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From facial expressions to social signals for useful embodied social agents

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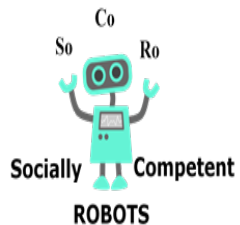
Overview

- Introductions
- Embodied Socially Interactive Agents
- Social emotions and social signals
  - Transparency?
    - Display rules
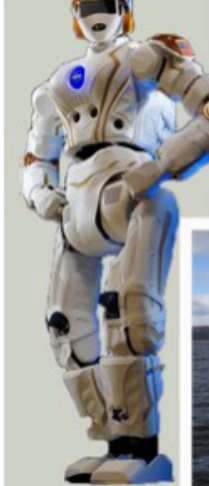- Expressive behaviour and emotion?
  - Behavioural ecology theory
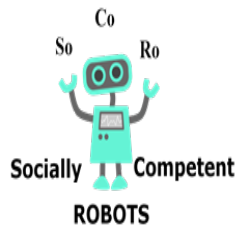
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ROBOTICS
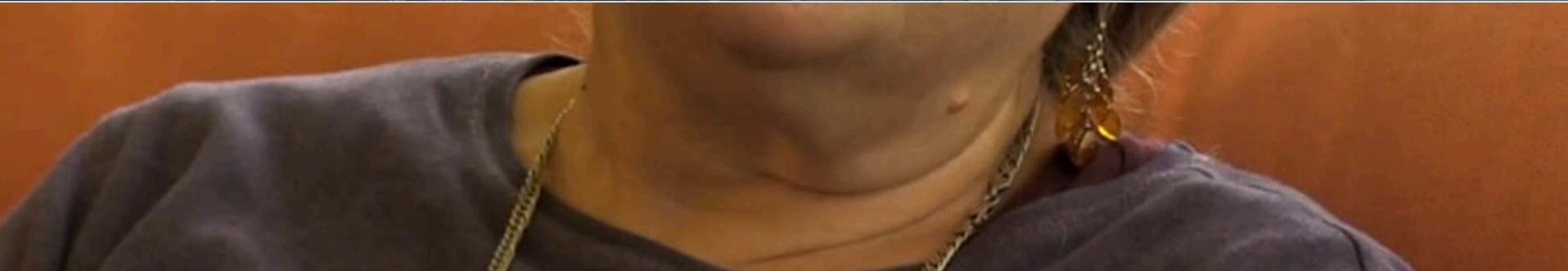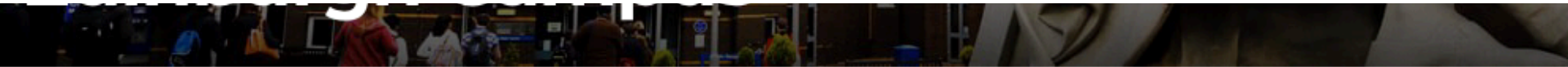
Embodied socially intelligent agents

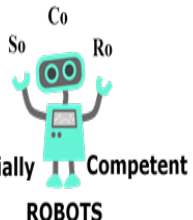- **AIM: agents able to act in everyday human environments**
    - Currently: varied specific application domains
        - Varying communication requirements
    - Social action selection
- **Embodied**
    - Both graphically and as robots
- *Selective* use of psychological and neurological models

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Embodiment

- **Extra communication bandwidth**
  - Expressive behaviour
    - Affective displays ('non-robotic')
    - Can display intentionality
    - Regulates interaction
- **Requires multi-level architectures**
  - Bodies always have dynamics
    - Graphical: procedural animation interface
    - Robotic: real-world physics of gears/ motors

