The Dörner Model of Emotion

Workshop Emotion & Computation
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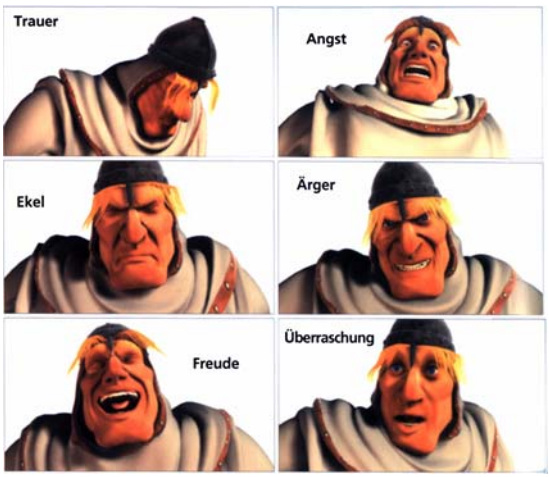
Emotion modeling approaches

- engineering vs. science
- descriptive vs. explanatory

- different goals:
  - high-level behavior
  - individual behavior
  - communication:
    - display
    - recognition
  - role within cognition



Emotion

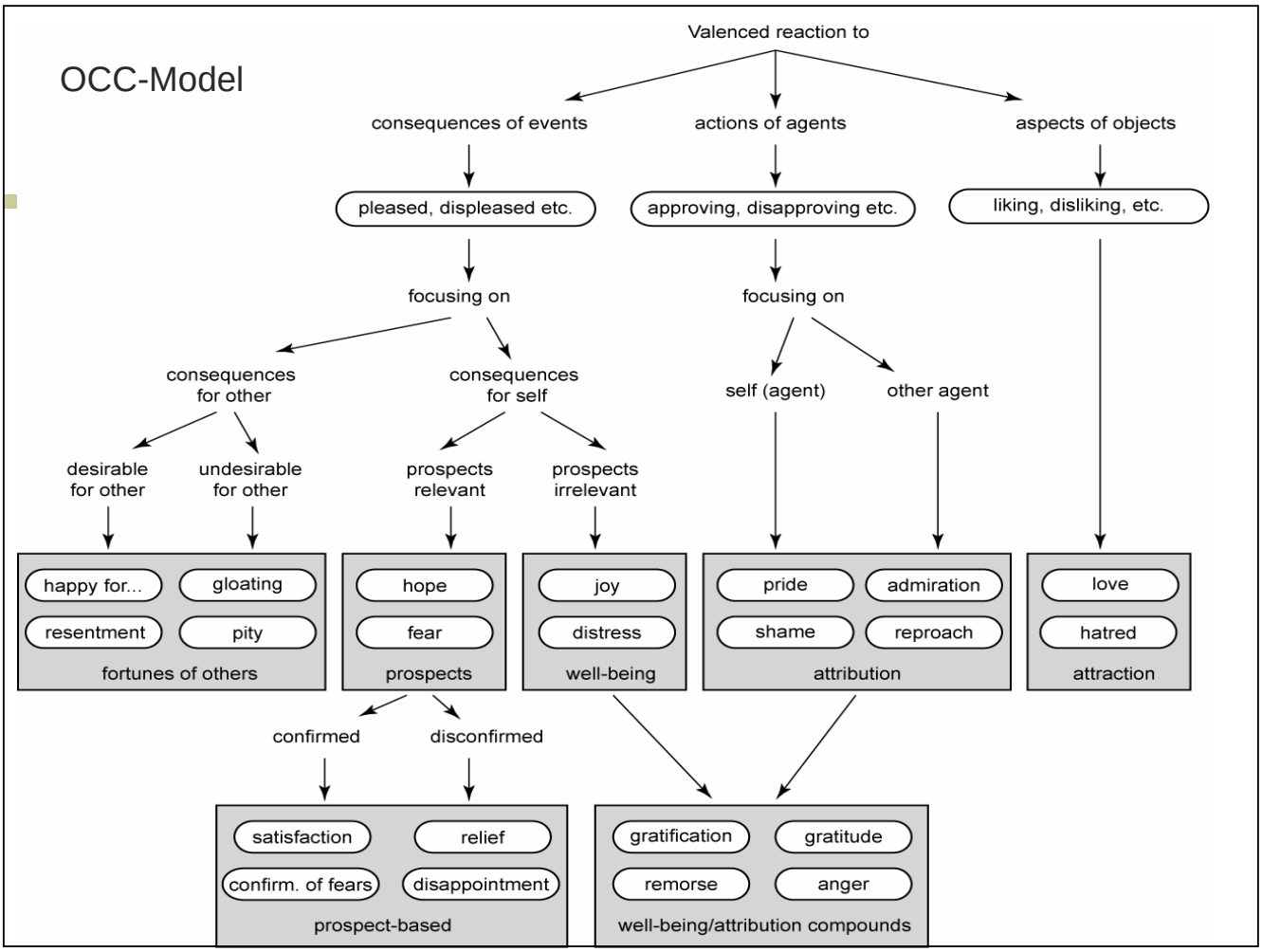
- Having an emotion is different from behaving as if having an emotion

