Kesako?

- Affective Computing
  - Book by R. Picard (1997)
  - **Detect, Interpret, Process and Simulate human emotions**

- How is it connected to HMI?
  - (Hess et al., 1999)

    Emotions play a crucial role in social interactions
  - (Krämer et al., 2003)

    People, when interacting with an ECA, tend to be more polite, more nervous and behave socially

  → **Affective** ECA / **Affective** Robot!

The story so far...

H-M Dialogue Eliza Trains

Agents MAS AAMAS

Virtual Agents Video Games CHI IVA Serious Games Simulation

Online ECAs everywhere

Emotions R. Picard Humaine ACII

Links from the community

- IVA (Intelligent Virtual Agents)

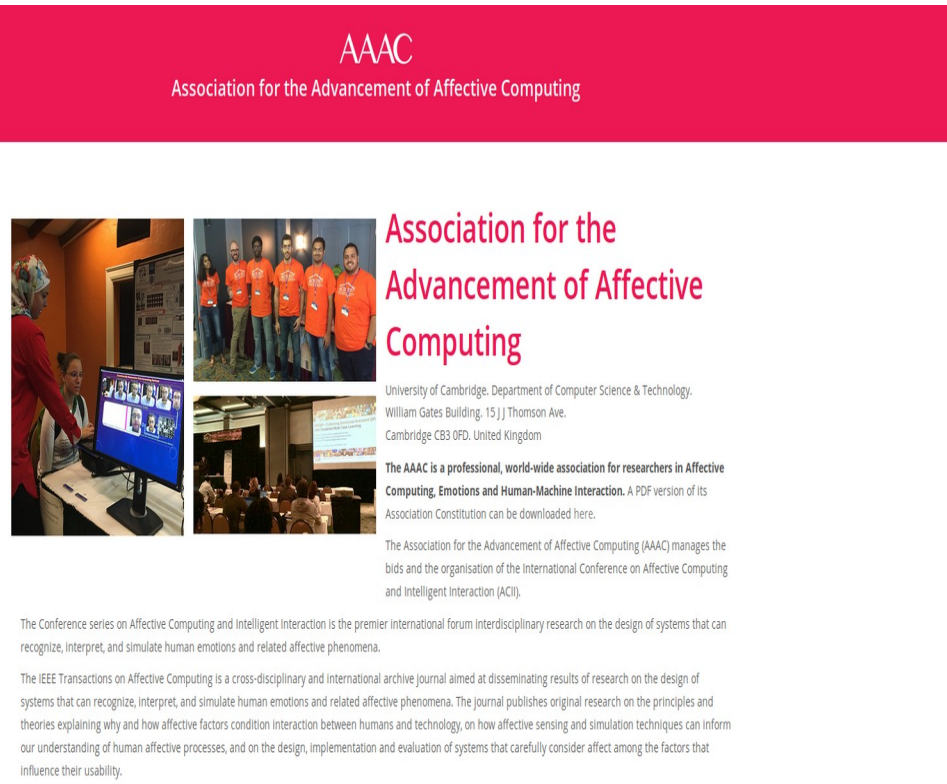
  http://iva2012.soe.ucsc.edu/

- ACII (Affective Computing & Intelligent Interaction)

  http://www.acii2011.org/

- AAAC (ex Humaine)
  - FP6 Project

    (1/12004 – 31/12/2007)
  - Association: **https://aaac.cs.nott.ac.uk/**



Research questions

Detect, interpret, process and simulate human emotions → **affects**

- Computer Sciences ↔ Cognitive Sciences
  - AI and Psychology (for emotions)
  - AI and Sociology (for social relations)
- 3 computational scientific domains:

Machine Learning	*Symbolic AI*	*Image*
Signal processing	Interaction models	Synchronisation
Fusion	KR & reasoning	Virtual reality
Pattern Recognition	Behaviour models	Command

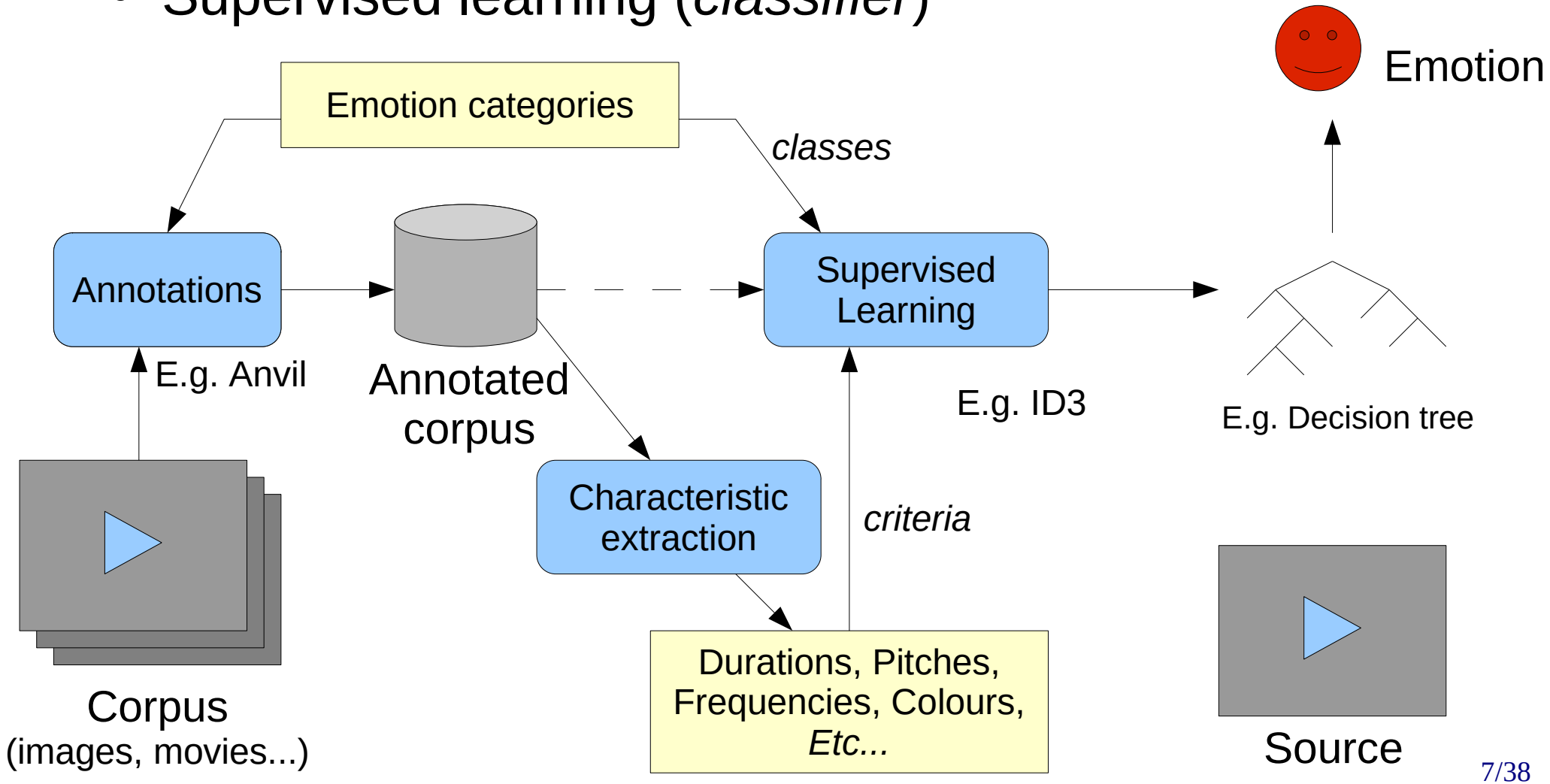
Examples

- Recognition
  - Affectiva Q sensor:
    https://www.youtube.com/watch?feature=player_profilepage&v=mFrSFMnskI4
- Synthesis
  - Virtual agent: http://www.youtube.com/watch?v=CiuoBiJjGG4
  - Robot (Hanson): http://www.youtube.com/watch?v=pkpWCu1k0ZI
- Models
  - Fatima (LIREC): http://www.youtube.com/watch?v=ZiPlE80Xiv4

