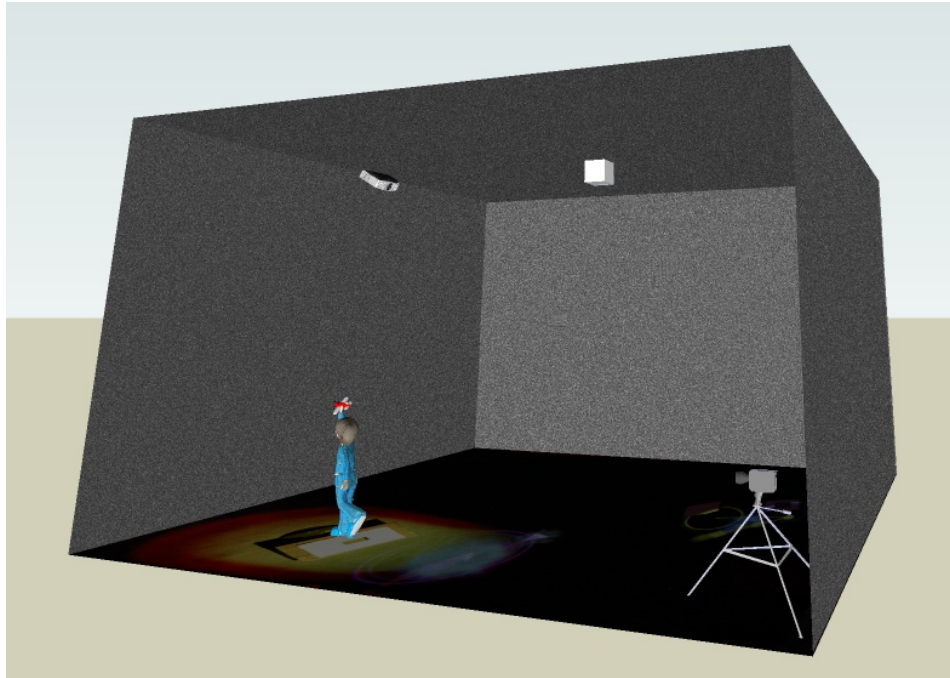**Joint research with Imperial College**

Recent Research: Mimicry Analysis

'Daily Life': Looking at Interaction
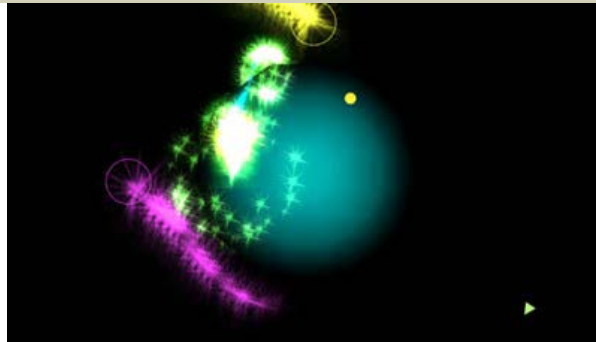
Joint research with Imperial College
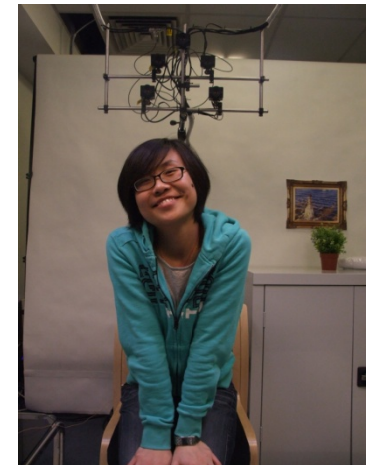
Recent Research: Mimicry Analysis