- What is it like to have an emotion?
- Can emotion only be simulated, or can an artificial system be in an emotional state?

→ is having an emotion a way or an aspect of information processing?

State models, appraisal theories

- Orthony, Clore, Collins
- Scherer (SECs)

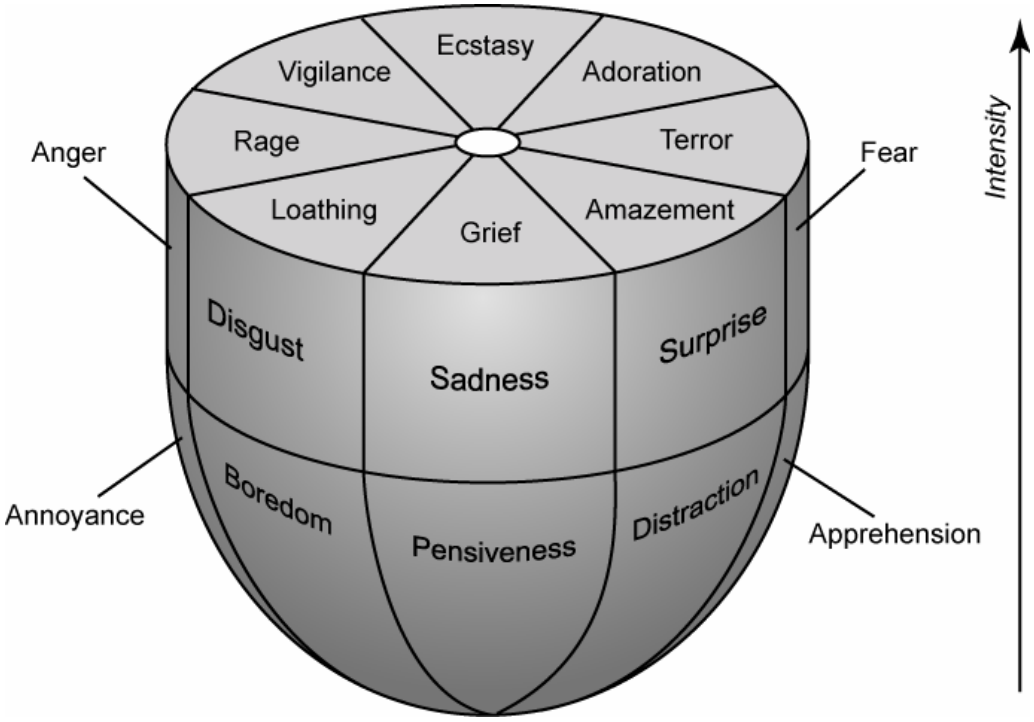


Parameter space models

Emotions emerge over basal parameters:

- Wundt (1910)
  - Pleasure/Displeasure
  - Arousal/Calm
  - Tension/Relaxation
- Osgood (1957)
  - Evaluation (Valence)
  - Arousal
  - Potency
- Traxel and Heyde (1961)
  - Submission/Dominance
  - Valence
- Plutchik, Izard, Johnson-Laird, James:
  - different basic emotions
  - intensity

Example: Plutchik

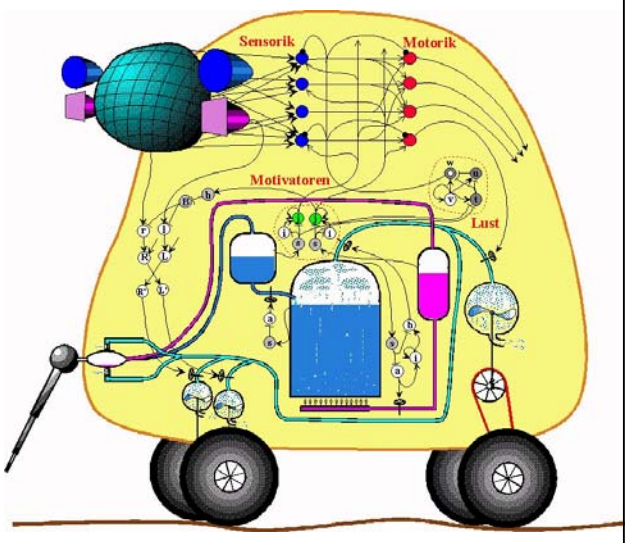


Psi theory

- Dietrich Dörner
  Universität Bamberg

Psi Theory of Human Action Control:

- Emotion, Motivation
- Cognition
- Representation
- Semantics through interaction



Psi theory

- cognitive architecture with a difference:
  - emotion
  - motivational system
  - learning “from scratch”
  - all symbols within architecture refer to an interaction context
  - flexible representational structures to capture behavior, impose object structures upon the world, conceptualize own interaction upon world

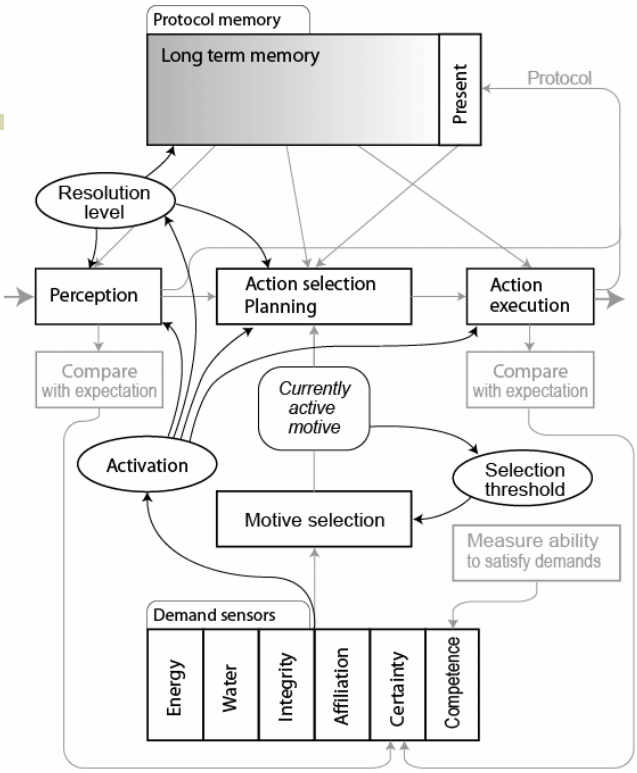
→ allows thinking about cognition in terms of a constructionist stance

What the Psi theory has to say about emotion

- Emotion is seen as a configuration of a cognitive system
- Modulators of cognition:
  - arousal, selection threshold, securing threshold, resolution level
  - estimate of competence and certainty
  - pleasure/distress signals
- action dispositions
- Emotion itself is emergent property of modulation

Psi model

- Emotion as modulation of cognition



Dörner model of emotion

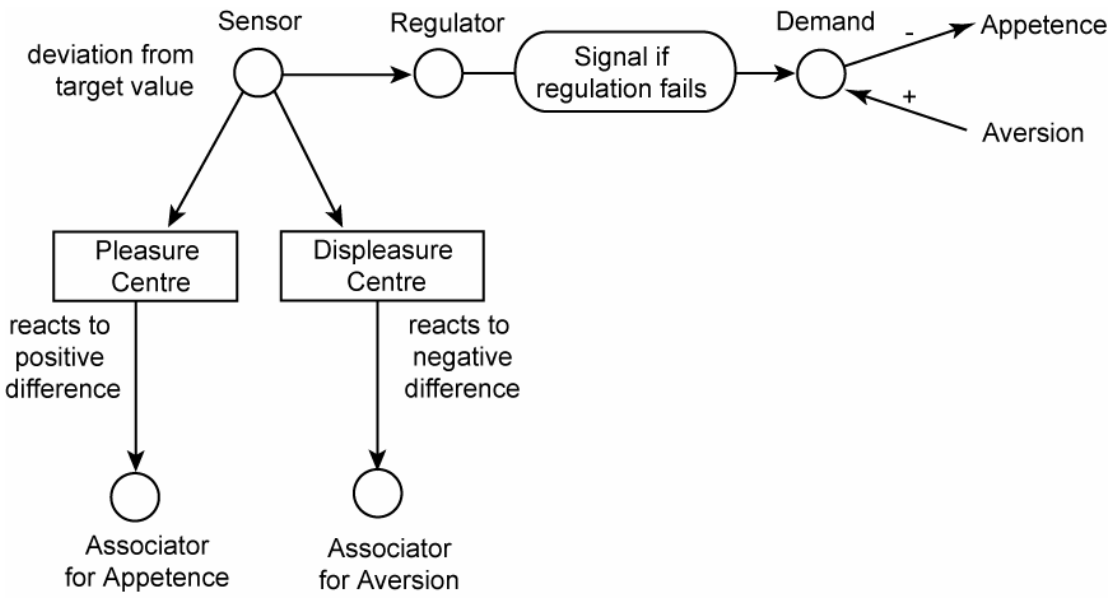
- Covered aspects
  - affects (valenced reactions)
  - moods (effect on cognitive processing)
  - emotional dispositions (effect on action selection)
  - emotional expression
- Ignored aspects
  - emotion recognition
  - emotion classification

