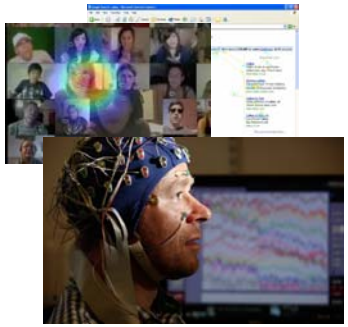
case studies in design informatics

Lecture 10: Affective Factors



design informatics

NRlabs neuropolitics research

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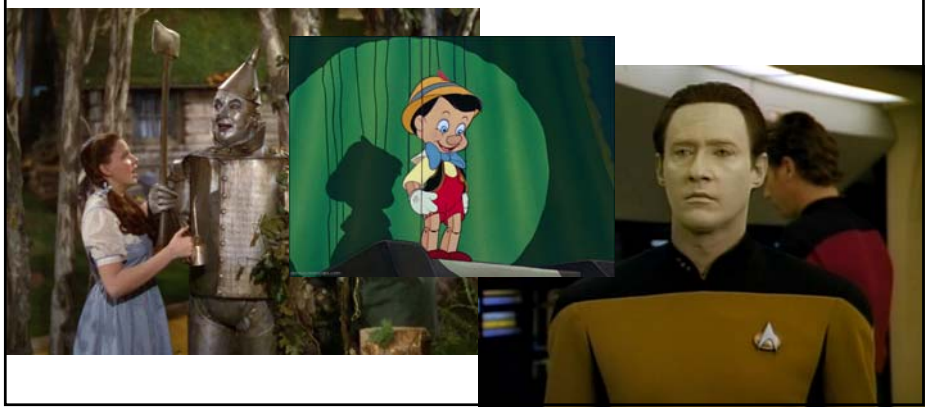
Emotions: to be human?



What is affective computing?

Rosalind W. Picard (MIT) is credited with introducing the term in 1995, leading to a book in 1997:

"computing that relates to, arises from, and deliberately influences emotion"

What is affective computing? (2)

Jonathan Gratch (University of Southern California):

An Interdisciplinary field of research

- **Research and develop systems that recognize, interpret, stimulate and simulate human affect including:**
  - How affect influences human-computer and human-robot interaction and machine usability.
  - How affective sensing can inform machine-understanding of people.
  - How to make computers more human-like.
  - The ethics of "giving" machines emotional capabilities.

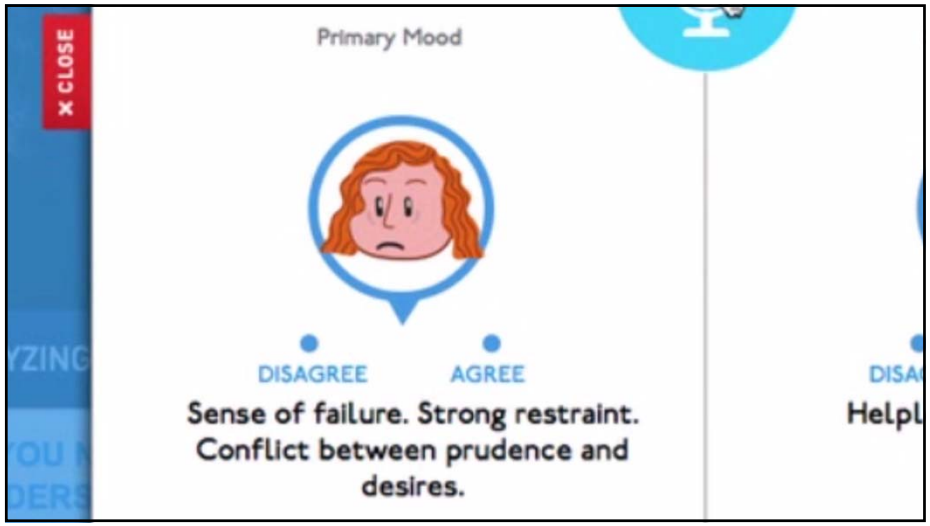
What is affective computing? (3)

- Covers but is not limited to the topics involving:
  - Sensing and analysis (i.e., recognition of facial expressions).
  - Psychology and behaviour as they relate to affective computing.
  - Behaviour generation and user interaction.