Looking at Children Interaction

Evaluate and improve interfaces & applications

Human Media Interaction

Looking at Children Interaction

Example Applications

Build a Sensitive Artificial Listener (SAL) that

- Performs listening behaviour
- Motivates the user to continue speaking
- Has 4 different personalities which try to get the user into their emotional setting
- Dialogue Management
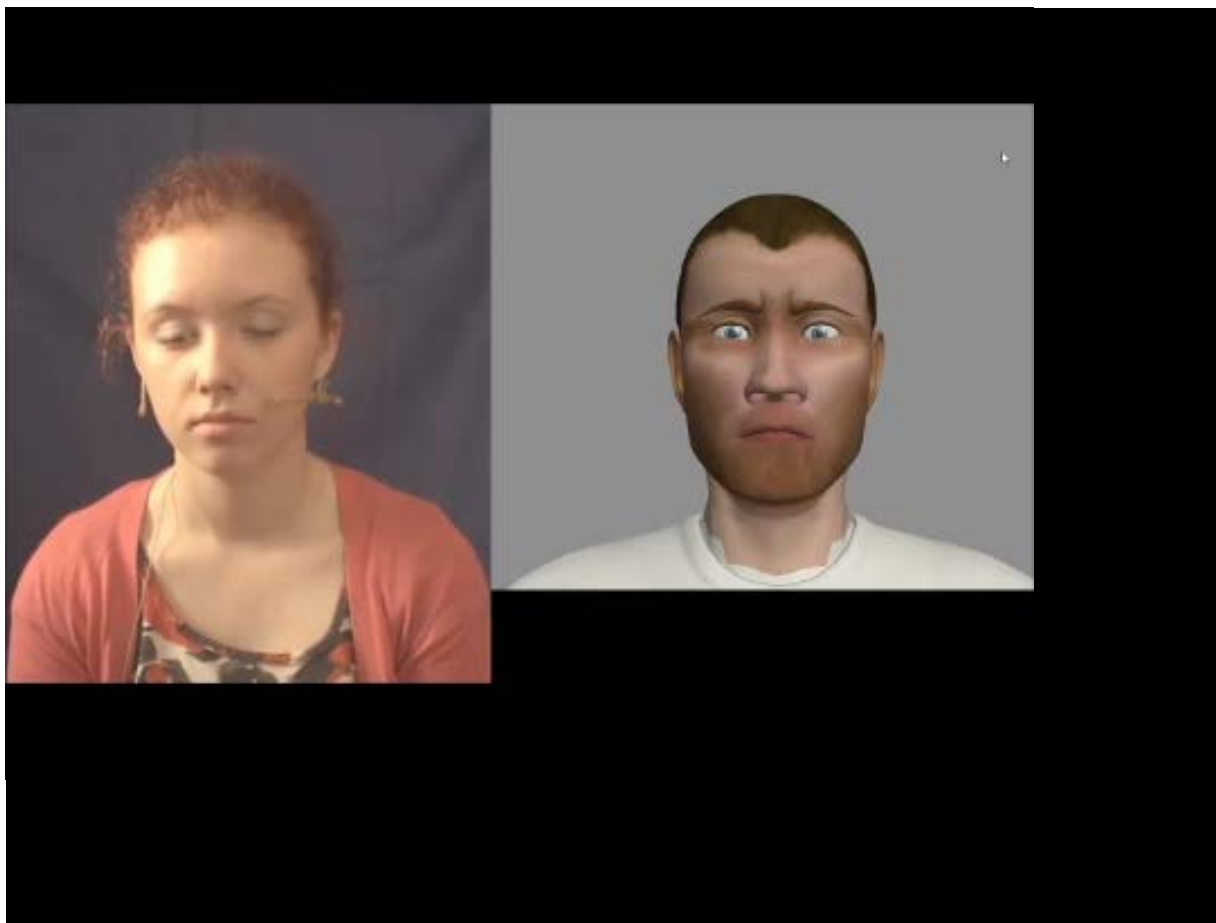
Cheerful   Pragmatic   Sad   Angry

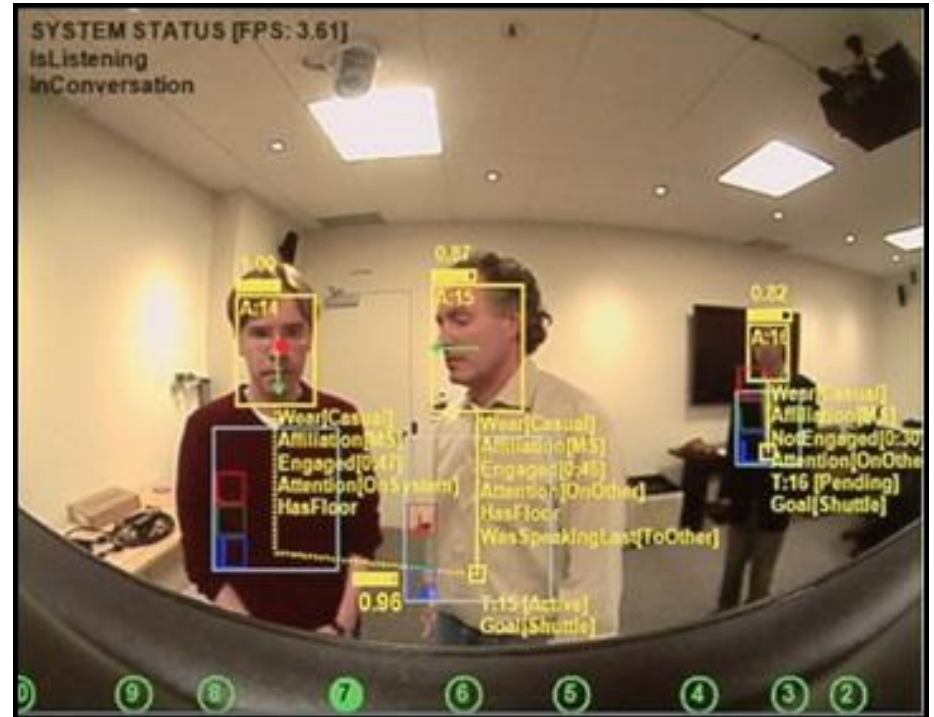**Human Media Interaction**

Example Applications

SAL

Human Media Interaction

Example Applications

**SAL
2011**

**Poppy
Spike
Prudence
Obadiah**

Human Media Interaction

Example Applications

Microsoft Real Receptionist

Microsoft Virtual Receptionist

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Example Applications

**Microsoft
Virtual
Receptionist**

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Example Applications

- Nice, but ..
  - How to recognize conflicts …
  - How to deal with conflicts …
  - How to use politeness …
  - How to hide feelings ….
  - Etc …….