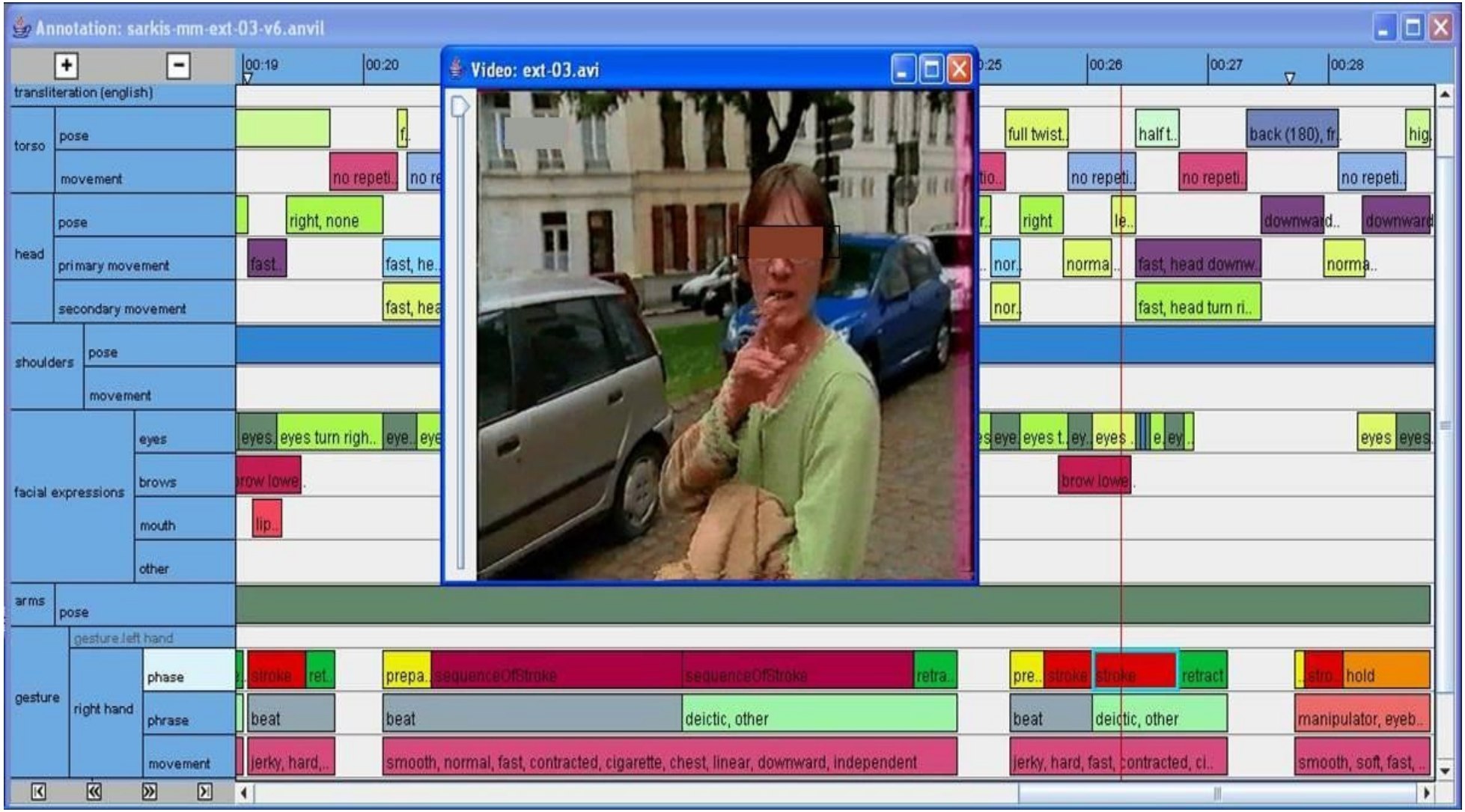
Emotion Recognition

Emotion recognition

- General principle: data-oriented
  - Corpus tagging
  - Supervised learning (*classifier*)



Multi-modal behavior annotation: ANVIL

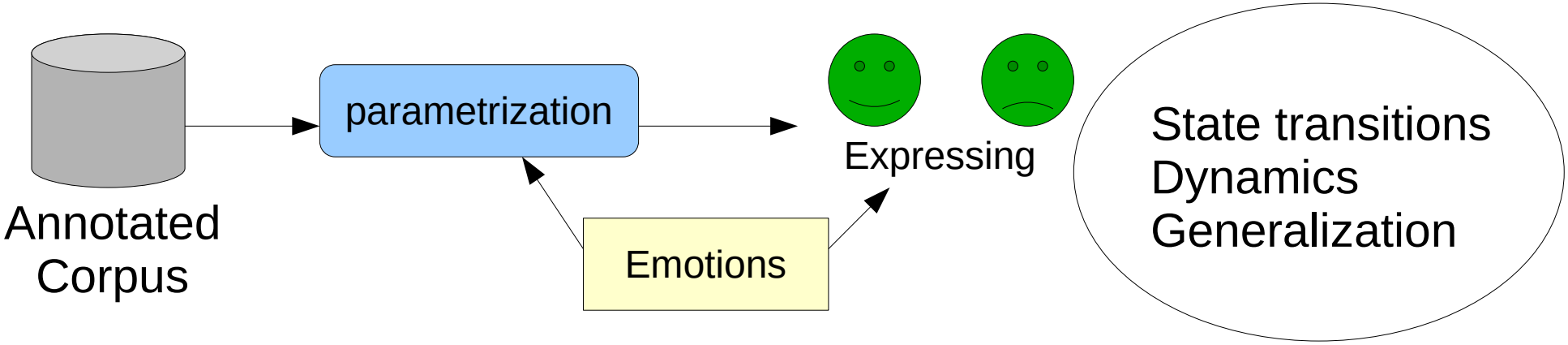


ANVIL tool

Emotion Synthesis

Emotion synthesis

- From Emotion to Parameters



- Evaluation
  - Human recognition of expressed emotions

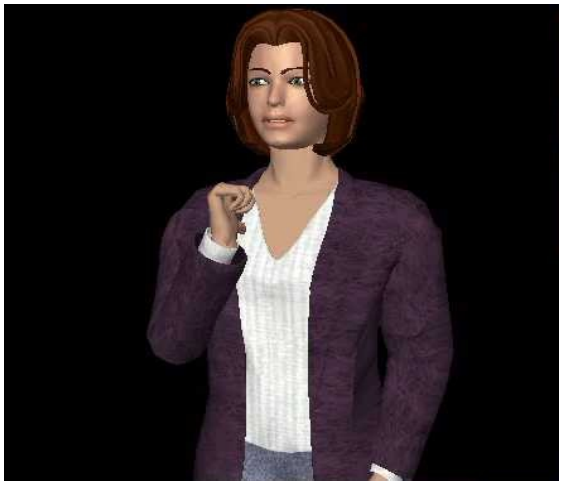
    not reliable, even in H-H interaction (with spontaneous emotions)
- Some examples:
  - Virtual agents: Greta/Semaine/MARC
  - Robots: Kismet, iCat, Nao