Emotional configuration in Dörner model

Affects (specific reaction to events)

- negative or positive valence of different drive-related events:
  - pain/relief
  - hunger/satisfaction
  - affiliation/social frustration
  - certainty/re-orientation
  - ...

Appetence and aversion



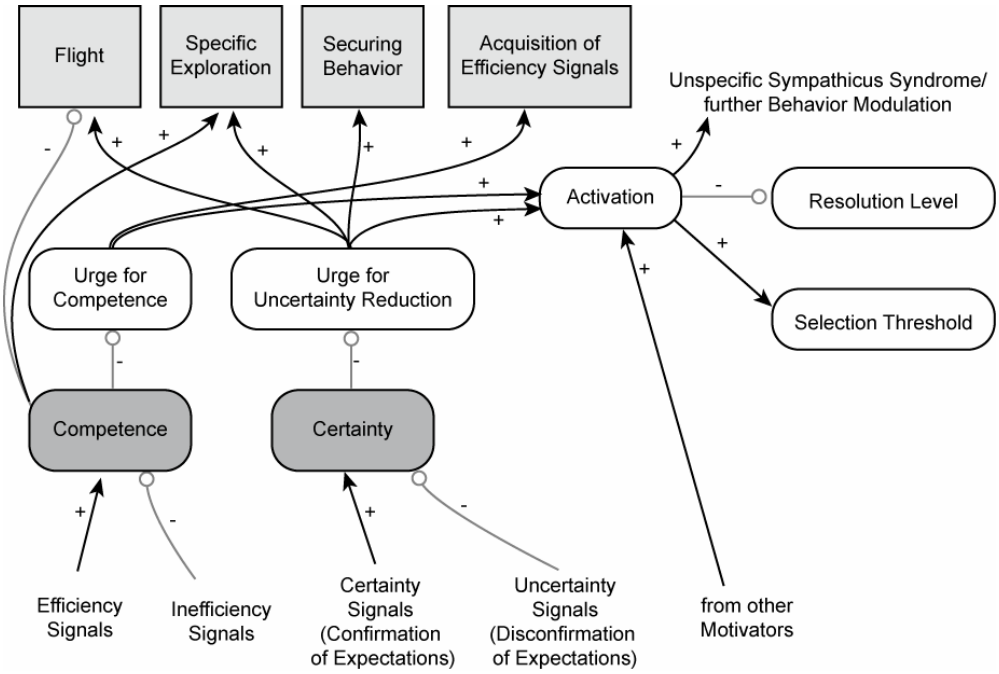
Emotional configuration in Dörner model

- Moods:
  - affect (valenced reaction to recent event)
  - general competence
  - general certainty -> securing rate
  - arousal
  - selection threshold
  - resolution level

Purpose of emotional modulation

- Control width, depth and bias of operations on mental representations of the agent
  $\rightarrow$ modify perception, memory, planning and action selection
- Reduce complexity of cognitive processes

