



# Affective and cognitive automation

ENF 2007, Vienna

Peter Palensky, Brigitte Lorenz, Andrea Clarici

Institut für  
Computertechnik

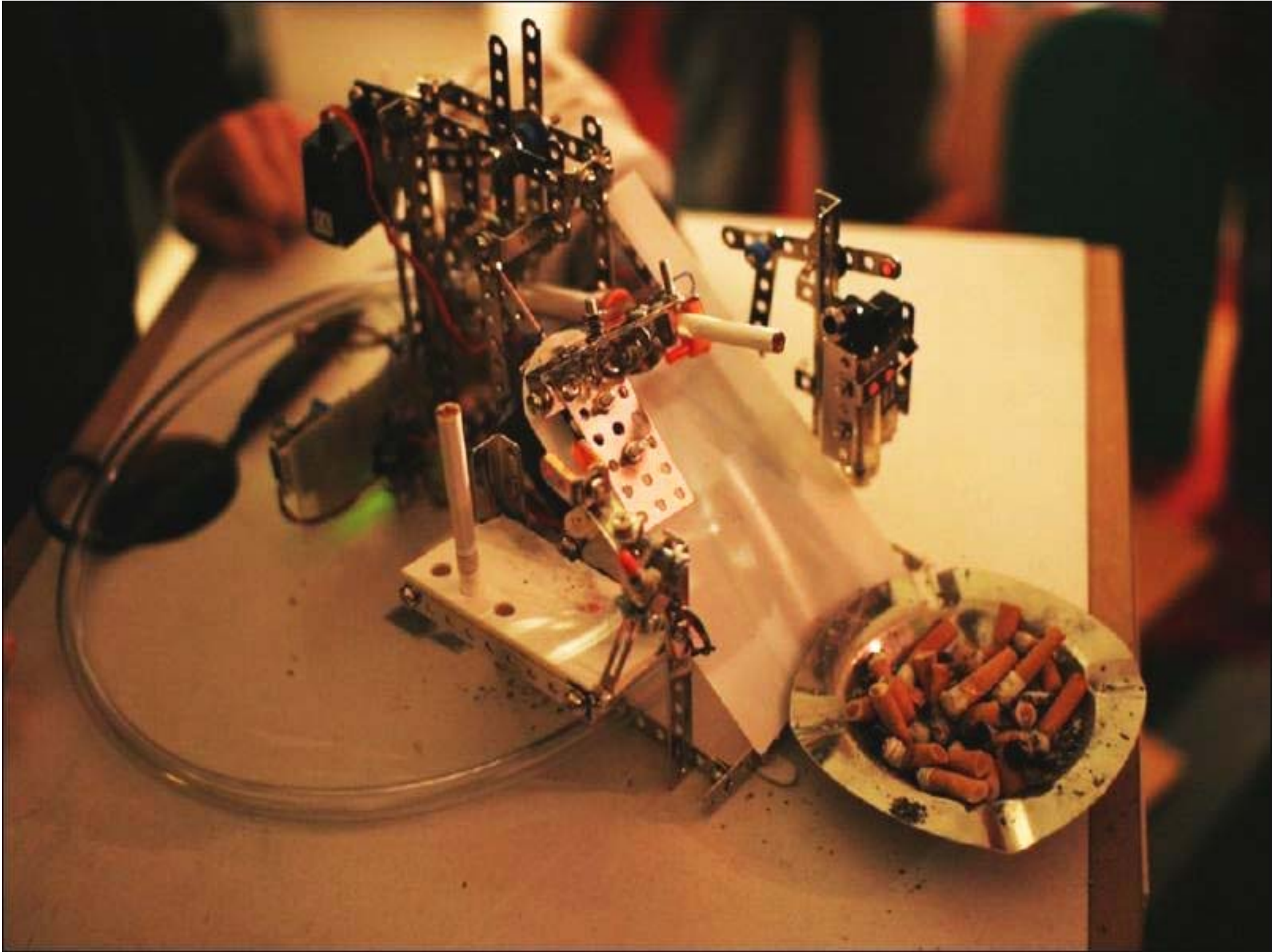
**ICT**

Institute of  
Computer Technology

# What can automation engineers do?

---

- Automation: Influence a **process** on behalf of someone
  - Process can be dangerous, boring, difficult,...
  - Traditional: Room climate, manufacturing, traction,...
  - New: Hygiene, safety, evacuation, business,...
- Done by (a) machine(s)
- **Digital Microcomputer**
  - Digital data structures and algorithms
  - Interfaces to „real“ world (sensors, actuators, network)