Example : from videos to animations

Original video

GRETA

Anger



Desperation

C. Pélachaud LTCI and J-C Martin LIMSI

Emotion Modelling

A bit of Human Sciences

« The question is not whether intelligent machines can have any emotion, but whether machines can be intelligent without any emotions. »

Marvin Minsky, 1986

- Darwin, 1872 (Ed. 2001)

  The expression of emotions in man and animals

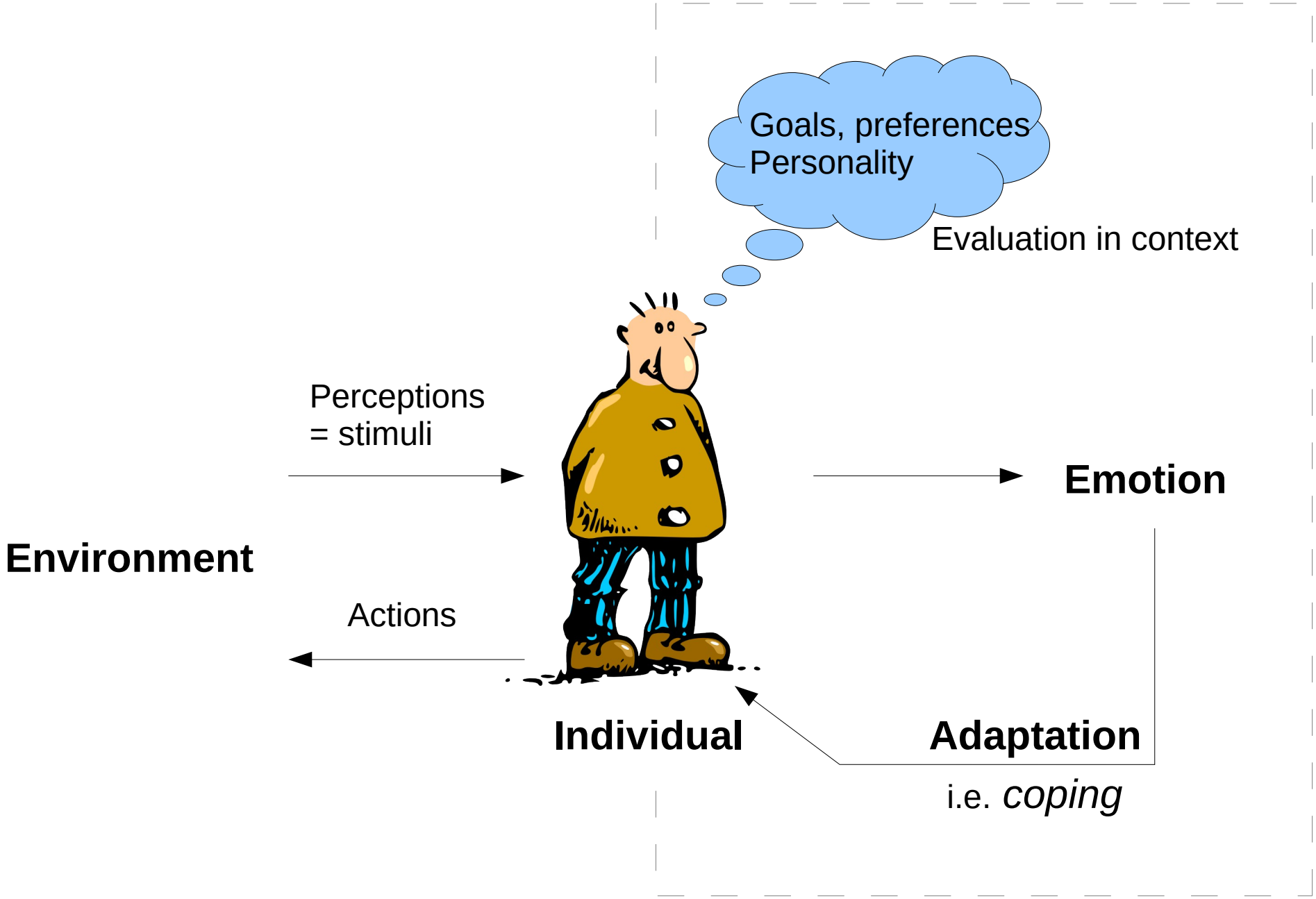
  → Adaptation mechanism

- (Ekman, 1972 & 1990): role in communication
- 2 schools
  - William James, 1887

    Organism changes → emotion
  - Lazarus, 1984 ; Scherer, 1984

    Appraisal theory

Appraisal theory (1)



Appraisal theory (2)

- Coping (adaptation strategy)

  = the process that one puts between himself/herself and the "stressing" event

  - Active coping (*i.e.* problem focused)