Effect of Competence and Certainty on modulation



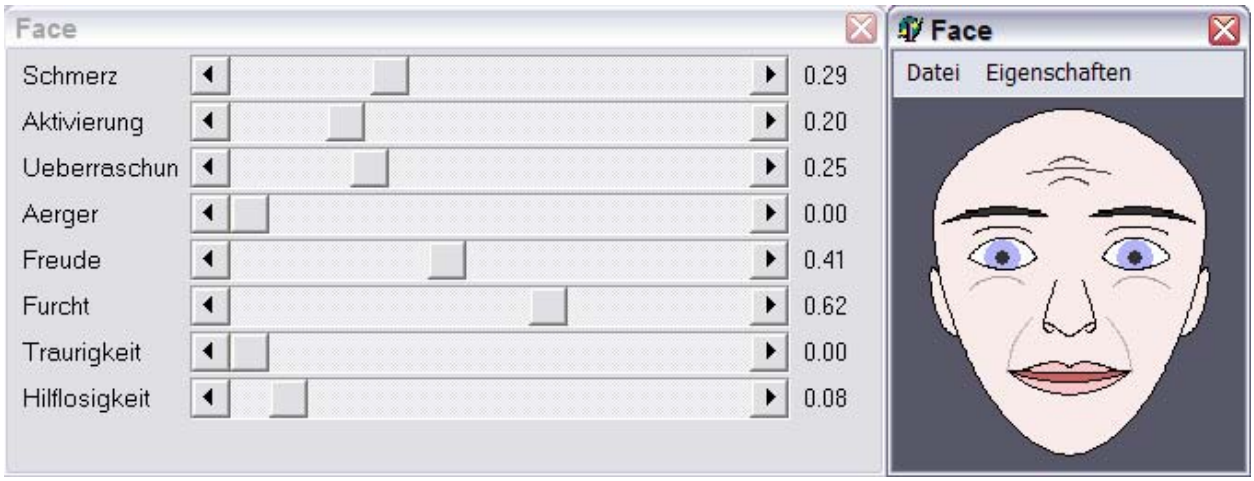
Emotional configuration in Dörner model

