

Introduction to Robotics for cognitive science

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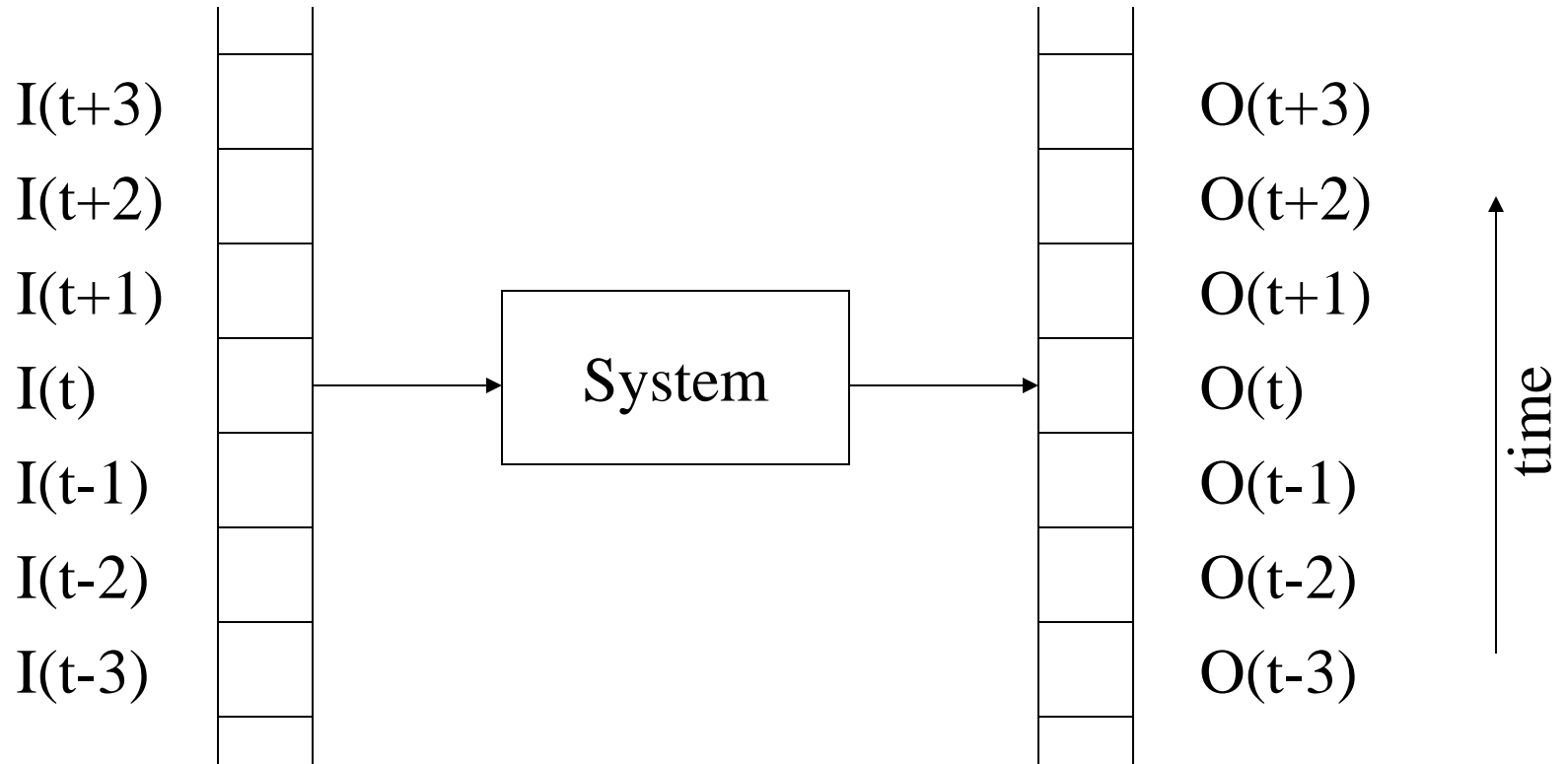
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Web page of the subject

www.agentspace.org/kv

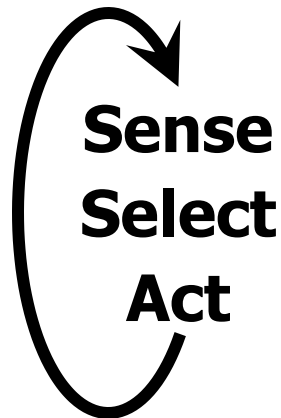


Control



Monolytic solution

- Single loop: read data from sensors, calculate actions, perform actions



Problems

- Code becomes complicated where more and more features are implemented
- Slow processes slow down fast processes, as a result the system is not working in real-time

Real-time

- Operation in real-time means that if an event should be performed in time t , it is sure it will be performed in time $t+L$, not later
- L is latency and it is expressed in ms