Example SIAs

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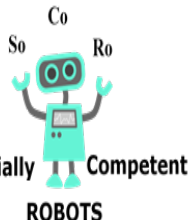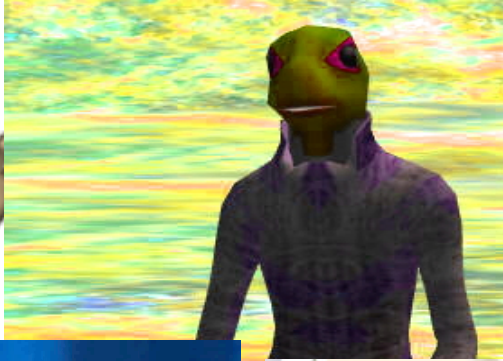
Are our models social?
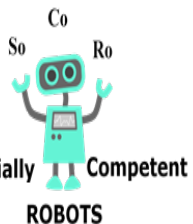
- **Simple appraisal models**
  - Emotion from interaction between external stimuli and individual goals
    - No difference between sadness and admiration?
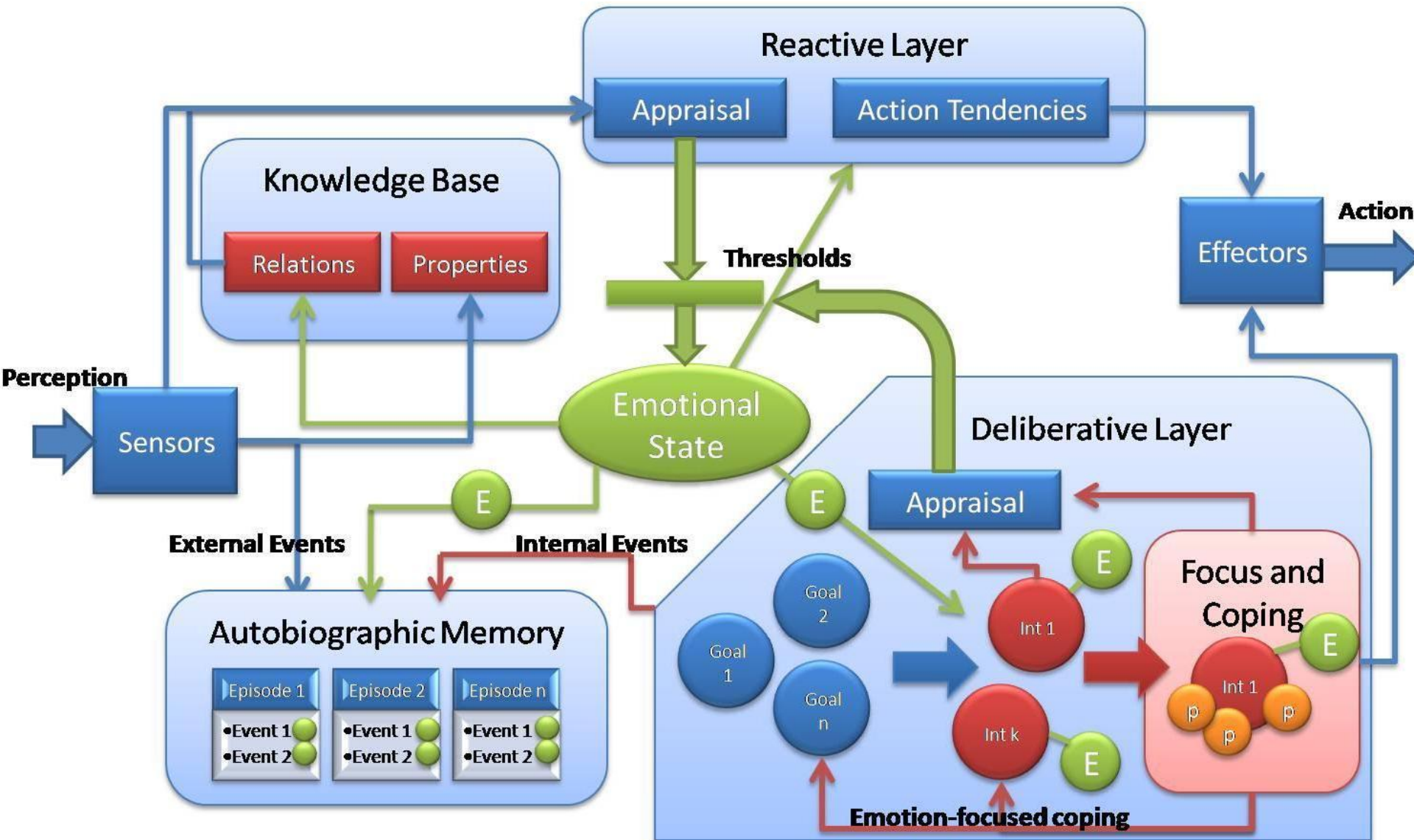- **Big 5 models**
  - Emotion related to personality type?
- **Homeostatic models**
  - Emotion from drives moving outside thresholds
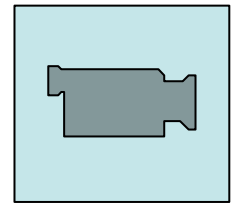   - No difference between hunger and affiliation?