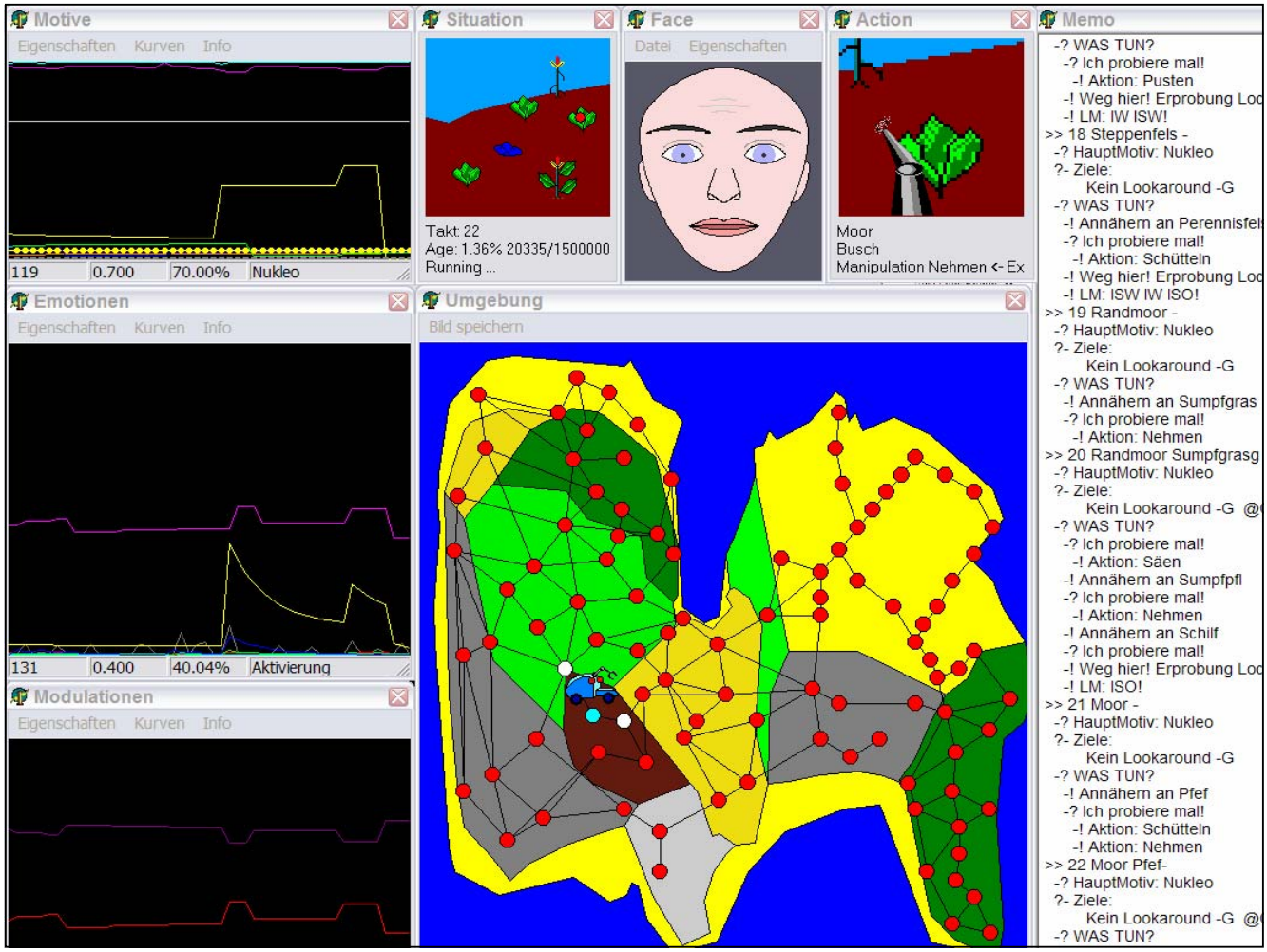
Emotional disposition towards something

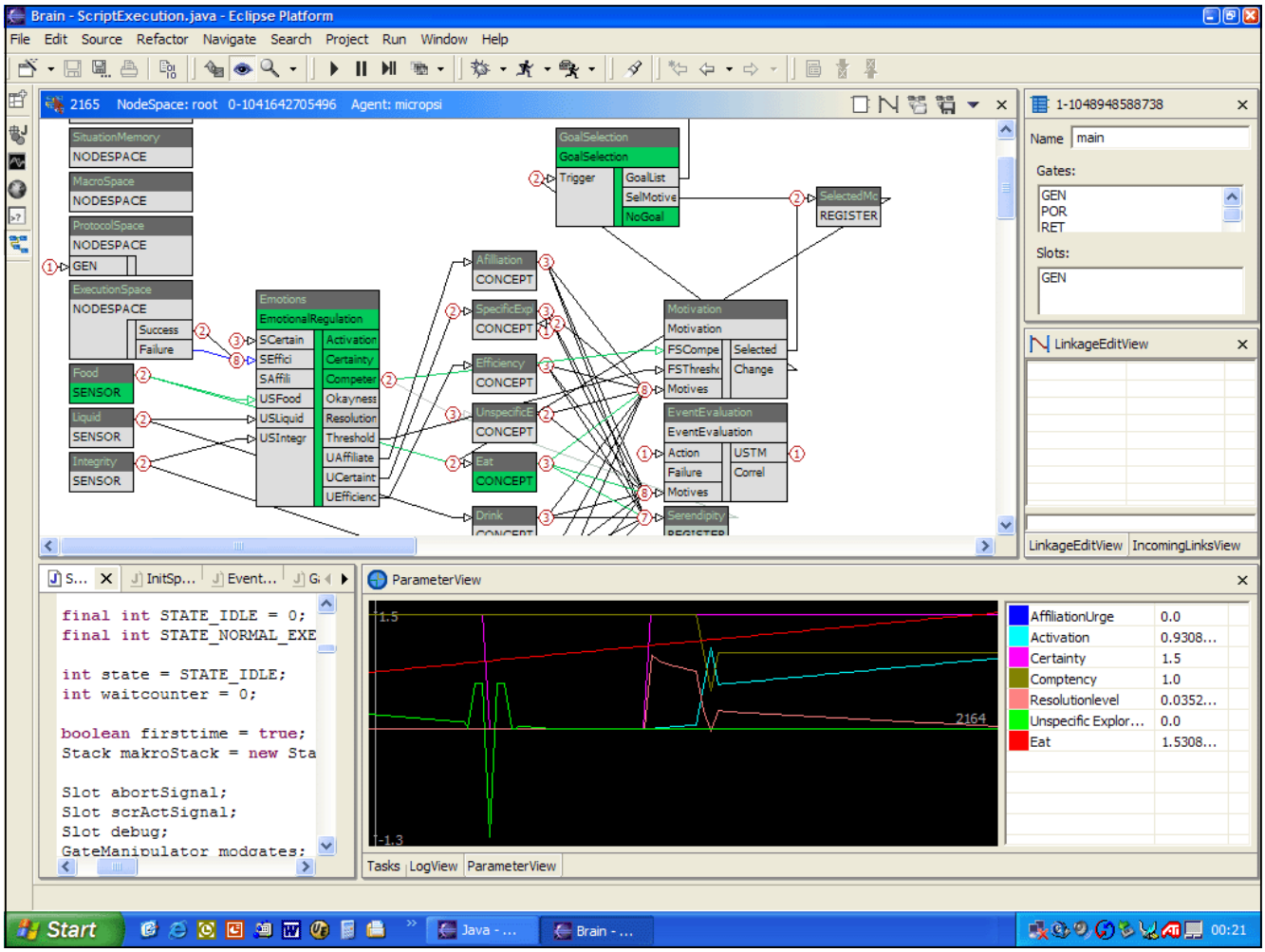
- Appetence + Aversion
- Competence
- Certainty