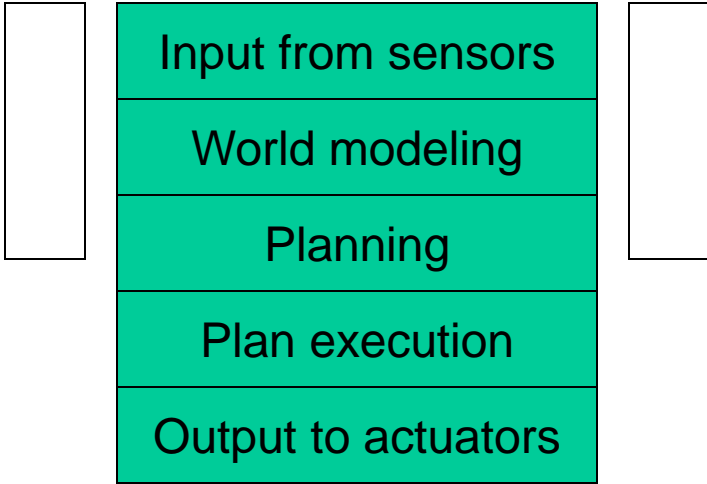
Modular architectures

We need to decompose the control somehow

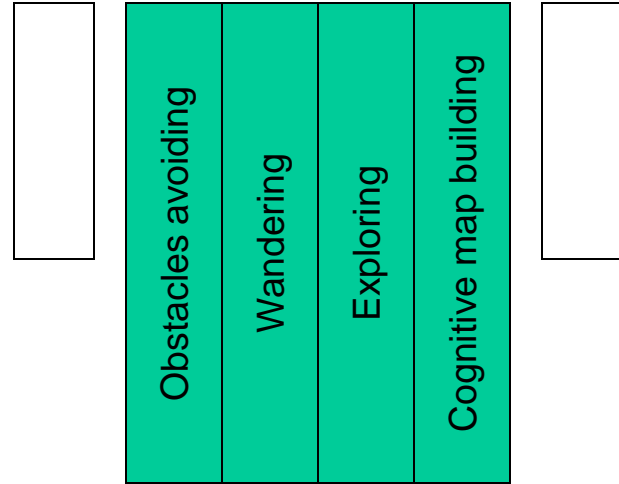
Decomposition

- by function = layers contain codes providing similar function (e.g. vision)
- by activity = layers contain codes providing similar activities (e.g. obstacles avoiding)

By function
Horizontal



By activity
vertical



Modular architectures

Historical architectures:

- Brooks' subsumption architecture
- Minsky's "society of mind"
- Payton & Rosenblat: Fine grained architecture
- RTOS architectures (pyramidal client-server)
- Arkin's Behavioral architecture
- ...

Modular architectures

Implementations:

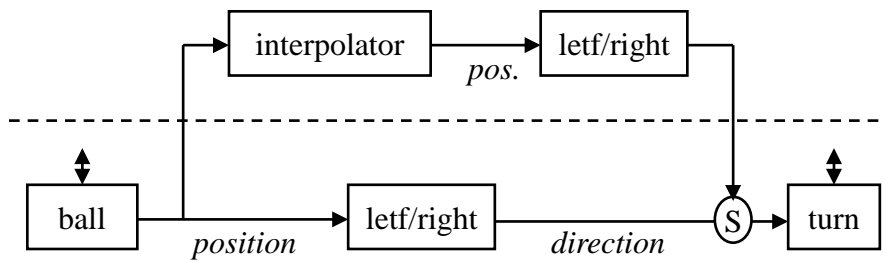
- Robot Operating System (ROS)
- Agent-Space architecture

Agent-space architecture

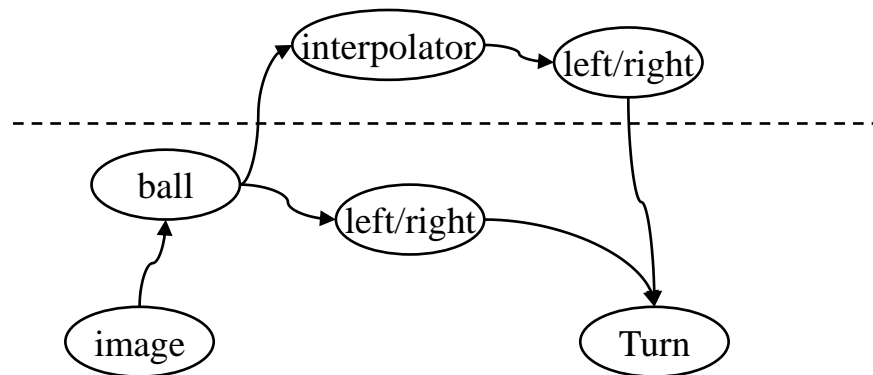
- We can employ for that our derivate of Brooks subsumption architecture (designed in 1997-2004 by Lucny under supervision of Kelemen – btw. friend of Minsky):