Basic FAtiMA architecture
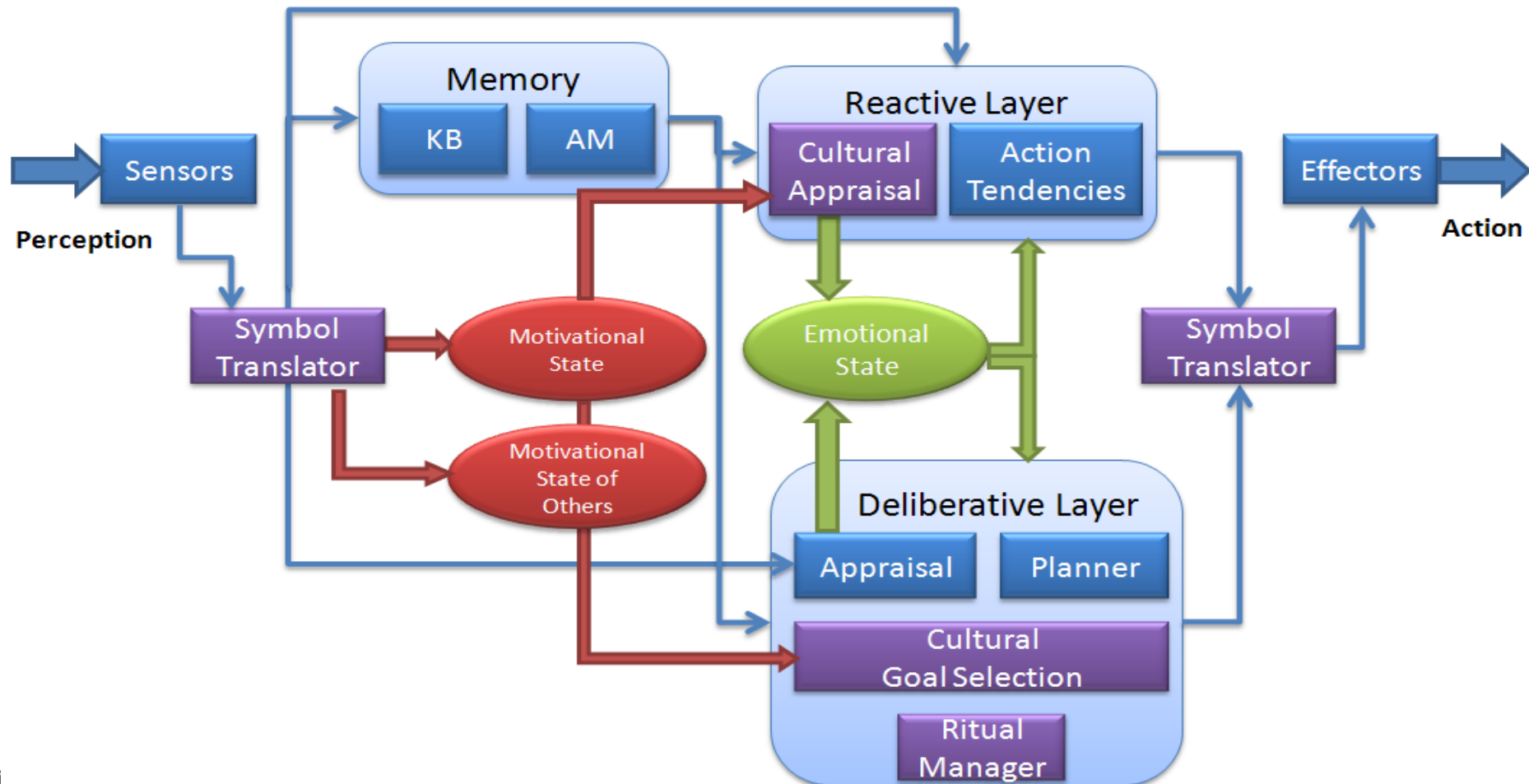