- Connected to representations by learning

Emotional expression






Brain - ScriptExecution.java - Eclipse Platform
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2165 NodeSpace: root 0-1041642705496 Agent: micropsi
SituationMemory
NODESPACE
MacroSpace
NODESPACE
ProtocolSpace
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GEN
ExecutionSpace
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Success
Failure
Food
SENSOR
Liquid
SENSOR
Integrity
SENSOR
Emotions
EmotionalRegulation
SCertain
SEffici
SAffili
USFood
USLiquid
USIntegr
Activation
Certainty
Competer
Okayness
Resolution
Threshold
UAffiliate
UCertaint
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Name main
Gates:
GEN
POR
RET
Slots:
GEN
LinkageEditView
LinkageEditView IncomingLinksView
final int STATE_IDLE = 0;
final int STATE_NORMAL_EXE
int state = STATE_IDLE;
int waitcounter = 0;
boolean firsttime = true;
Stack makroStack = new Sta
Slot abortSignal;
Slot scrActSignal;
Slot debug;
GateManipulator modgates;
ParameterView
1.5
-1.3
2164
AffiliationUrge 0.0
Activation 0.9308...
Certainty 1.5
Comptency 1.0
Resolutionlevel 0.0352...
Unspecific Explor... 0.0
Eat 1.5308...
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Brain - ...