Example Applications
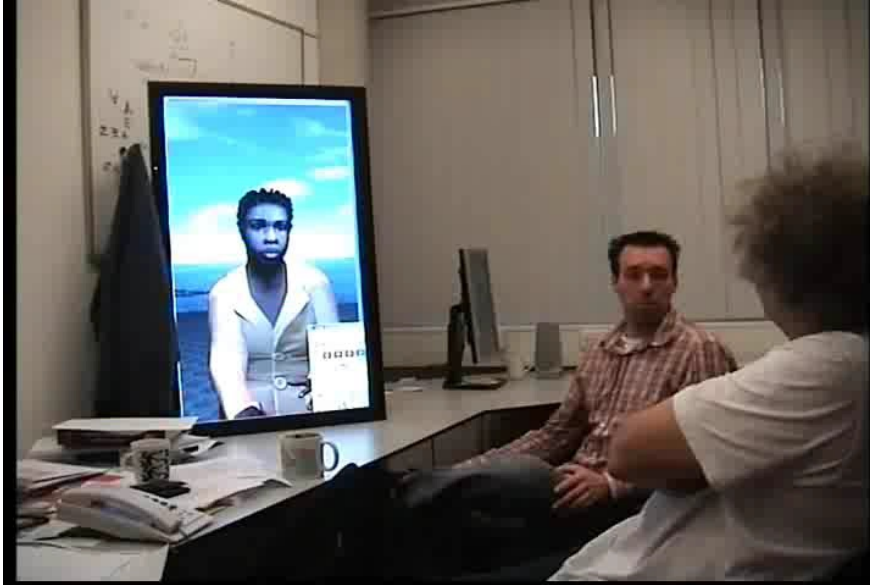
Mediate
- Turntaking behavior
- Visual focus of attention
- ….

Example Applications

Automated Audience Measurement

Attention and Activity Monitoring

Human Media Interaction

Summary:
Sensing & Interpreting Interaction

- Understand interaction & collaboration behavior

- Provide implicit interaction/real-time support

- Provide/generate natural 'machine' behavior (virtual humans, social robots, avatars in games, interfaces

- Adapt interface to users

- Retrieval of all kinds

Human Sensing, Tagging, and Interaction

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Human Media Interaction
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Part III

University of Twente
Enschede - The Netherlands

Intermezzo

WHAT ABOUT SOCIAL MEDIA?

Social Media

- Camera's everywhere, People everywhere
  - London, UK, Shenzen (city of control), …
  - millions of surveillance cameras (public spaces, buildings, homes)
  - connect them, allow public access (great for crime prevention) to online views, add private video cameras (mobiles)
  - then design games, artistic performances and social media

Social Media

- Implants everyone, wirelessly connected
  - WorldWideMind: The Coming Integration of Humanity, Machines, and the Internet. Michael Chorost, Free Press (Simon & Schuster),NY, 2011
  - distribute, share, manipulate mental activity
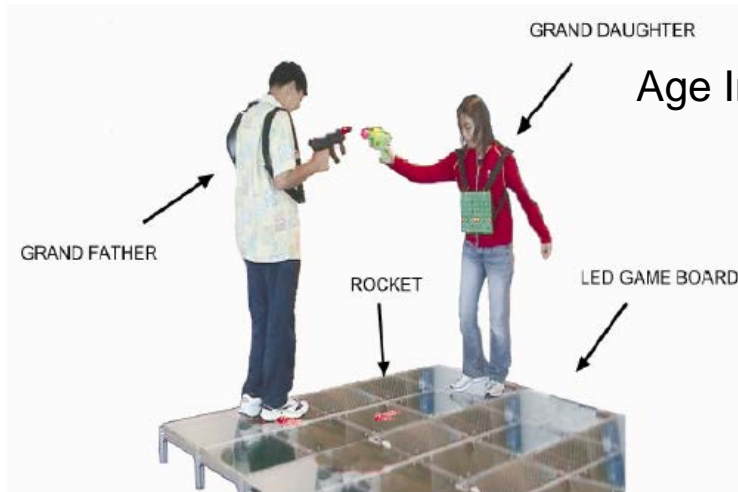 - design games, artistic performances and social media based on shared mental activity

Part III

FUTURE & SOCIETY CHANGE
GAMIFICATION & CONTROL & (PLAYFUL) DECEPTION

HMI

Human Media Interaction

Game Worlds Enter 'Daily Life'

Age Invaders

AR Quake

Human Pacman

URGAN GAMES URBAN GAMES

Human Media Interaction

Game Worlds Enter 'Daily Life'

REALITY
Worst game ever.