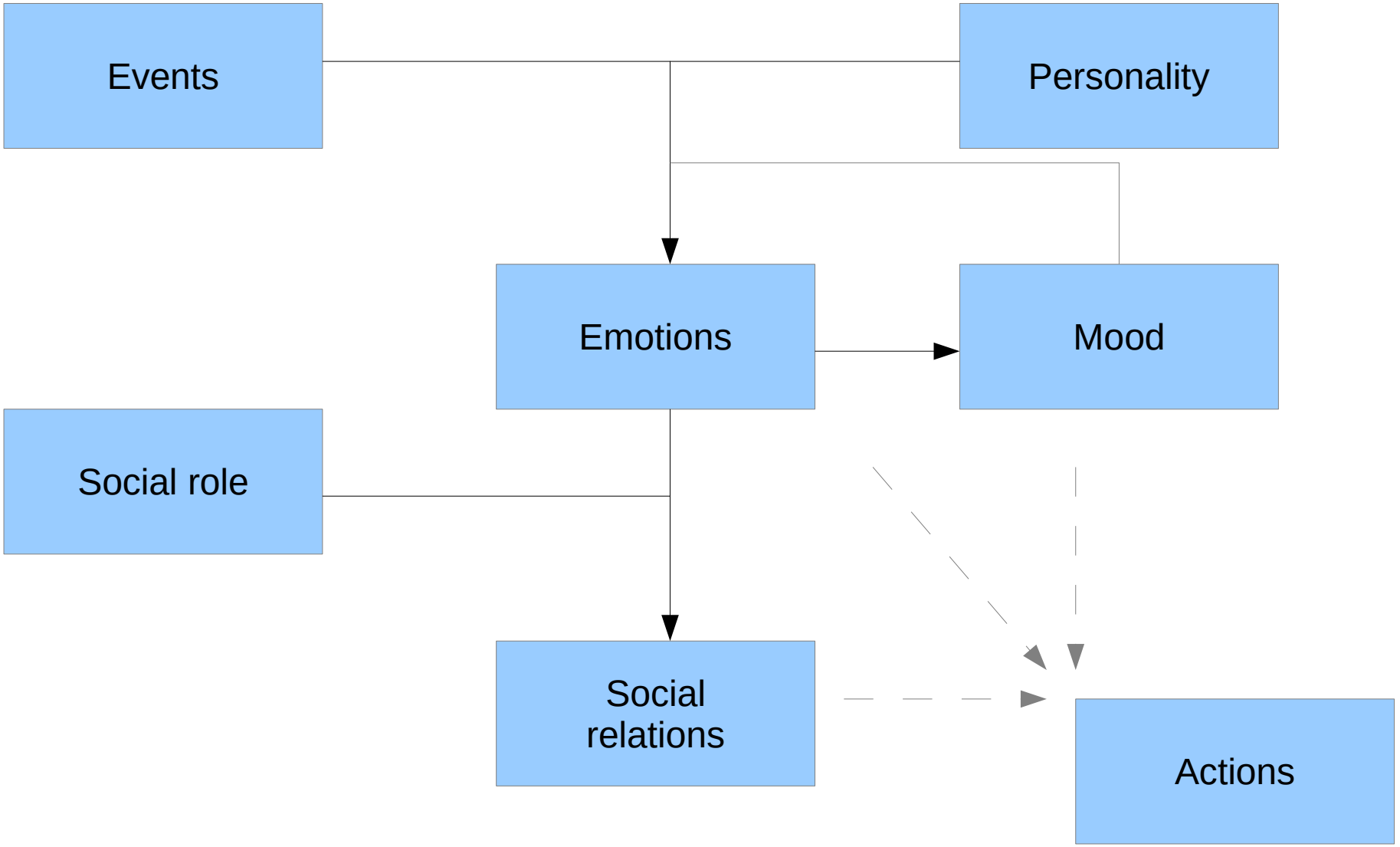
    → act upon the environment

  - Passive coping (*i.e.* emotion focused)

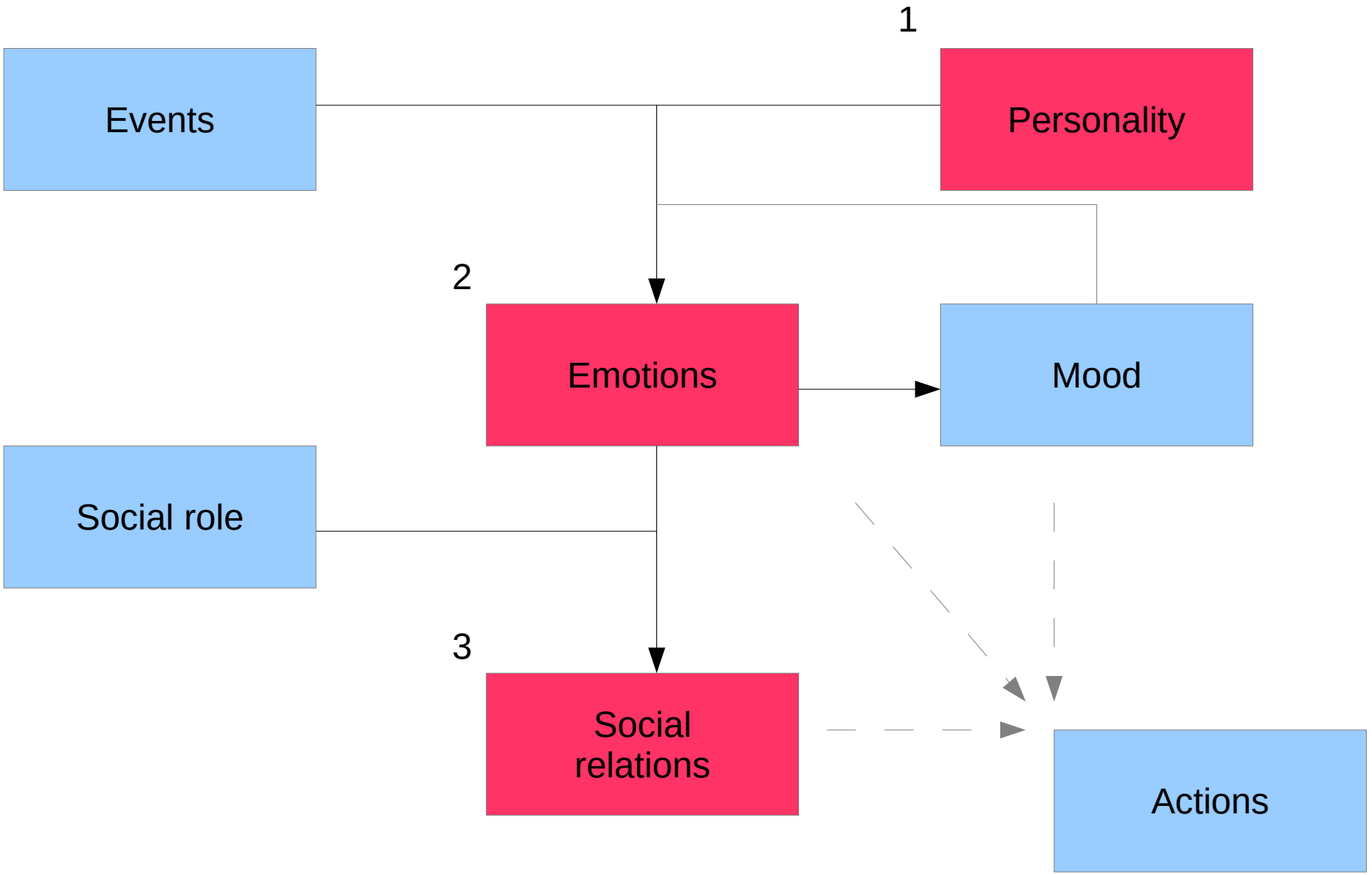
    → act upon one's emotion

- Rousseau & Hayes-Roth, 1997
  - Personality → emotions (Watson & Clark, 1992)
  - Emotions → social relations (Walker, 1997)

Architecture



Architecture



Personality models

Definition and problem

- Personality = stable component in an individual's behaviour, attitude, reactions...
- Designing computational models
  - Define variables
  - Define their value domains
  - Define the characteristic values

Models of personality (1)

- Eysenck, 1967 (1982)
  - Extraversion → Higher sensitivity to positive emotions (and more expressive)
  - Neuroticism → Higher sensitivity to negative emotions (and more frequent changes)
  - Psychoticism → impulsive nonconformity or tough-mindedness