# What can automation engineers do?

- Automation: Influence a **process** on behalf someone
  - Process can be dangerous, boring, difficult,...
  - Traditional: Room climate, manufacturing, traction,...
  - New: Hygiene, safety, evacuation, business,...
- Done by (a) machine(s)
- **Digital Microcomputer**
  - Digital data structures and algorithms
  - Interfaces to „real“ world (sensors, actuators, network)

# Use of neuro-psychoanalytic findings

## ■ Expectations

- New/better version of psychologically inspired AI
- Affective & cognitive agents
- Handling of complex situations
  - „Gut-feeling“
  - Focus of attention
  - Anticipation of consequences

## ■ Problems

- Translate things into functions/technology
- Overwhelmingly many complicated details  
Unfinished system trivial, (When) feasible?

## ■ Methodology

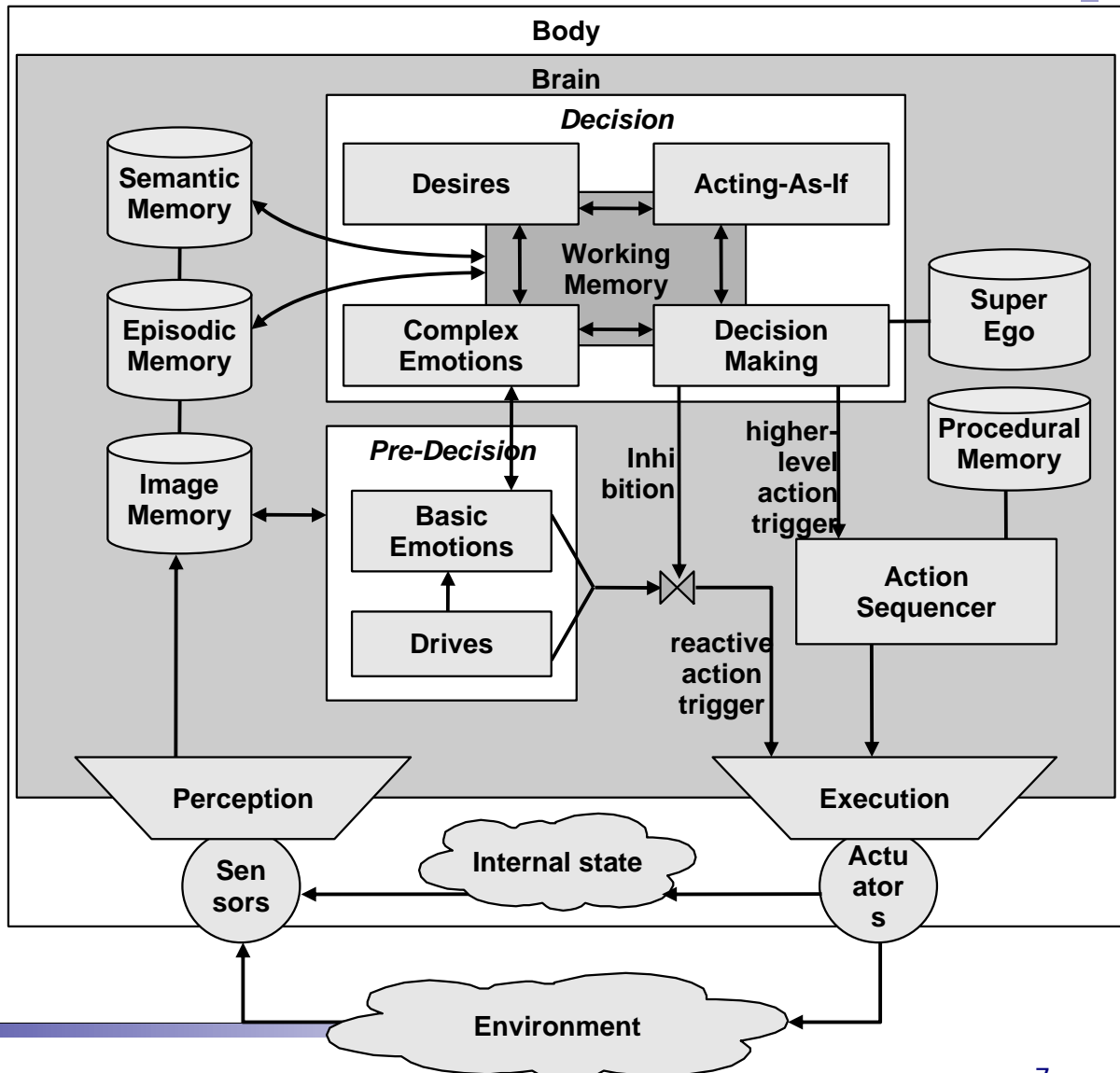
- Modular view of the mind
- Supported by findings of neurology and psychoanalysis
- Inclusion of body, environment