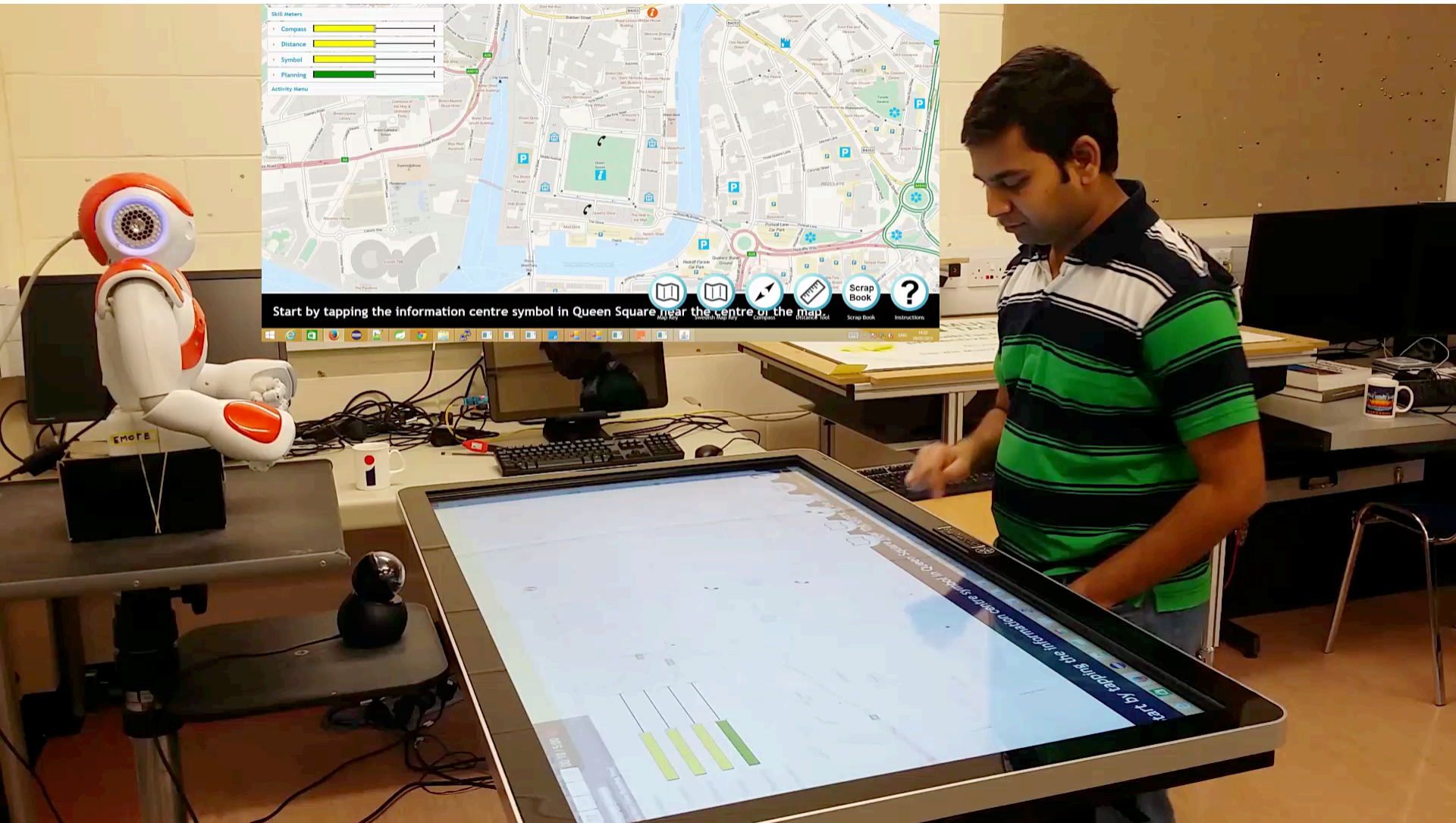
Cultural sensitivity