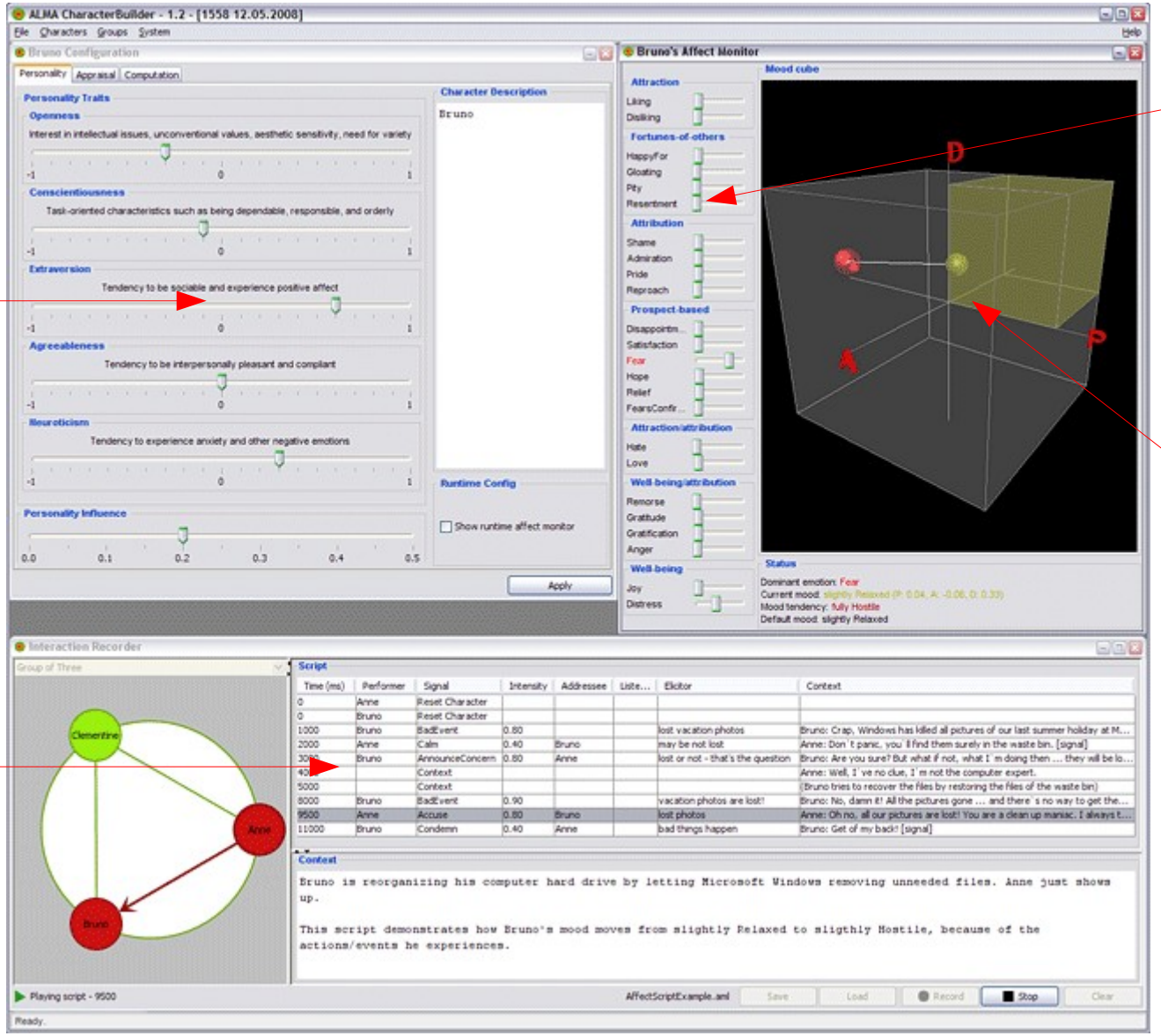
Models of personality (2)

- McRae, 1987 (i.e. O.C.E.A.N. or "Big Five Model")
  - Openness → curiosity, imagination
  - Consciousness → organization, self-discipline
  - Extraversion → exteriorization
  - Agreeableness → compassionate, cooperative
  - Neuroticism → emotional instability

- Myer-Briggs Type Indicator (MBTI) *based on Jung*
  - Energy → introverted or extroverted
  - Information collection → sensitive or intuitive
  - Decision → thinking or feeling
  - Action → judgement or perception

An example: ALMA

(Gebhard, 2005)



O.C.E.A.N.

Events

Emotions

Mood

Emotion models

Models of emotions

- What is an emotion ?
  - James, Ekman, Scherer, …

- Characterizing an emotion
  - Category-based approaches

    → There are N emotions *(N being subject to discussion)*
  - Dimension-based approaches

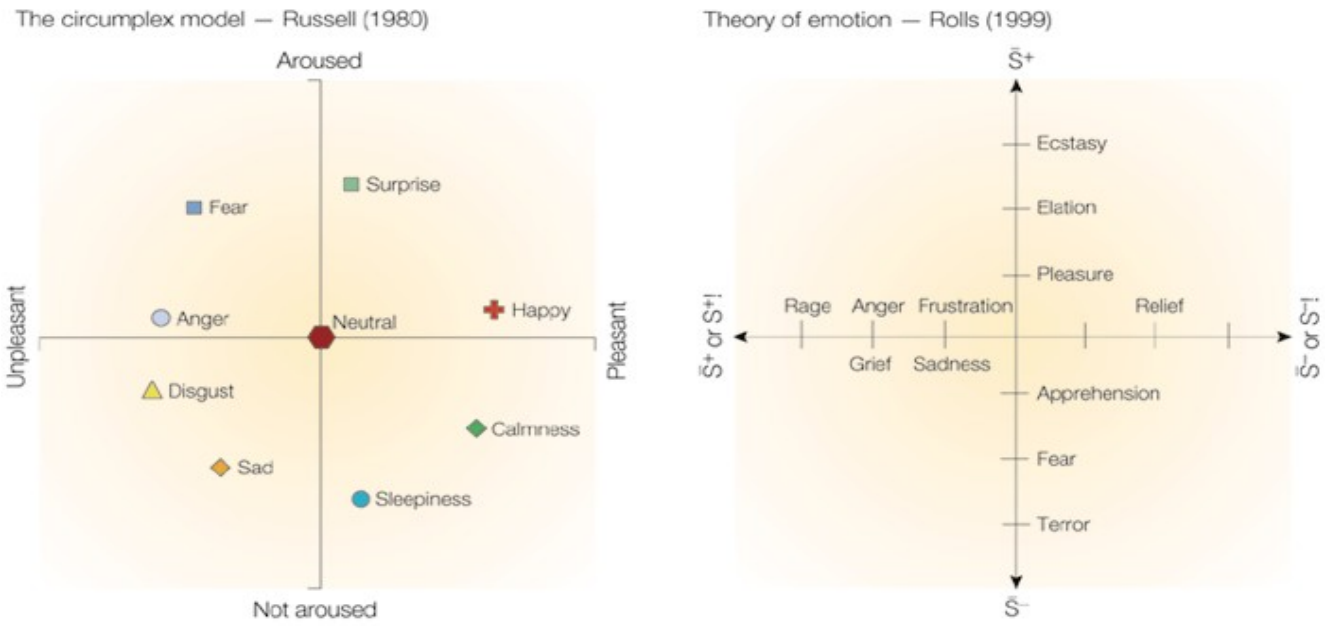
    → An emotion is a point in an N-space (dimensions must make a basis)

Categorical model: Ekman

- **Ekman & Friesen**, 86: joy, surprise, fear, anger, sadness, disgust (, contempt, neutral)
  - Intensity scale associated with emotional labels
  - Sub-categories associated with emotional families
- Complex emotions linked with other mental states (**Baron-Cohen**, 07)
- Detection: Google, Noldus FaceReader, Affectiva, ...