See, for example:

Gratch, J., & Marsella, S.(Eds.) (2013). Social Emotions in Nature and Artifact. Oxford University Press. DOI:10.1093/acprof:oso/9780195387643.001.0001

Marsella, S and Gratch, J. (2014). Computationally modeling human emotion. *Communications of the ACM* 57, 12, 56-67. DOI: http://dx.doi.org/10.1145/2631912



Areas of interest

Extracted by J. Gratch from the journal he edited:
IEEE Transactions on Affective Computing (TAC)

Areas of interest (2)

- Emotion Recognition in:
  - Speech
    - Emotion in natural speech
    - Depression detection
  - Text
    - Opinions in twitter; blogs
    - Emoticons
  - Face
    - Understanding impact of aging
    - Recognizing expressions with thermal
  - Physiology
    - Inferring response to music via EEG
    - Detecting stress from skin conductance
- Synthesis
  - Emotional speech
  - Emotional facial expressions
- Games/Entertainment computing
  - Responses to victory and defeat
  - Affective music player
  - Boredom detection

Areas of interest (3)

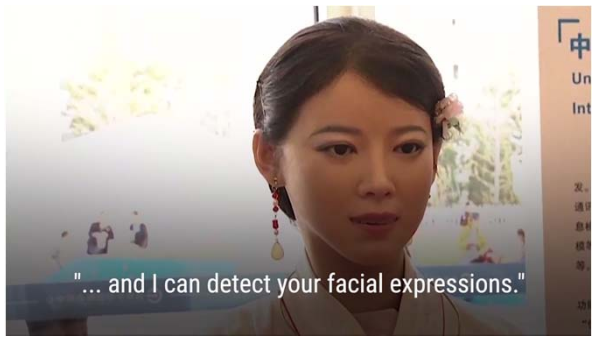
- Modeling
  - Modeling emotional influences on decision making
  - Modeling factors that elicit emotions
- Applications
  - Health – detection and shaping
  - Games/entertainment – detection and shaping; synthesis/realism
  - Education – detections; shaping
- Behavioral science

Companion robots

Solution for an ageing population?

China's University of Science and Technology

Jiajia:
- Can talk with you
- Recognise faces
- Identify gender of people
- Identify age of people
- Detect facial expressions



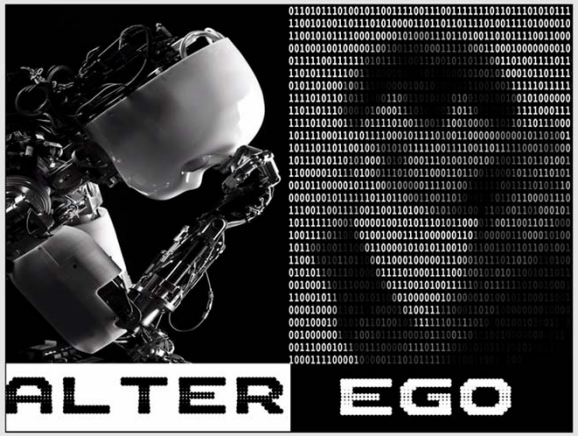
Kirobo Mini

- Toyota is introducing a four-inch robot baby created to "invoke emotional connection" in 2017. (Expected to cost about $400.)
- Fits into the cupholder of your car.
- Features a camera, microphone and Bluetooth connectivity to recognize facial expressions and engage in conversation.

AlterEgo Project

- Create new human-artificial agent interactions through the concept of similarity in order to enhance social competence in patients suffering from social deficits.
- Easier to socially interact with something “like us”.

http://www.euromov.eu/alterego/



In contrast

- This year, La Société de Saint-Vincent-de-Paul released an anti-A.I. advert: B.E.N (Bionically Engineered Nursing).
- “Today, companion robots are being introduced to assist lonely people.
- “… we think that only human beings can help in fighting loneliness.
- “We recruit volunteers.”

http://www.ssvp.fr/
https://www.youtube.com/watch?v=kMXKr3-nQds

Emotional background (1)

- What is the **scale** of emotions?
  - Feelings
    - Joyful, angry: seconds, minutes
  - Moods
    - Cheerful, irritable: hours, days
  - Temperaments
    - Outgoing, nervous: years, decades
- Interpersonal stances
  - E.g. warm, distant, etc.
- Preferences
  - E.g. liking, hating