FAtiMA culture

# Empathic robot tutor

Cognitive appraisal and ToM

- Appraisal links external events to actions via emotions, plans, goals

- SO:
  - Agent1's action is Agent2's event
  - Set Agent1's proposed action as an event
  - Create copy of Agent1 architecture
  - Recurse with projected action for Agent2
  - This gives predicted internal state of Agent2
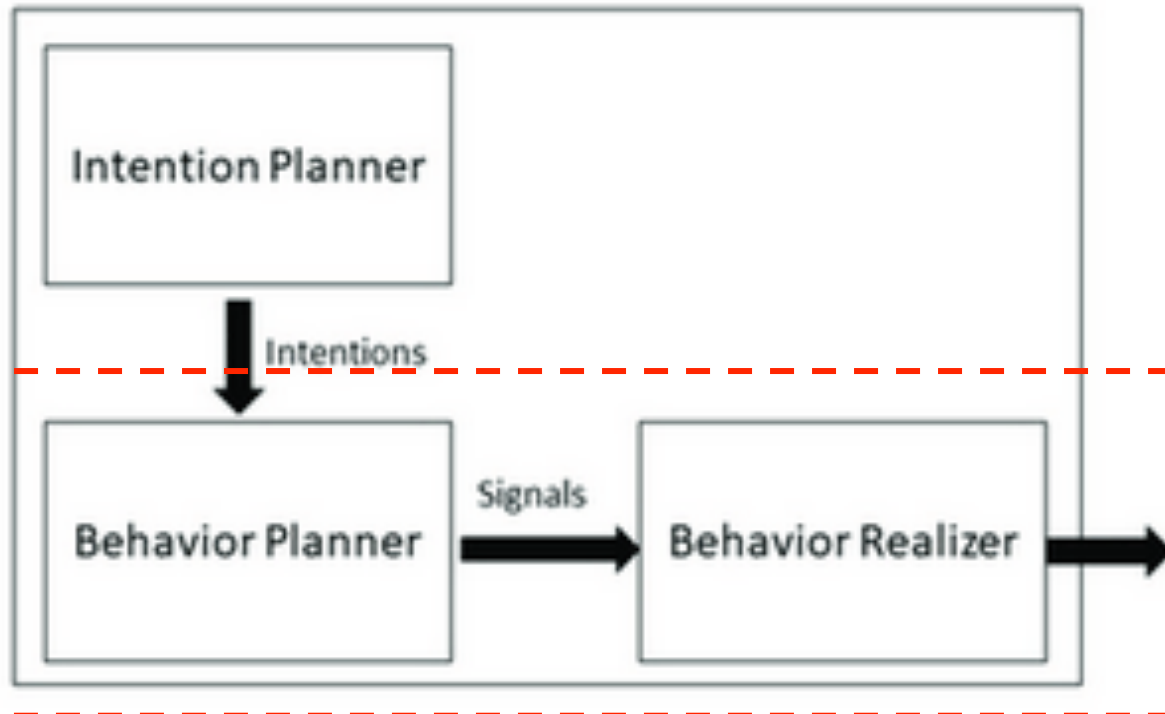
- Note an assumption..
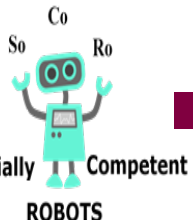
Recursive architecture
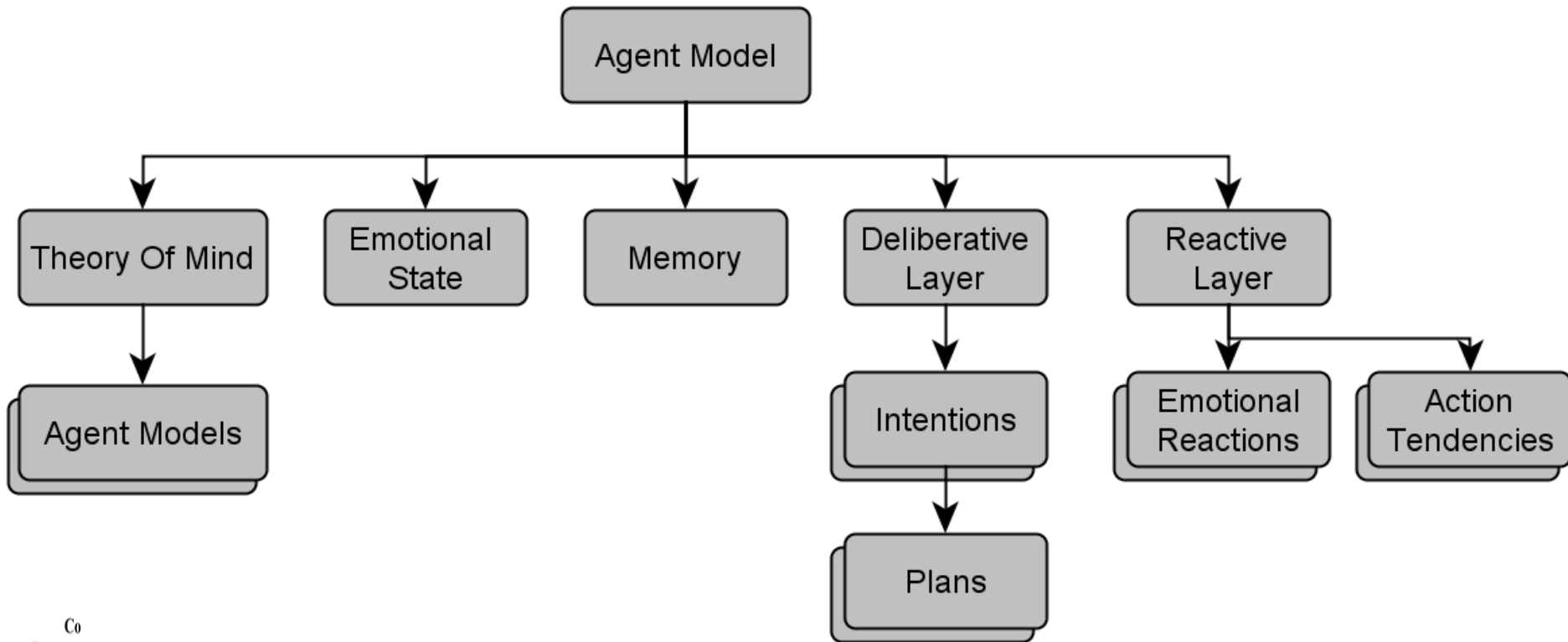
But what about the body?
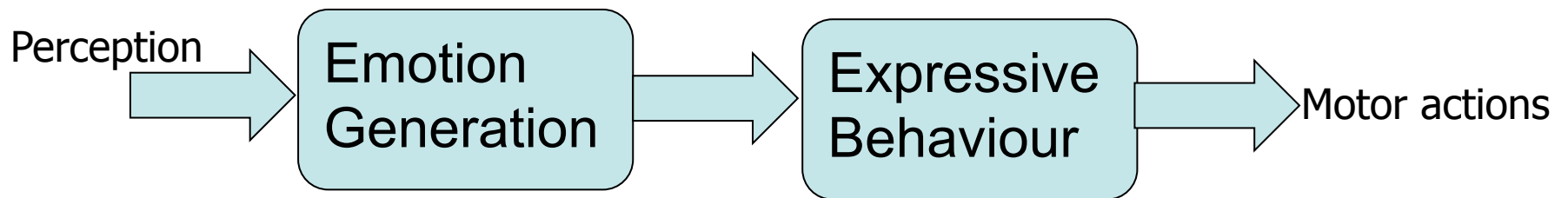
- SAIBA: for intelligent graphical agents
  - Behaviour Markup Language – BML
  - Note direction of flow
    - If actions may fail?