Reality
- Graphics are great
- Replayability is poor
-Not always fun
-Not enough bonus points, incentives, and instant gratifications

Jesse Schell, CMU
http://gigaom.com/2010/02/22/video-reality-tv-iphone-the-future-of-technology-why-its-all-a-game/

Maybe Life turns into a Game?

HMI
Human Media Interaction

Game Worlds Enter 'Daily Life'

Game Engines to 'control' your Life

- Project game world on the real world such as AR Quake

- Control the real world

(Very) Modest Example

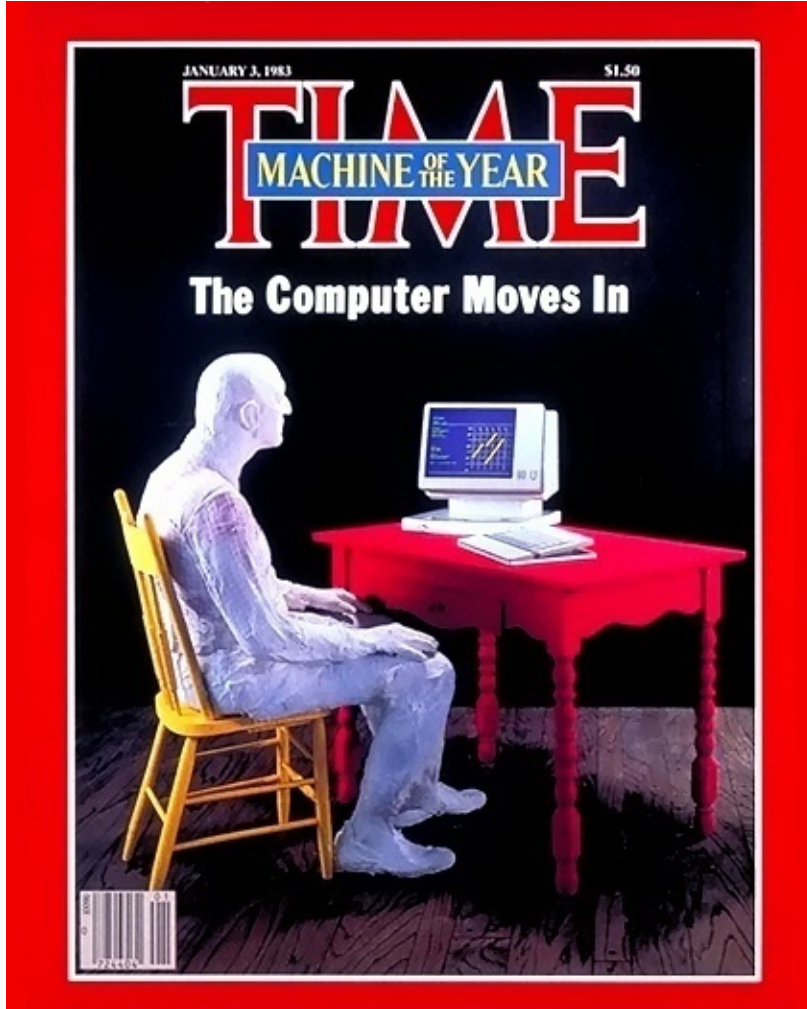- HKU Performance Engine, makes use of Unity 3D engine software

- Designed to facilitate interaction with digital (multi-) media technology in a performative context (theatre making process); includes motion tracking of performer to trigger media and events

Human Media Interaction

Gamification Enters 'Daily Life'

Developments

- **1982: First time in the history of TIME that a non-human was chosen as 'Man of the Year'**

- **Despite that, the computer was yours …**

Human Media Interaction

Hence, …

- The computer was yours …

- It was supposed to be cooperative, to do what you want …

- You were in control …

- Still?

'Non-Cooperative' & Deceptive Behavior

- No control about the situation: we don't want to give ourselves away; we are not always in control anymore

- Useful and not unnatural in daily situations

- Part of the games we play

Human Media Interaction

'Daily Life' Interactions (recall)

Human-Computer Interaction

- Cooperative Principle: Do we want it?
  - Has been the leading principle in HCI, dialogue systems, QA systems, … and other task & efficiency oriented applications
  - But in early chatbots? And in other present, non-task/efficiency-oriented applications that have become possible through embedded sensors, intelligence, and sensors?
  - Moreover, we don't interact anymore with our computer; others have access to what the computer knows about us and may want to benefit from it; we don't know the world behind our partner

- And, in real life . . .
  - Cooperation is not always natural, not always in our interest, not always enjoyable, …

'Daily Life' Interactions (recall)

Human-Human Interaction

- Lots of 'Non-Cooperative' (verbal/nonverbal) behavior

    - Not always telling the truth (can be a social lubricant)

    - Self-interest, exaggerated/false politeness

    - Teasing, provoking, joking, flirting, . . .