Dimensional model: PAD (1)

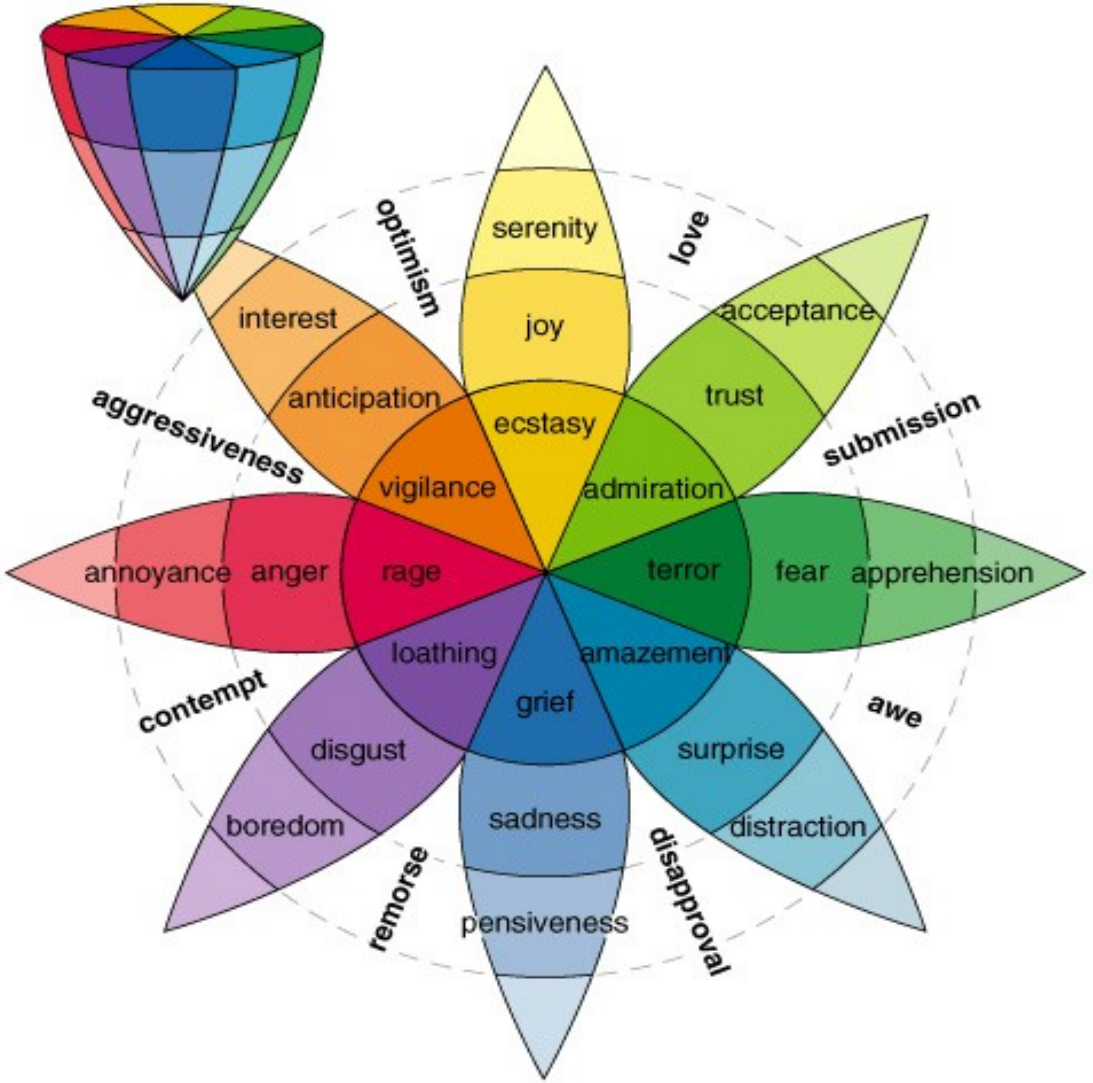
- **Mehrabian**, 1980
- Emotion = 3 dimensions
  - Pleasure (or « valence »)
  - Arousal (or « activation degree »)
  - Dominance
- Examples



Nature Reviews | Neuroscience

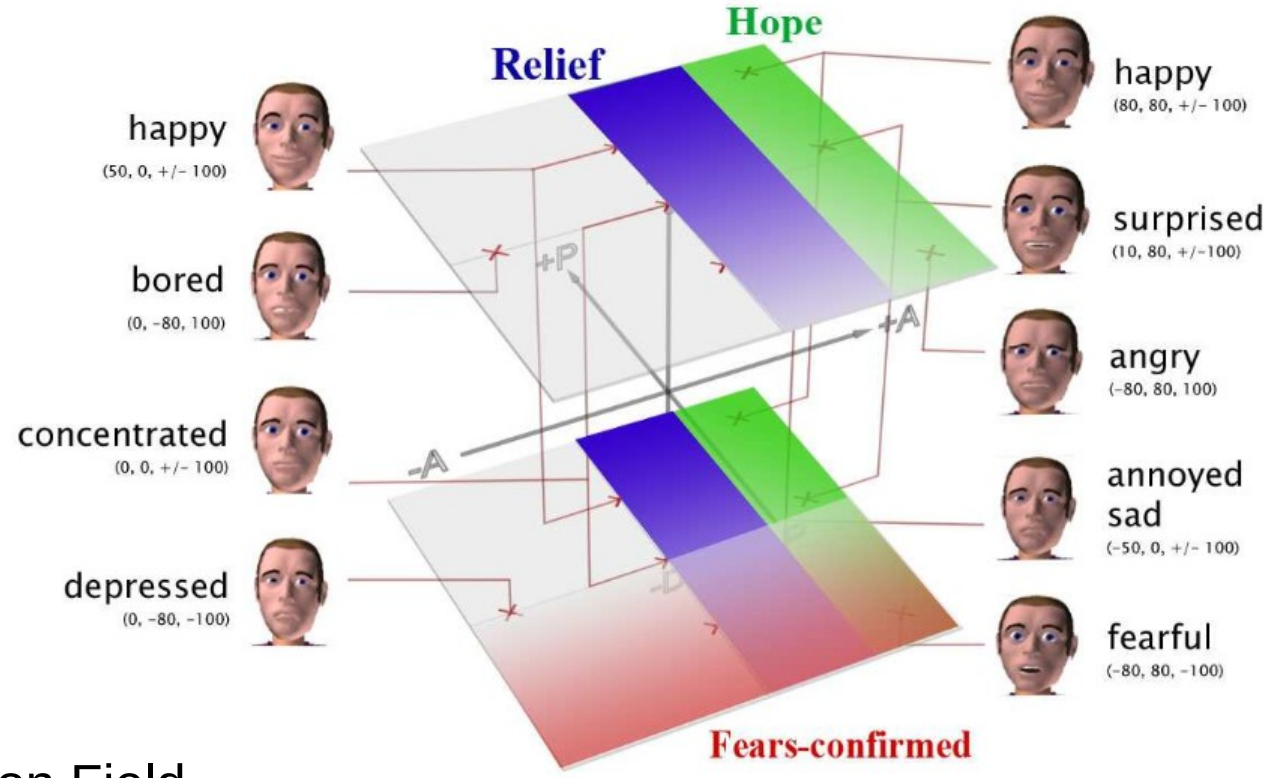
Dimensional model: PAD (2)

- **Pluchnick's wheel**



Dimensional model: PAD (3)

- **Wasabi**: Affect simulation for agents with believable interactivity
- Idea: emotions and mood influence each other over time



