Enhancing Embodied Intelligent Agents with Affective User Modelling

Doctoral Consortium Session
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Motivation

- Embodied agents as a user interface
  - Establish an easier/smoother communication style
  - Provide the user with an engaging and enjoyable experience

But: Can be perceived unnatural

Motivation (cont.)

- Enhance believability using emotions
- Affective agents:
  - Emotional model
  - Expression of emotions
  - Understanding of user emotions!
- Need to model user emotions

Overview

- Motivation
- Affective Agent
  - Application and techniques
- Affective UM
  - Emotion estimation, expertise and personality computation
- Summary/Conclusion & Future Work

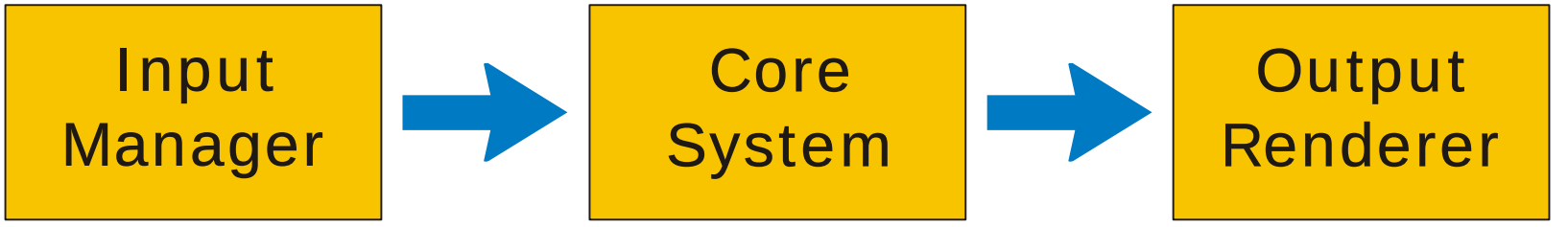
Application: Cyberella's Information Kiosk