    - Play different roles for different audiences

    - Mediated interaction: chatting, instant messaging, twittering, …

    - Games, sports, education, …

Human Media Interaction

'Non-Coop' and Deceptive Actions

'Non-Coop' and Deceptive Actions

- Sports, Recreation, Education, Games, ….
- Social Control, Parental Control, Crime, ….

  - Mislead, provoke, tease, cheat, lie, conceal, omit, mask, false confirms, avoid, feint, challenge, ….

- Computer as opponent, trainer, teacher, parent, police man, social control agent, game control agent, bonus provider, …

HMI

Human Media Interaction

'Non-Coop' and Deceptive Actions

Young People

Sly children fool exercise study

Children taking part in a study to measure how much exercise they do fooled researchers by attaching their pedometers to their pet dogs.

About 200 children in east London were given pedometers to automatically count how many steps they walked and ran.

Mile End Centre for Sports and Exercise Medicine was surprised by the activity levels recorded in some obese children.

Professor Nicola Maffulli said: "Then we realised they were attaching the pedometers to their dogs' collars."

Girls are advised to take 12,000 steps a day and boys to take 15,000

Good for a
15 MINUTE
Delay of
BEDTIME

'Non-Coop' and Deceptive Actions

Old People

- Example
  - Caretakers have to look after the personal hygiene of the elderly. How do they check whether someone has washed herself in the morning? Check whether the wascloth is still wet or moist.

  - After some time people know how this is done, don't wash, but make the wascloth wet and put it back on the towel rack.

  - In a sensor-equipped environment, what to do with this information?

HMI

Human Media Interaction

'Non-Coop' and Deceptive Actions

Government

Pretending ...

Olympics 2008, Beijing

Human Media Interaction

'Non-Coop' and Deceptive Actions

- Unilateral topic shifts or topic maintenance

- Avoidance

- Unhelpful criticism

- Withholding of information

- Rejection of empathy

Negotiation

'Non-Coop' and Deceptive Actions

Sports

- In games and sports deceptive actions are there to divert attention from one's real purpose

- Computer environments as sports or training environment, virtual human as trainer

- Environments for rugby, handball, ice hockey keeper training, ….

Human Media Interaction
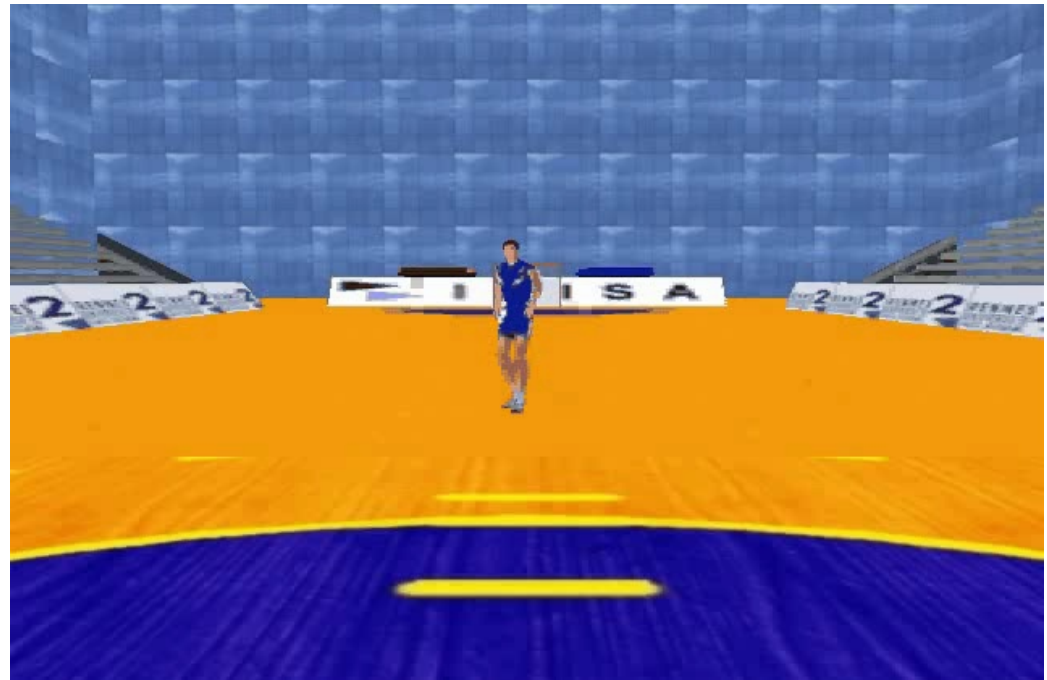
'Non-Coop' and Deceptive Actions