## ■ Tools

- AI (e.g. learning, memories: ANN, evol. programming)
- Object oriented design
- Simulation
  - Platform not yet known
- Visualization

# ARS PA Modules

- Memories
- Computation
- Interfaces
- Body model
  
- No explicit, predefined world model

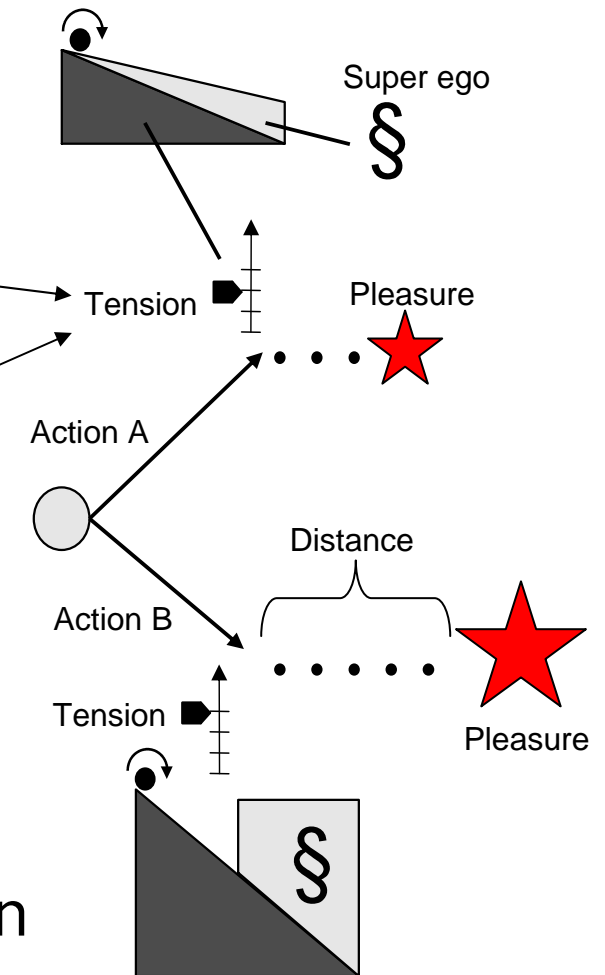


# "Affective and cognitive"

- Affects: slow, chemistry-like, distributed
- Cognition: fast, neural-like, explicit mechanisms
- (formal) languages to describe both!
  - Cognitive and affective functions
  - Situation-dependent actions
  - Explicit semantics
- Learning: planned
- Animals without explicit language  
affective smartness?