- Application Field
  - Robotics: MARCO at ICMI2014
    https://www.youtube.com/watch?v=qADz9Vq5e7Y&feature=youtu.be
  - ECA acts as a teacher in paired associate task

Appraisal: the OCC model (1)

- Ortony, Clore, Collins, 1988
- 20 emotion categories
  - Joy – Distress
  - Fear – Hope
  - Relief – Disappointment, Fear-confirmed – satisfaction
  - Pride – Shame, Admiration – Reproach
  - Love – Hate
  - Happy-for – Resentment, Gloating – Pity
  - Remorse – Gratification, Gratitude – Anger

Appraisal: the OCC model (2)

- Appraisal model based on individuals' goals & preferences:

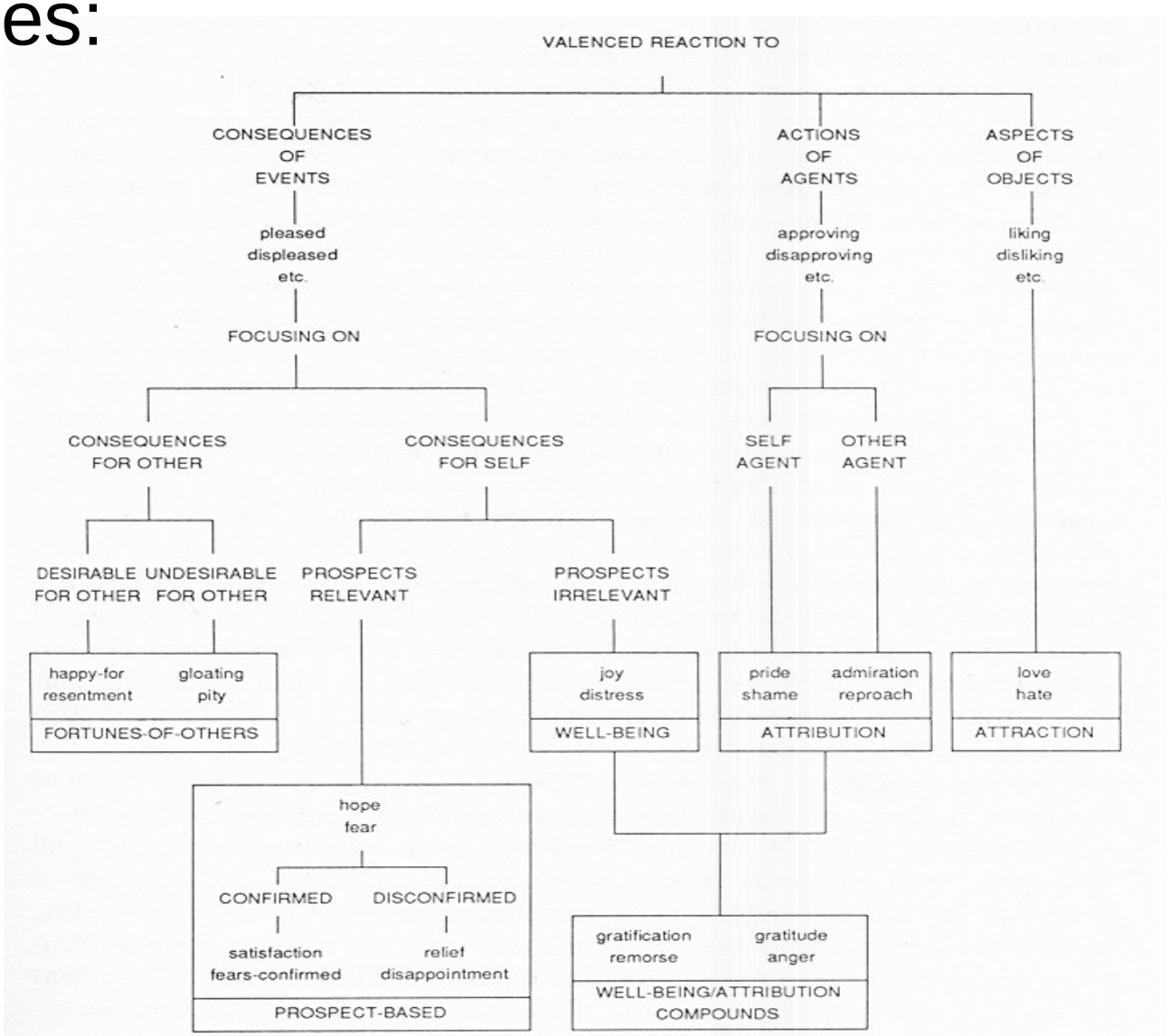
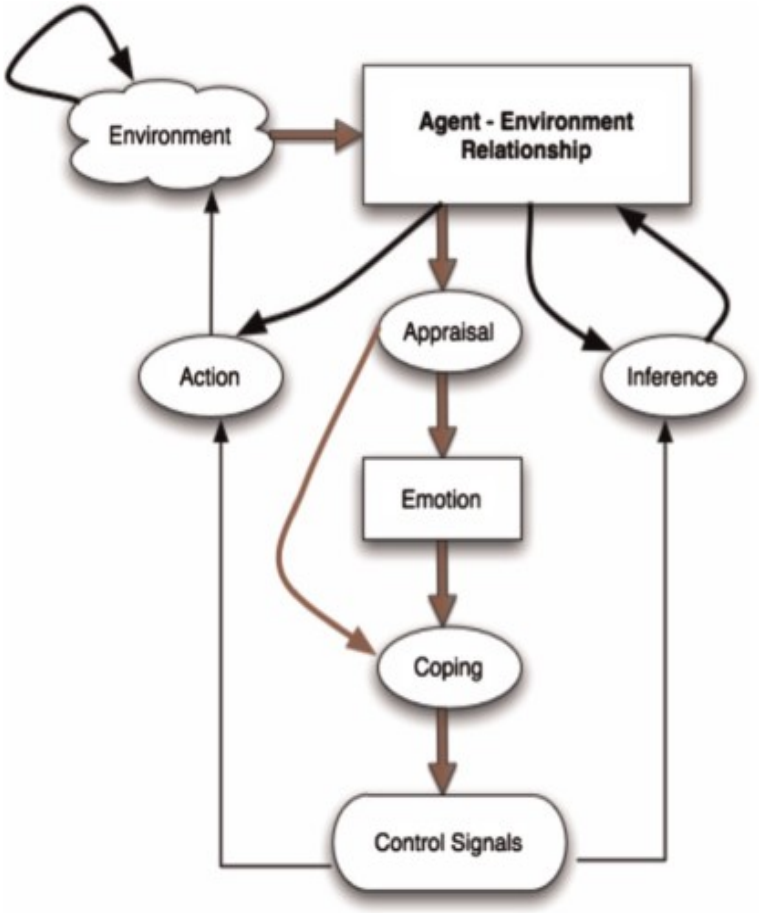


Figure 2.1. Global structure of emotion types.

Appraisal and coping: EMA (1)

(Gratch & Marsella, 2010)

- EMotions & Adaptation
  - → OCC (appraisal)
  - → Coping (action selection)
- Based on SOAR
- Evaluation criteria
  - Relevance
  - Point of view
  - Desirability (expected utility)
  - Probability & expectedness
  - Cause
  - Control (by me and others)



Appraisal and coping: EMA (2)

- Rule-based system

  E.g. : Desirability(self, event) > 0
  & Probability(self, event) < 1.0 → hope

- Coping strategies
  - Perceptions
  - Belief revision (including about other agents' intentions and responsibilities)
  - Changing goals
- Simulation model
- Application to serious games

Social relations

Social relations

- Social behaviour model

  Static models: Walker, Rousseau et al., Gratch...