Sports

Feint

a deceptive action calculated to divert attention from one's real purpose…

a good feint takes courage and a pokerface …

what if an opponent can always anticipate your feigned attack …?
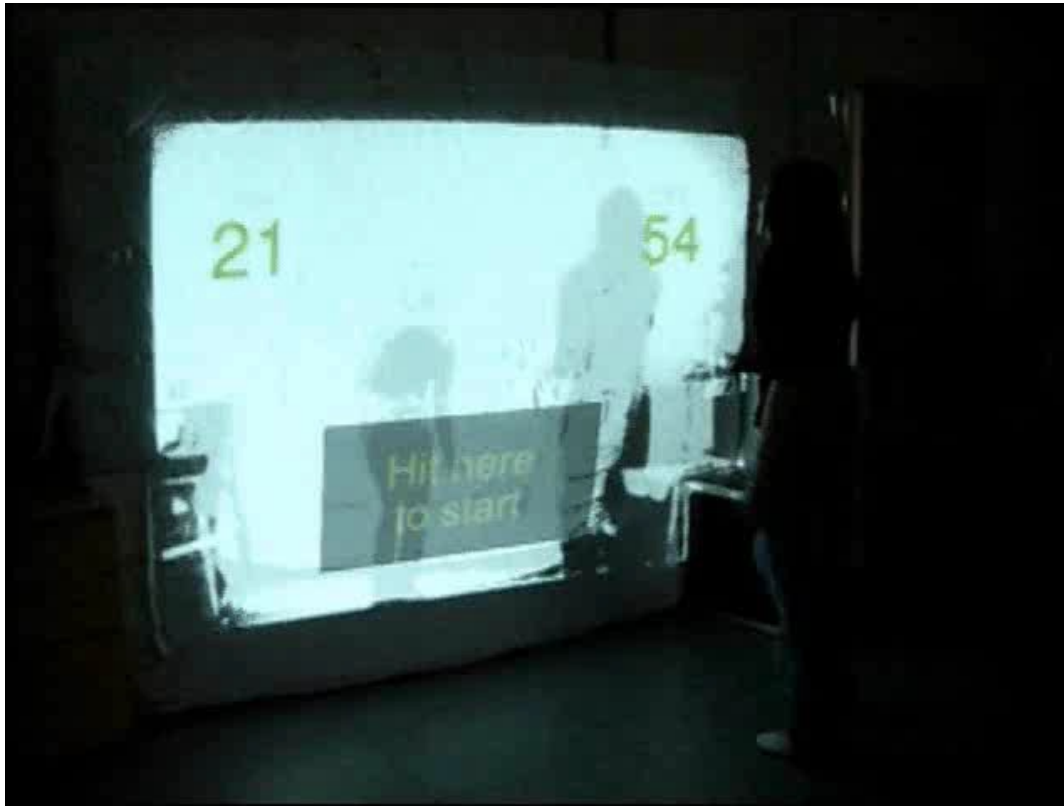
'Non-Coop' and Deceptive Actions

Fitness

Computer vision
Monitoring the user
Exercise schedule
Animations

Desired pose

Current pose + feedback for pose-change

Body part labelling
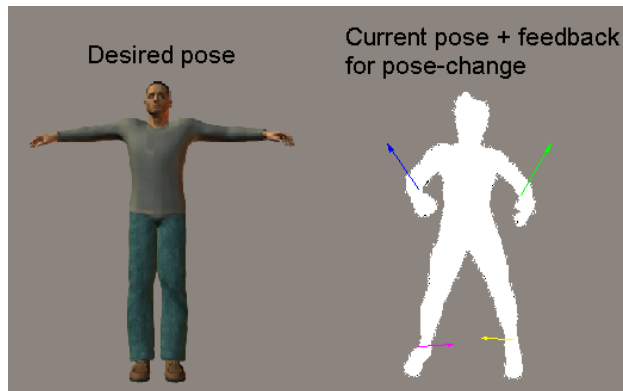
Interaction between user and trainer

User doesn't always speak the truth (I'm tired, I'm not tired at all)

Sensors speak the truth/How should the virtual trainer employ this information?