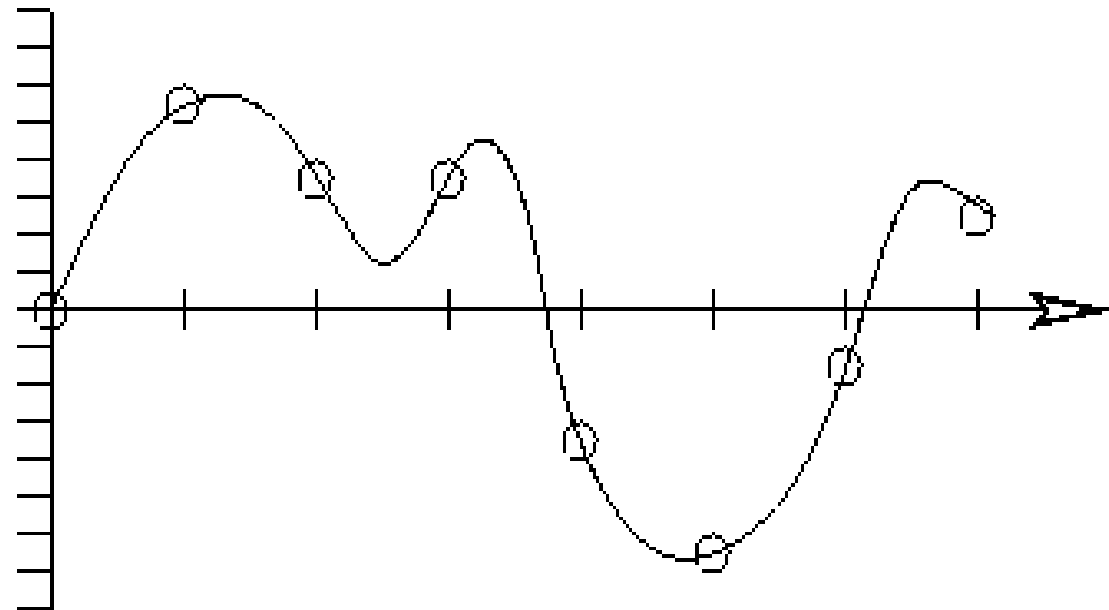
# *Id vs. Ego vs. Superego*

- *Id*
  - Drives
  - basic emotions
- *Superego*
  - Rule set
  - Acquired
- *Ego*
  - Desires, complex emotions
  - Inhibition, planning, conflict resolution



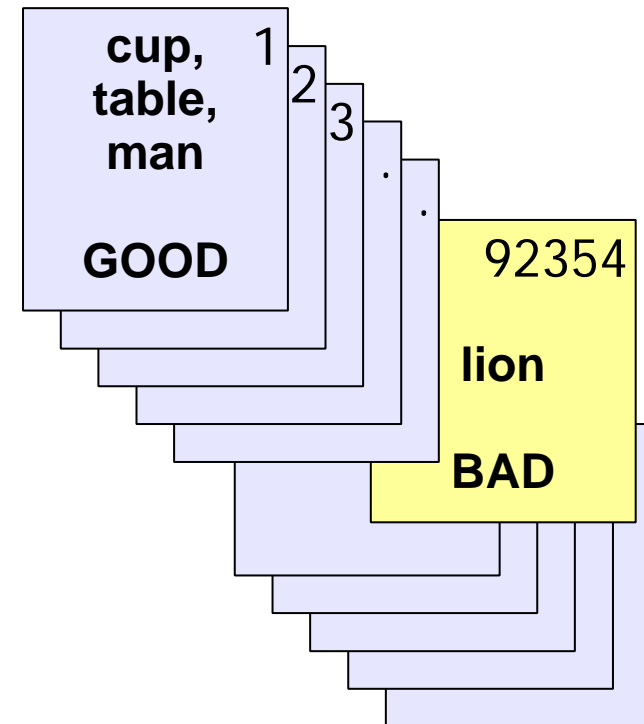
# Easy problem

- Discretization and quantification
- Loss of information
- Goodbye analogue world?
- Typically no real problem...  
But who knows...?



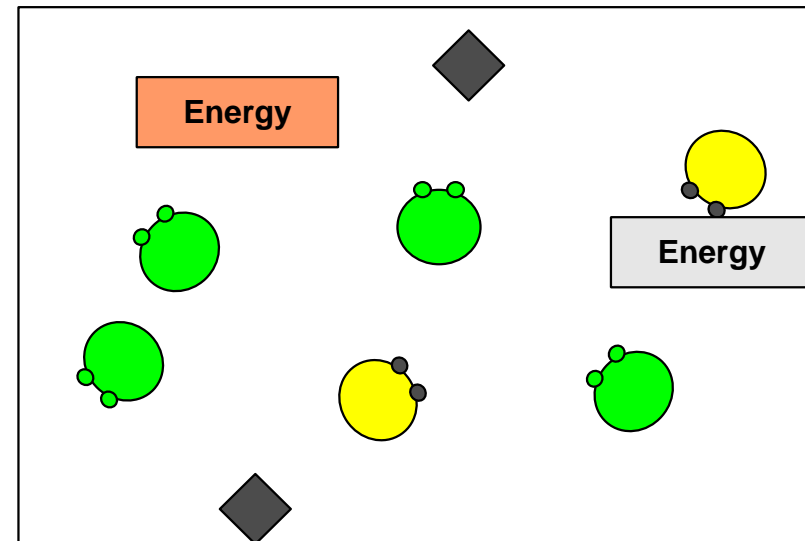
# Not so easy: Find „image“ in memory

- Perceived: „lion“
- Look up memory for Emotions, actions, etc.
- A.) Sequential search: slow
- B.) Associative Memory
  - > Query(„lion“) -> „BAD“
  - In Software: contains A.)
  - In Hardware: expensive