Agent Stage

Presentation Area

Dialog Monitor

Architecture Overview

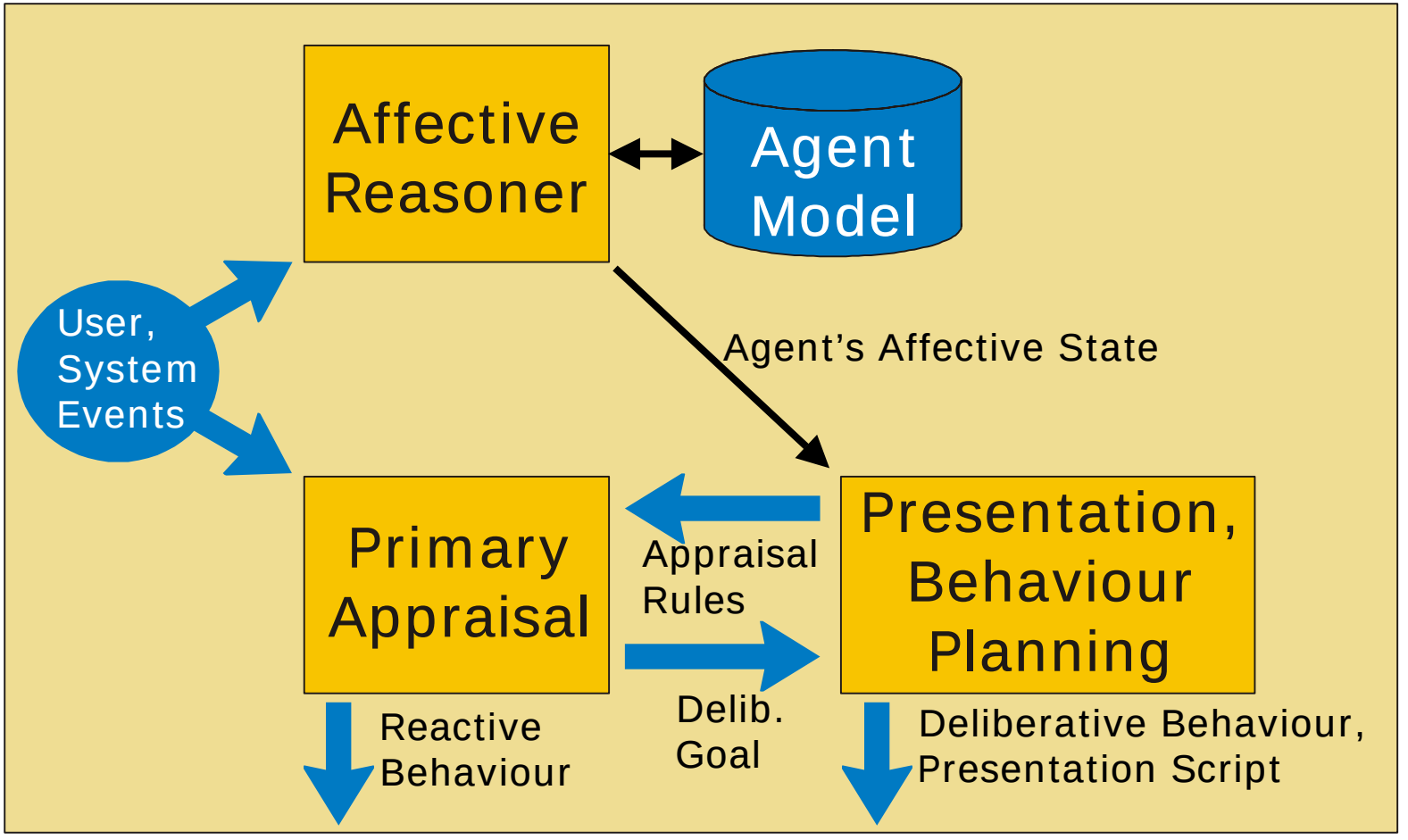


Speech
Keyboard
Mouse (Touch Screen)
WebCam

Presentation Planning
Behaviour Computation

Speech
Animations
Text + Graphics

Core System


Affective Reasoner
Agent Model
User, System Events
Agent's Affective State
Primary Appraisal
Appraisal Rules
Presentation, Behaviour Planning
Reactive Behaviour
Delib. Goal
Deliberative Behaviour, Presentation Script