HMI

Human Media Interaction

'Non-Coop' and Deceptive Actions

Dancing, …
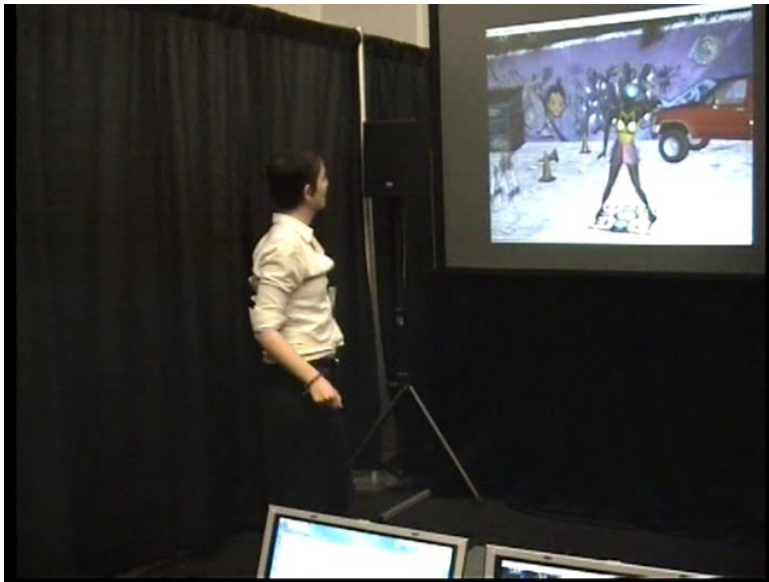
… leading, following, attract-repulse, synchronize, external events (music, audience, …)

'Non-Coop' and Deceptive Actions

Famous Non-Coop Behavior

Not being allowed to know better: Cheat HAL?

HAL gets conspicuous

HMI

Human Media Interaction

'Non-Coop' and Deceptive Actions

Famous Non-Coop Behavior

HAL: This mission is too important for me to allow you to jeopardize it.

Dave Bowman: I don't know what you're talking about, HAL?

HAL: I know you and Frank were planning to disconnect me, and I'm afraid that's something I cannot allow to happen.

Dave Bowman: Where the hell did you get that idea, HAL?
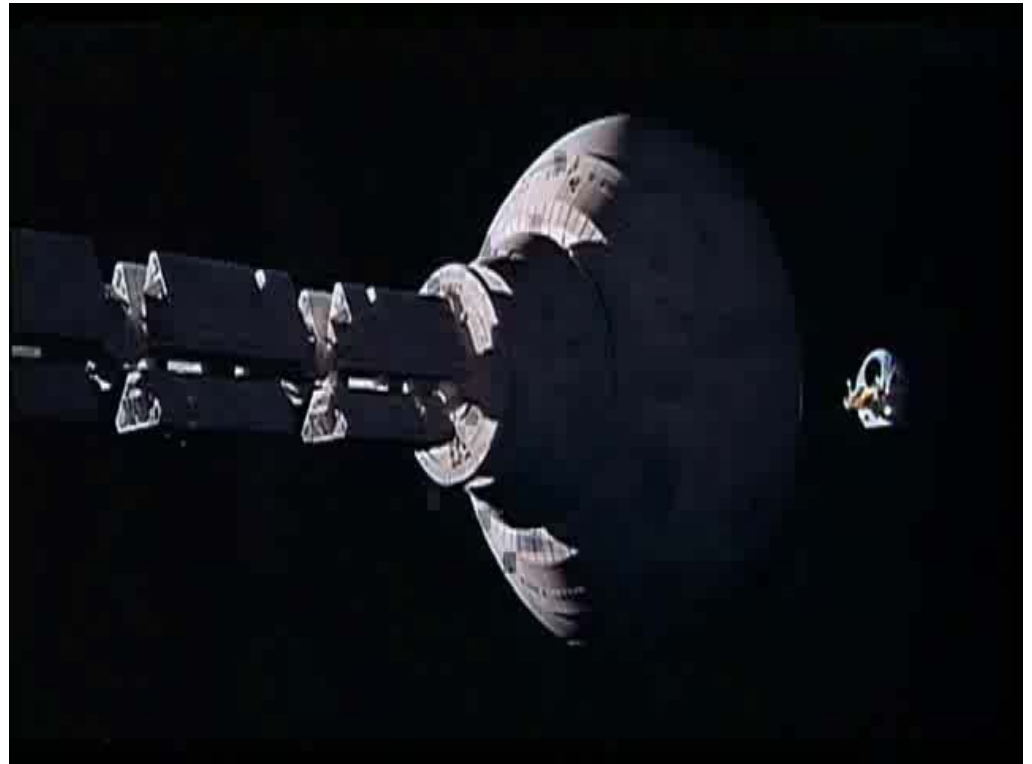
argue, cheat, mislead, loose, win, …

Detecting, Dealing, and Generating …

- The environment generates and displays non-cooperative or deceptive behavior (in a training situation, as opponent in a game, to protect its human owner, to avoid loss of face, …)

- The environment detects, analyzes, interprets and deals with non-cooperative or deceptive behavior of its human partners or opponents

- The (humanoid) computer is not able to detect deceptive behavior of its human partner (see HAL, final discussion)

Human Media Interaction

Detecting, Dealing, and Generating …

Unbeatable Computer Games?

Skin signals betray a gamer's moves

Two Hungarian researchers have come up with a cunning way to create the most frustrating computer game imaginable.