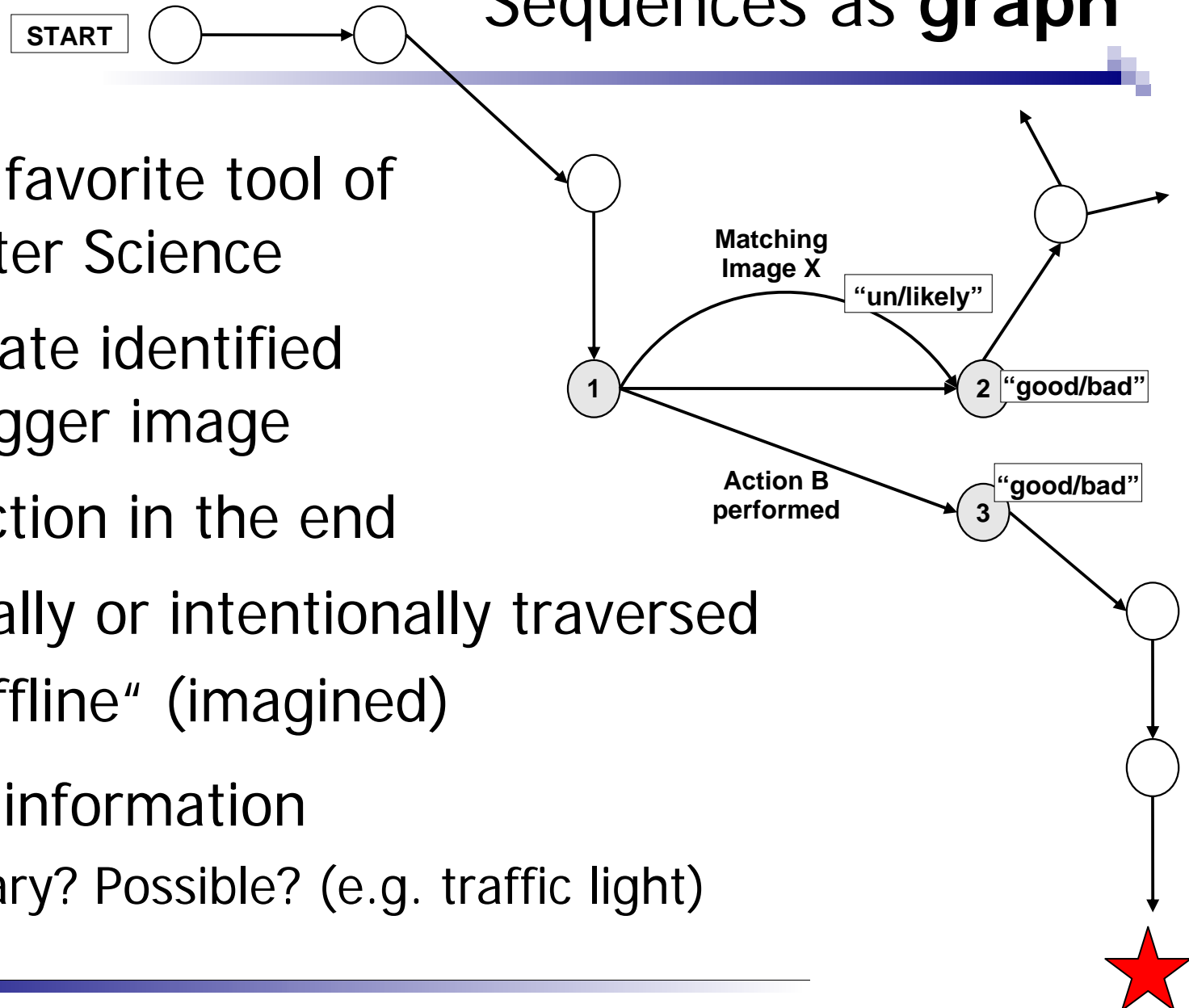


# Bubble Family Game

- Social setting for autonomous individuals
  - 2 Teams
  - Energy/Food
  - ARS PA **inside** bubbles
- Trivial Artificial Life?
- Yes, BUT
  - Complex stimulus & situations, threat, conflicts,
  - Place for cooperation of individuals, visual impression



# Sequences as graph



- Graph: favorite tool of Computer Science
- Start state identified with trigger image
- Satisfaction in the end
- Eventually or intentionally traversed
- Also „offline“ (imagined)
- Timing information  
Necessary? Possible? (e.g. traffic light)

# Conclusion and outlook

---

- Selection of right „tool“ essential  
e.g. for memory
- Scalability of individual parts probably bad  
-> complexity, performance
- How to tune machine for inexpressible problems?
  - Internals (data, not structure) eventually also too complex?
  - Black box (natural language, therapist/bugfix)?
  - Evolutionary mechanisms (drive selection)?

# Thank you!

There are only 10 options:  
digital or analogue.



Gottfried Wilhelm v. Leibniz



محمد بن موسى الخوارزمي