Affective Processing

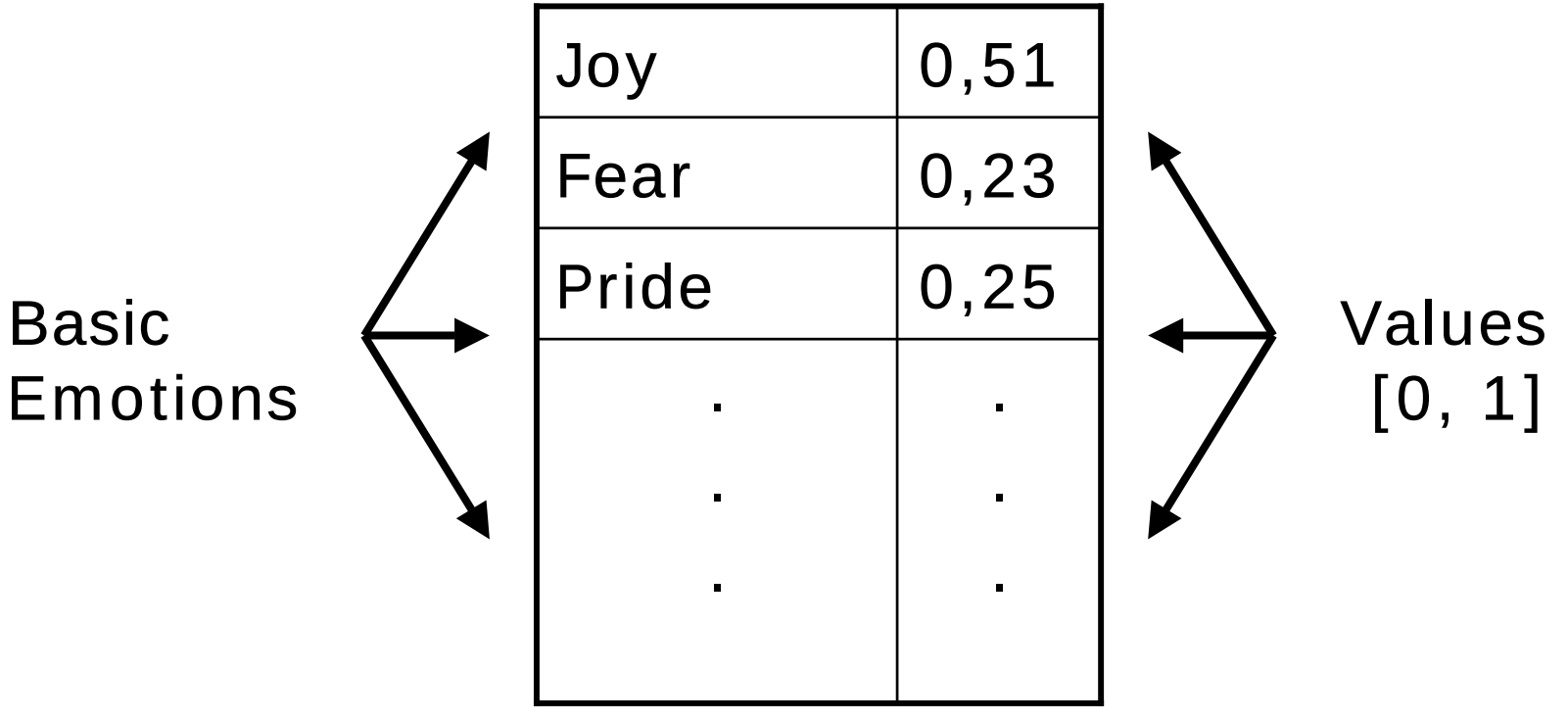
- The Primary Appraisal
  - Rule based appraisal of user and agent actions according to the affective state
- The Affective Reasoner
  - Uses cognitive models of emotions (OCC)
  - Uses personality model (FFM) to regulate emotion intensities
  - Computes affective state vector

Affective Processing (cont.)

- The Agent Model
  - Personality (Extraversion, Agreeableness, ...)
  - Goals, Standards, and Attitudes

Affective Reasoner (cont.)

- Affective State (Vector)



Adaptive Behaviour

- Planning process is influenced by affective state:
  - Selecting the presentation strategy
  - Determining the available time for the planning process
  - Choosing dialogue options

Adaptive Behaviour - Expression of Emotions

- Adequate utterances and gestures reflect the agent's affective state:
  - Voice pitch, pitch range, speed, breaks, word emphasis
  - Word selection
  - Gesture type (narrow, expansive, forceful, ...)

Adaptive Behaviour – Emotional Processing

- Runtime modification of event appraisal allows:
  - Consistent affective reactions of the presentation agent
  - Dialogue guiding