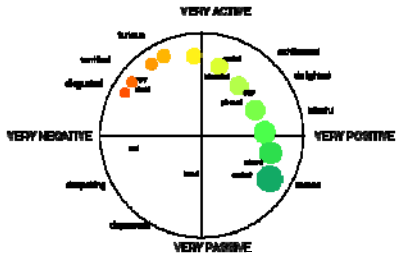
Emotional background (2)

- How **complex** can emotions be?
  - Basic feelings:
    - Happiness, surprise, fear, sadness, disgust, anger
  - More complex ones:
    - jealousy, hope, relief, pride, remorse

Three main schools of thought

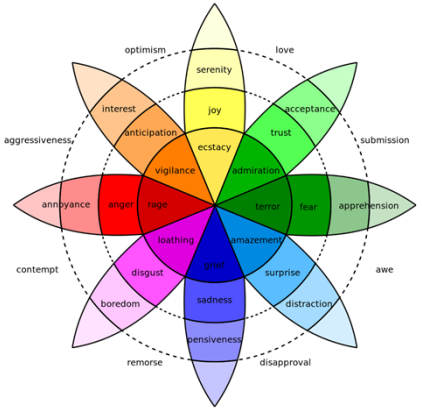
- Categorical
  - Joy, fear, anger
- Continuous
  - Valence vs arousal
- Appraisal
  - E.g. EMA (Marsella &Gratch, 2014).

Feeltrace (2d emotion labelling tool)



Allows labellers to trace emotional content in real time
http://emotion-research.net/toolbox/toolboxlabellingtool.2006-09-26.9095478150

Plutchik's emotion wheel



- Visualisation of human affect and emotional categories.
- Intensity is strongest in the centre.
- Based on Plutchik's Psychoevolutionary Theory of Emotion.

Plutchik, R. (1980), *EMOTION: A Psychoevolutionary Synthesis*, Harper & Row

Plutchik, R. (2001), *Integration, Differentiation, and Derivatives of Emotion*, Evolution and Cognition, Vol. 7, No. 2

Emotional background (3)

- What can you actually do with emotions?
  - Recognise other people's feelings, moods, temperaments.
  - Express a particular feeling, mood or temperament.
  - **Have** (experience) a feeling:
    - caused by events in the world, or in yourself;
    - causing—or at least biasing—further actions by you.
- Evolutionary advantages?

Gut reactions and the somatic marker

- Neurologist António Damásio proposed the Somatic Marker Hypothesis to explain the process of decision making while incorporating the role of emotion.
- Somatic events are bodily sensations.
- The marker links current events and old memories to visceral experiences—gut feelings.
- Combines cognitive and emotional processes.

Damasio, A. R. (1994) Descartes' Error: Emotion, Reason, and the Human Brain, Putnam Publishing: ISBN 0-399-13894-3

Gut reactions

- Watching a horror film has both intellectual and physical effects (sweat, muscle stress).
- Remembering the film may reactivate these sensations, or at least memories of them.
- Similarly, choosing one course of action over another recalls similar sequences of events from memory.
- Each of these sequences has emotional associations, coming from how these events made us feel in the past.
- These associations are essential for fast decision-making.

Somatic markers are useful

- They speed up search, flagging up which plans have negative feelings, biasing towards those with positive feelings.
- Choice is limited, and made quicker, by counting in the emotional consequences.
- At a physical level, this involves links between the frontal cortex and the limbic system, particularly the hippocampus and the amygdala:
  - Hippocampus: links events together (red light = stop traffic);
  - Amygdala: tags these associations (red light/unstopped traffic) = nasty accident.
- If any of the representations are activated, emotion comes too.

Functions for affect

Back to Gratch – he identifies three roles:

1. Physical: Shapes the body
   - Action preparation: energizes body, changes physical orientation
2. Cognitive: Shapes the mind
   - Rapid, continually adjusting assessment of significant events
   - Interruption of behaviors and changing of goals
3. Social: Shapes the minds of others
   - Signaling: broadcast information about mental state
   - Coordination: orient and coordinate group response

Physical role (Gratch)

Emotion prepares the body for the circumstances that elicited the emotion.