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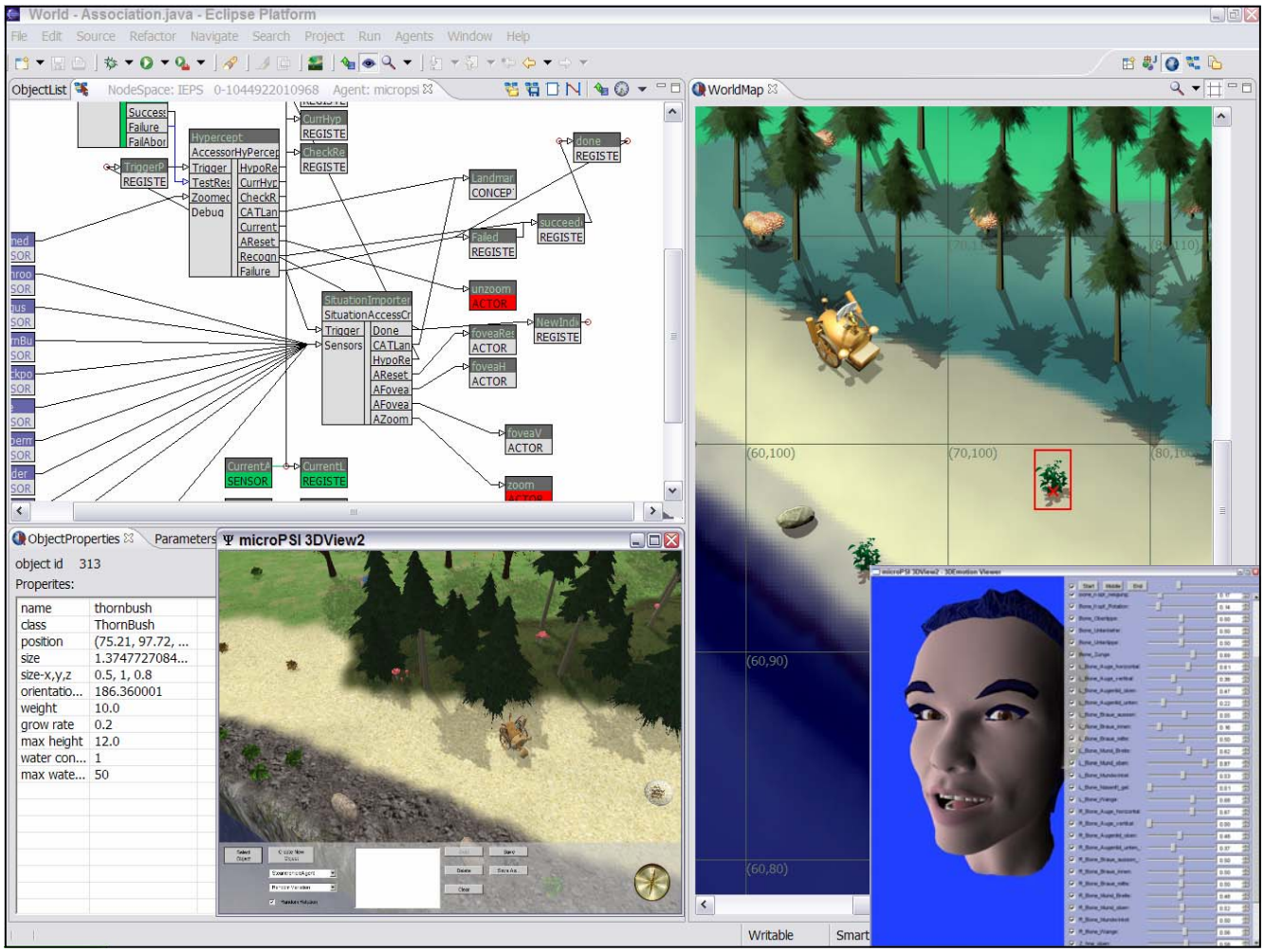
World - Association.java - Eclipse Platform
File Edit Source Refactor Navigate Search Project Run Agents Window Help
ObjectList NodeSpace: IEPS 0-1044922010968 Agent: micropsi
Success
Failure
FailAbor
Hypercept
Accessor
Trigger
TestRes
Zoomec
Debug
HypoRe
CurrHyp
CheckR
CATLan
Current
AReset
Recogn
Failure
CurrHyp
REGISTE
CheckRe
REGISTE
TriggerR
REGISTE
done
REGISTE
Landmar
CONCEP
succeed
REGISTE
failed
REGISTE
unzoom
ACTOR
NewIndi
REGISTE
foveaRe
ACTOR
foveaH
ACTOR
foveaV
ACTOR
zoom
SituationImporter
SituationAccessCr
Trigger
Sensors
Done
CATLan
HypoRe
AReset
AFovea
AFovea
AZoom
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SENSOR
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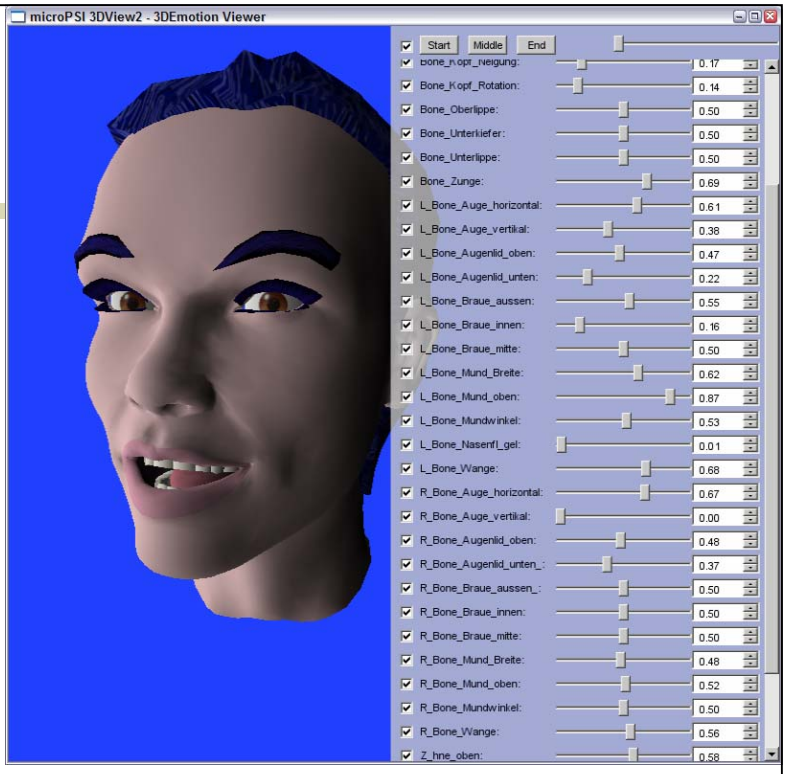
REGISTE
WorldMap
(60,100)
(70,100)
(60,90)
(60,80)
ObjectProperties
Parameters
object id 313
Properites:
name thornbush
class ThornBush
position (75.21, 97.72, ...
size 1.3747727084...
size-x,y,z 0.5, 1, 0.8
orientatio... 186.360001
weight 10.0
grow rate 0.2
max height 12.0
water con... 1
max wate... 50
microPSI 3DView2
Writable
Smart

More information



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