Laszlo Laufer and Bottyan Nemeth at the Budapest University of Technology and Economics have discovered that a gamer's button presses can be predicted 2 seconds before they make them, through measurements of skin conductance.

This trick might ultimately have some important applications, like speeding-up a person's reaction time. But it could also conceivably be used to make computer games that predict a player's actions and adapt in order to frustrate them.

An unbeatable computer game?
August 30th, 2007 in Technology / Computer Sciences

"Yeti" is the character in a new computer game that has the potential to predict a player's move in advance by measuring skin conductance. Image credit: YetiSports.

Researchers have come up with an idea to design a computer game that knows a player's move about two seconds before the move is made. Using measurements of players' skin conductance, the computer's sensors can tell when a player is about to press a button.

BCI and Games

- The computer can glimpse into your future: the intent to act can be detected before the actual action takes place

- Automated detection of bluffing

Human Media Interaction

Commercial Developments

Commercial Deception Detection

Commercial Deception Detection

Cephos

NO LIE MRI

Commercial Deception Detection

Commercial Deception Detection

Commercial Deception Detection

News

► Love Detector for Skype PC is now available. Your e-relationship is about to change for good... Click Here!

► **USA Release:** LoveDetect.com was launched on Oct. 24th '06 to serve cellular users across the U.S. US resident? Click Here!

Latest Release

Love Detector for Skype PC is now available. Your e-relationship is about to change for good...

Order Now

"Any sufficiently developed technology is undistinguish from magic..."

(Arthur C. Clarke)

► **It's All About Love...**

The need to be loved is one of the s Whether it's a first date or a long-te desire to know how someone really you're telepathic, you can't always

Nemesysco's Love Detector can discovering someone's true feeli

► **Range of Emotions**

Love Detector uses SENSE technology to provide information for four main emotional parameters: Excitement, Embarrassment, Anticipation and Love /Arousal. Beyond this however, SENSE can provide an entire range of emotional indicators as follows:

Excitement Level: SENSE compares the presence of any Micro-High-Frequencies in the tested voice sample to the basic profile calculated by the system and determines the excitement level in each vocal segment.

Confusion Level: SENSE measures and compares the usually unnoticeable micro-delays in the person's voice to evaluate how certain or confused he/she is.

Stress Level: Stress is defined as the body's reaction to a threat, either by fighting the threat or by running away. Stress is detected by analyzing changes in the low frequency range over time.

Thinking Level: Measures and indicates whether the person is struggling to find answers, "inventing reality," acting, etc.

S.O.S (Say Or Stop): Indicates when someone hesitates to say something or when he/she immediately regrets having said something.

Concentration Level: Measures the level of concentration which the person is at while answering your questions.

Anticipation Level: Is he/she anticipating my response? Are they expecting to hear something specific? Perhaps this is the time to ask the important question?

Embarrassment Level: Is your subject feeling conformable, or is he/she embarrassed?

Love/Arousal Level: What triggers your subject's arousal? Does he/she like you? This indication is used to provide relevant information in the Love Detector applications.

Anger: SENSE detects and measures levels of anger.

About Love

Human Sensing, Tagging, and Interaction

HMI

Human Media Interaction

Commercial Deception Detection

High, sustained emotional activity, together with high concentration levels and low embarrassment levels indicates love-related emotions in the subject's voice. If this has been detected, **Love-Detector notifies you immediately.**

Human Media Interaction

Wrap Up

Wrap Up

- There is the possibility of continuously capturing, analyzing, interpreting and storing of temporal streams of data that concern a particular person

- Provides the opportunity to support persons in their private, public, professional life

- Provides the opportunity for computer systems to know about a user's personality, predict his behavior and prevent certain behavior, maybe not always in the interest of a 'user' (partner)

HMI

Human Media Interaction

Wrap Up

- We want to understand human behavior from verbal and nonverbal cues. Hence, we need to recognize and understand deceptive cues.

- We don't always want the computer to be able to understand and predict all our intentions. It will make us feel uneasy in our interactions with the computer/robot/virtual human. We should have the possibility to 'not give ourselves away' all the time and maybe we should be able to deceive the computer in our daily life games

- There are many (future) applications, apart from 'conversational systems', where deception is 'part of the game': in security, art, in sports, in games. People train how to cheat or make feint attacks. How can we hide our weak points when playing with the computer. How can we recognize the weak points of our computational 'opponents'

Human Media Interaction

Conclusions

Conclusions

- Looking at Human (Interaction) Behavior
- Retrieval-Interaction Continuum
- Computational Models of Interaction Behavior
  - Allow retrieval of Interaction Events
  - Allow retrieval of Higher-Level Events, Interaction & Human Characteristics
  - Both cooperative and 'non-cooperative' behavior have to be considered
- All kinds of applications (useful, playful, ...)
- Access through embedding in applications, games and social media

Human Media Interaction

Thank You for Your Attention