- Surprise
  - Opens eyes wider: allowing in more light to perceive information
  - Mouth opens and breath taken: pulling more information to the body
- When angry
  - Blood flows to the extremities: preparing for physical action

Cognitive role (Gratch)

Emotion shifts cognition to a mode appropriate for the circumstances that elicited the emotion.

- Emotions change perception & decision-making (e.g., anger)
  - Quicker to perceive threats (DeSteno et al, 2000/2004)
  - Underestimate risk (Lerner & Keltner, 2000/2001)
  - Use quick/heuristic reasoning (Bodenhausen et al, 1994)
  - Blame others/outgroups (Keltner et al, 1993; Mackie et al, 2000)
  - Remember anger-evoking past events (Bower, 1991)

Social role (Gratch)

Seeing emotions in others shapes our own cognition to prepare to interact with that person.

- Emotions impact social interaction
  - Distress elicits helping (Eisenberg et al, 1989)
  - Anger elicits fear (Dimberg & Ohman, 1996)
  - Negotiators concede more to angry partner (van Kleef et al, 2007)
  - Emotion communicates information to other social actors (Darwin; Parkinson, 2001)

Affect: the future

- In the near future, we are unlikely to have machines that have real emotions.
- But it may be worth working on the recognition and expression of emotions, moods and temperaments.

Why would this help?

- Recognition: making personal agents sensitive to our feelings or moods.
  - Boredom, inattention, stress
  - Content indexing (pain, fear, rage)
  - Deception, anxiety detection
- Expression: making computers appear to have feelings, moods or temperaments, even if they don't
  - More acceptable (?) companions
  - Better information transmission

Uses of recognition

- There's continuing interest in personal agents
  - Software on your mobile, desktop or IoT.
  - It filters your email or vmail, shops for bargains for you, chooses mood music to calm you down or wake you up, finds places of interest to visit, finds news snippets, solves problems, arranges meetings.
  - To do this well, it spends a lot of time with you, learning what you do, and how you like to do it.
- But it would do much better if:
  - It knew when you were interruptible.
  - It knew how well you liked its suggestions.

Uses of expression

- Software agents may be more or less confident in their recommendations.
- Encouragement may help motivate users.
- Presenting a lot of information via voice is a problem, since it takes time, and doesn't really use the voice channel to the full.

Desirability Testing

- Test which design elicits the optimal emotional response from users.
- First impressions matter and snap judgements happen.
- Interface elements that trigger an emotional response are difficult for non-designers to identify and articulate.
- Providing participants with a range of positive, neutral, and negative adjectives that help them articulate their feelings.

Martin, Bella, & Hanington, Bruce M. (2012). Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions (Vol. Digital ed). Beverly, MA: Rockport Publishers.

Microsoft Product Reaction Cards

- Set of 118 cards with a different word on each.
- Aim "to measure intangible aspects of the user experience quickly and easily in the lab".
- www.microsoft.com/usability/UEPostings/ProductReactionCards.doc
- (Permission is granted to use this Tool for personal, academic and commercial purposes.)

Benedek, Joey, & Miner, Trish (2002). Measuring desirability: new methods for evaluating desirability in a usability lab setting. *Proceedings of Usability Professionals Association, 2003, 8-12.*

Barnum, Carol M. & Palmer, Laura A. (2010). More than a feeling: understanding the desirability factor in user experience. In *CHI '10 Extended Abstracts on Human Factors in Computing Systems* (CHI EA '10). ACM, New York, NY, USA, 4703-4716. DOI=http://dx.doi.org/10.1145/1753846.1754217

Barnum & Palmer (2010) example

figure 3. Positive language for prototype site vs. current site

figure 4. Negative language for prototype site vs. current site

figure 9. Comparison of card choices related to ease-of-use category for current site, P1 and P2.

Triangulation

- Greater accuracy of information by combining sources and mitigating the weaknesses of any single method.
- Commonly combine observational methods with self-report ones.
- May involve physiological recordings such as heart rate, pupil dilation, or Galvanic Skin Response (GSR) measures in combination with traditional interviews, questionnaires, and observations, comparing physical evidence with self-reports or visible behaviours.
- Often a Mixed Methods approach: mixture of quantitative and qualitative data, mutually informative to the same inquiry.

(Martin & Hanington, 2012)