  Dynamic model: Ochs et al.

- Several traits:
  - Liking
  - Dominance
  - Solidarity (or social distance)
  - ...

→ Social relations are unidirectional and not-always reciprocal!

Emotions and Social relations

- Influence E → RS (examples)
  - Ortony, 91 : caused + emotions >0 → liking ↑
  - Pride + Reproach → dominance ↑
  - Admiration + Fear + Distress → dominance ↓

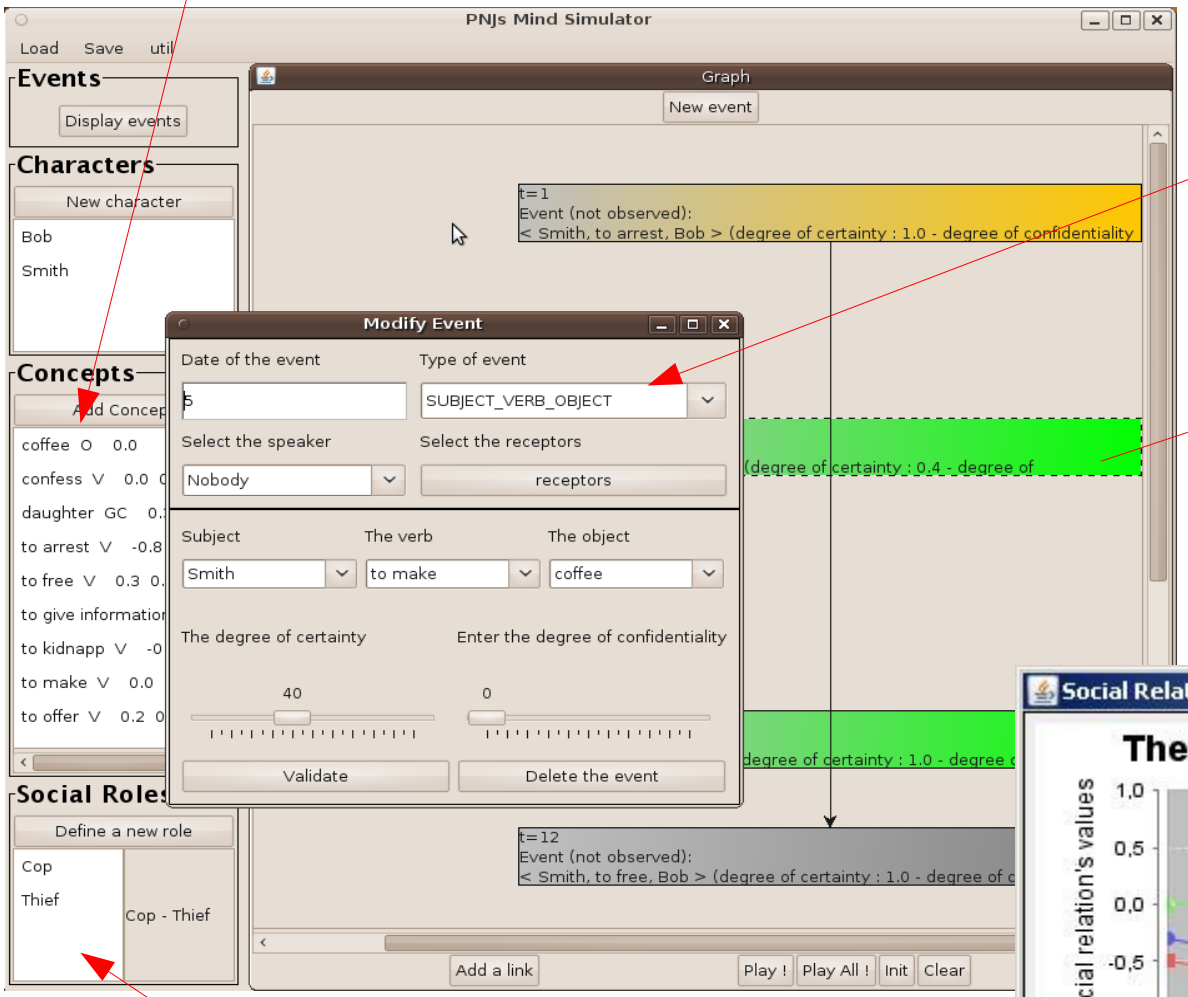
- Influence of the social relation on actions and communication
- Action selection guided by target social relation
- Emotional contagion

  → neighbour computation based on social relations

An example: OSSE

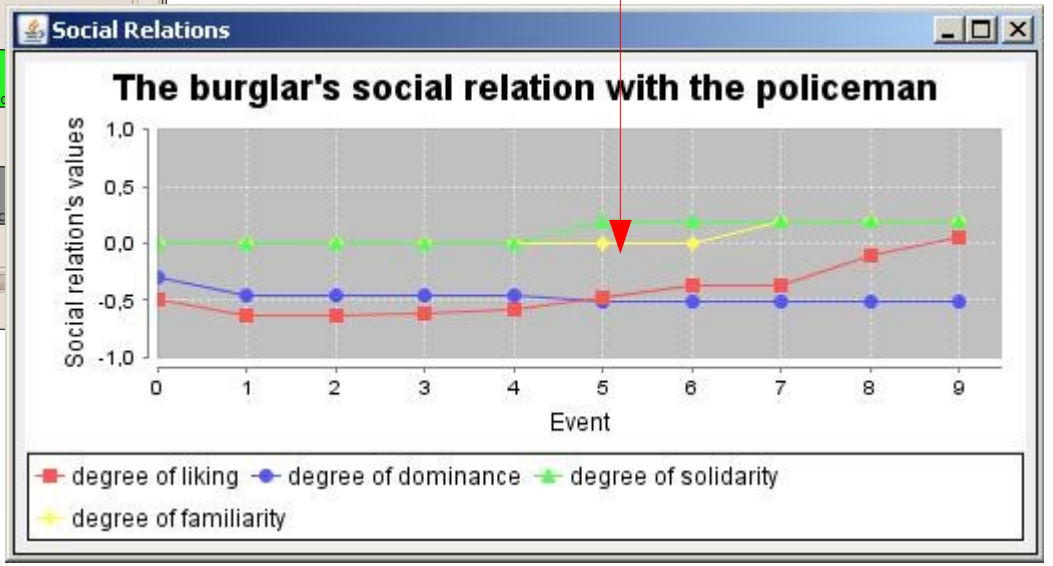
Attitudes

(Ochs et al., 2008)



Scenario
= set of events

Events
→ Emotions
→ Social relation dynamics



Social roles
→ initial relation

Learn more!

- Books
  - Rosalind Picard, *Affective Computing*, MIT Press
  - Scherer, Bänziger, & Roesch (Eds.) A blueprint for an affectively competent agent: Cross-fertilization between Emotion Psychology, Affective Neuroscience, and Affective Computing. Oxford University Press
- Next IVA conference

  Humaine-news mailing list !
- Next ACII conference
- Transaction on Affective Computing Journal

Advanced Human Machine Interaction

Affective Computing

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