Adaptive Behaviour – Example

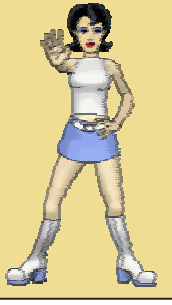
Primary Appraisal

Appraisal Rules Modification

Presentation, Behaviour Planning

Event	Reaction
Agent_Clicked	Say „Keep your hands off!“
…	…

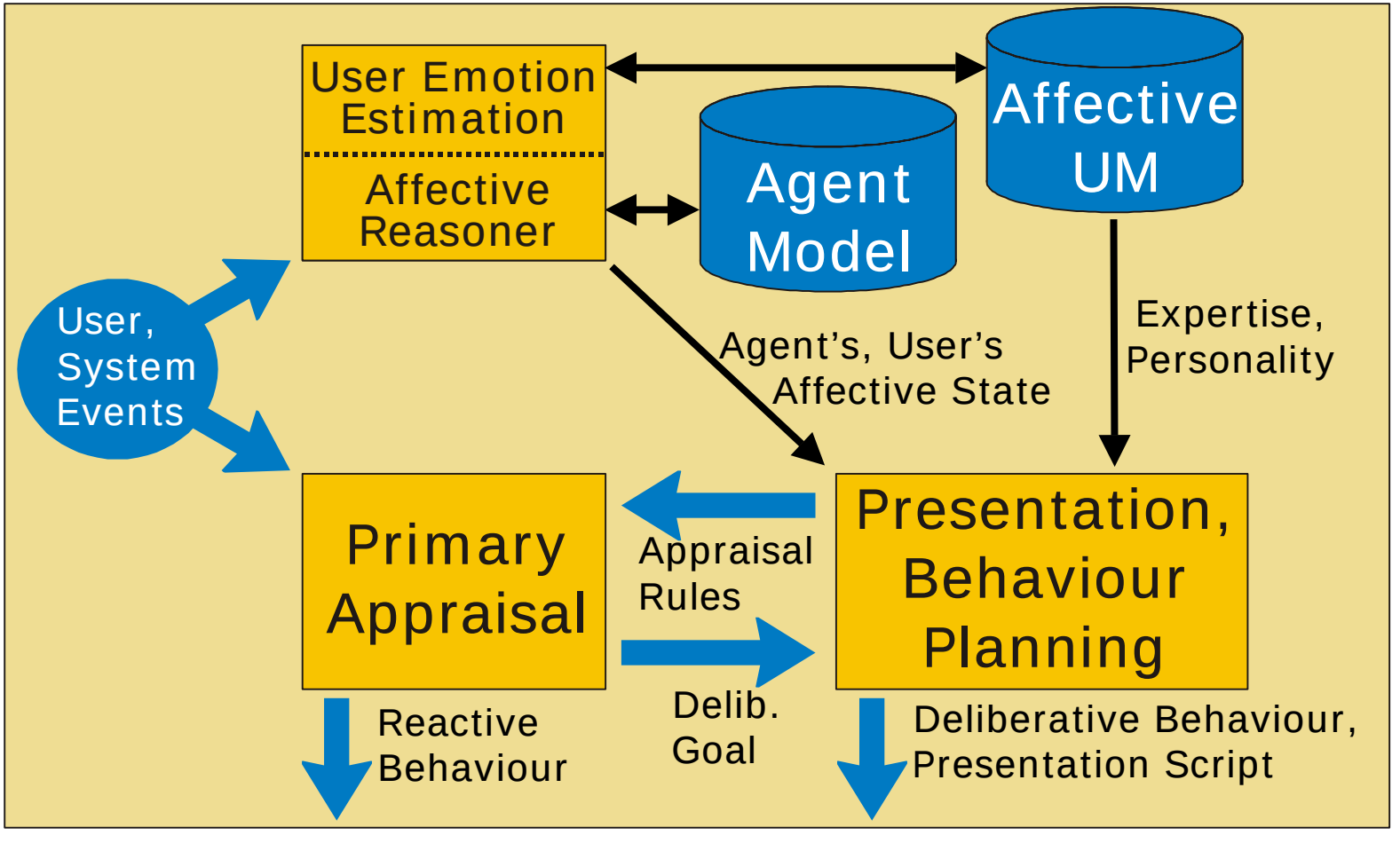
Event	Reaction
Agent_Clicked	Gesture „Stop Hand“
…	…



Affective UM

- Estimate the user's emotional state
  - Method: keyword and phrase spotting
- Affective UM:
  - Expertise through dialogue history
  - Personality through user emotion history

Enhanced Core System



Summary and Conclusion

- System Framework:
  - Embodied Agent (speech + gesture)
  - Emotions (OCC)
  - Personality (FFM)
- Runtime modification of reactive behaviour

➡ More believable Agent

Future Work

- Better estimation of the user‘s affective state
  - Speech features (Pitch, Range, Speed)
  - Reaction time measurements
  - Mouse movements
- Integration of the Affective Reasoner and Affective User Model

Future Work (cont.)

- Evaluation:
  Does acceptance rise with the use of
  - Affective agent
  - Affective UM