Expressive behaviour

Perception → **Emotion Generation** → **Expressive Behaviour** → Motor actions

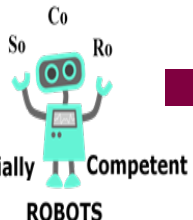- **Like this?**
  - Not in many - ?most – social contexts
    - Social roles
    - Cultural norms
    - Personal relationships
- **ToM assessments of impact**

Social signals

- Small children may express what they feel
  - social environment: carers need to know
- Socialisation involves NOT doing this
  - Examples:
    - you are given a birthday present you don't like
    - your boss tells you off
    - walking with your child on a dark night
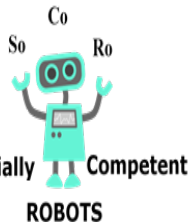   - a teacher with a struggling learner
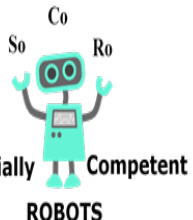- Social signals are *actions*

Ekman Display Rules

■ Four categories:

– Cultural

- What is acceptable, what is suppressed

– Personal

- Eg. Extrovert v Introvert

– Vocational

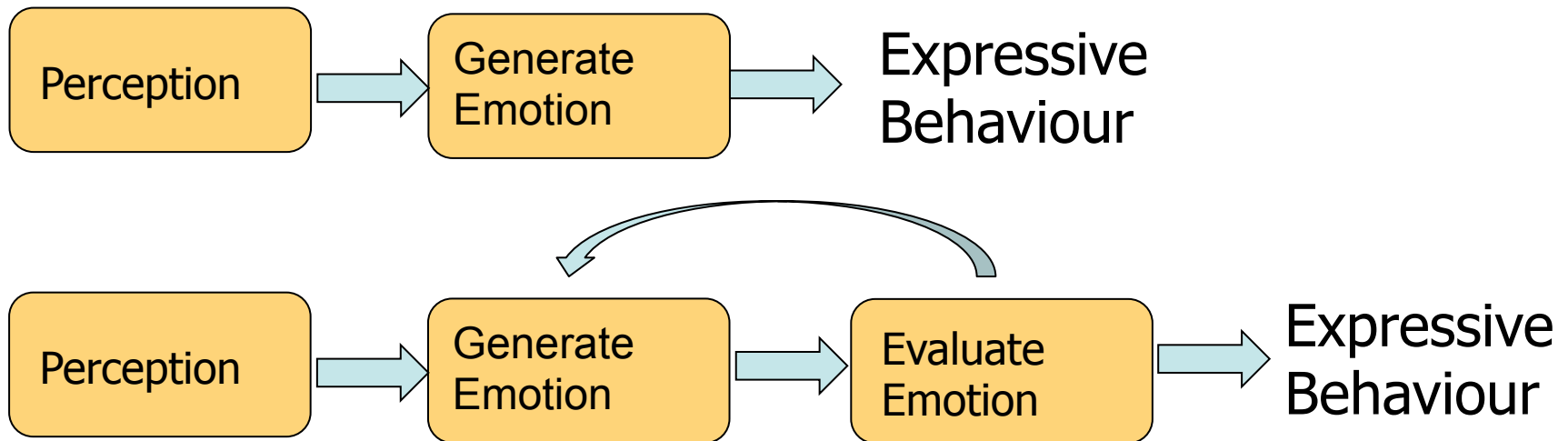- Eg. Teachers, Actors

– Needs of the moment

Display rules

■ How do we know what we are feeling?
- Internal feedback loop
- Similar idea to 'coping behaviour'
- EG. Reappraisal

■ The face as a mask of 'true feelings' ?

■ This is not a model..
- Ad hoc rule sets?
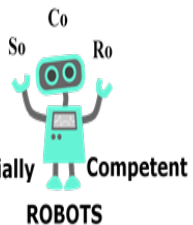- Work best as annotation of utterances

Architectural implications

- But how to evaluate?
- Feedback into generation?

Is this worth doing?

- **It depends** – on the social context
  - A child-like transparency may be the right thing to do
- **BUT**
  - Long-term interaction?
  - Role-determined behaviour?
  - Slow modification as a dramatisation of agent social reactions? (eg. Double-takes)
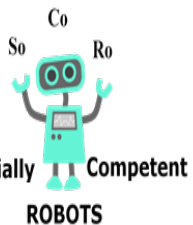
Emotions and social signals

- ■ Emotion
 - – Communicates internal state
  - – Motivates actions
- ■ Social signal
  - – Has interactional semantics
    - • Regulatory (eg turntaking, back channel)
    - • Communicative – non-speech action
  - – 'Happy' v 'Approve'

Beyond display rules

- Deliberate use of expressive behaviour
- Three types of social smiles:
  - Rewarding the behaviour of others
    - The birthday present example
  - Creating/strengthening affiliative social bonds
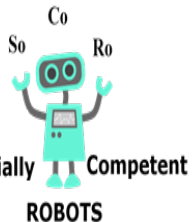 - Regulating social hierarchies
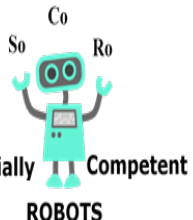
An assumption

- **Basic emotion theory**
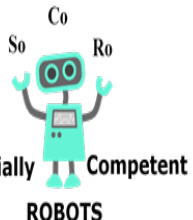 - Systematic causal relationship between emotion and expressive behaviour

- **Behavioural Ecology Theory**
  - Contingent socially-located evolution of expressive behaviour: social signals

Conclusions

- Evaluate models for social content
- In general affective expressions are social signals
  - Which may or may not reflect affective state
- We need to operationalise more theories

QUESTIONS?