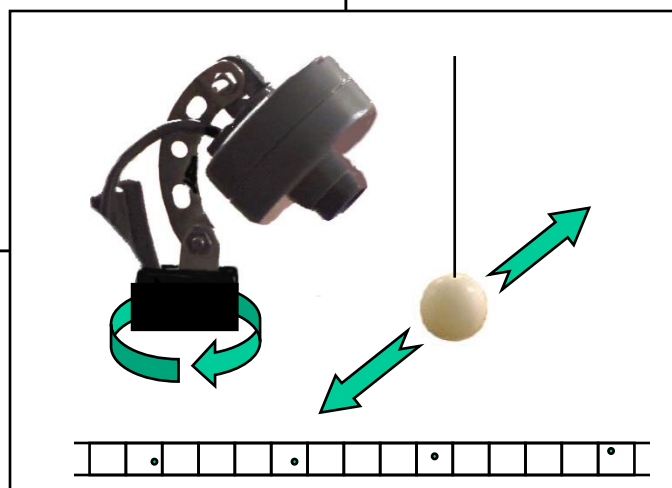
Jozef Kelemen
(author of the first book
about AI in Slovak)



subsumption
architecture

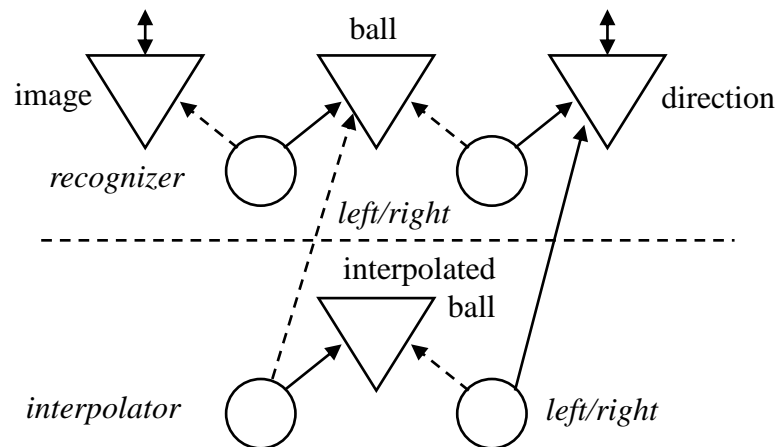
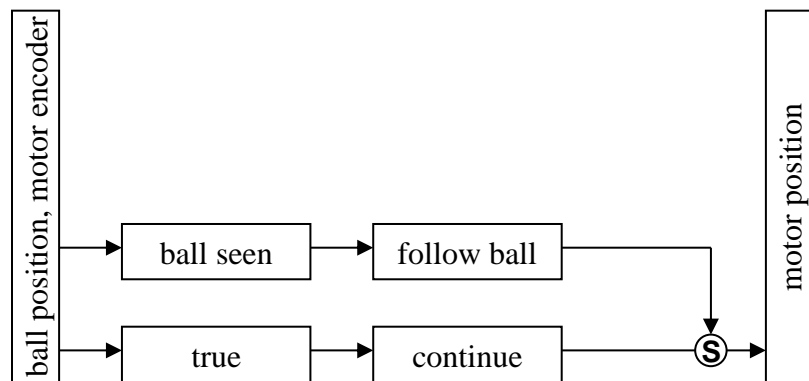


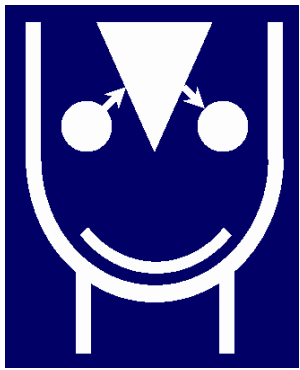
Society of mind



behavioral
architecture

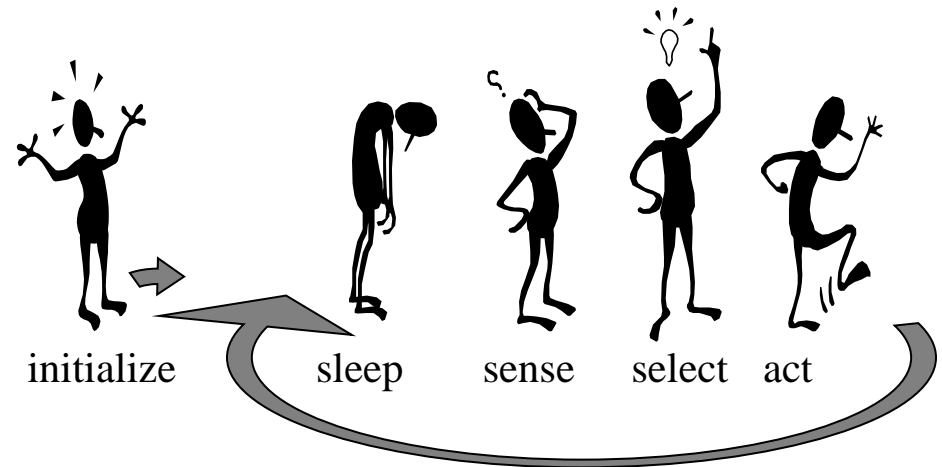
agent-space
architecture



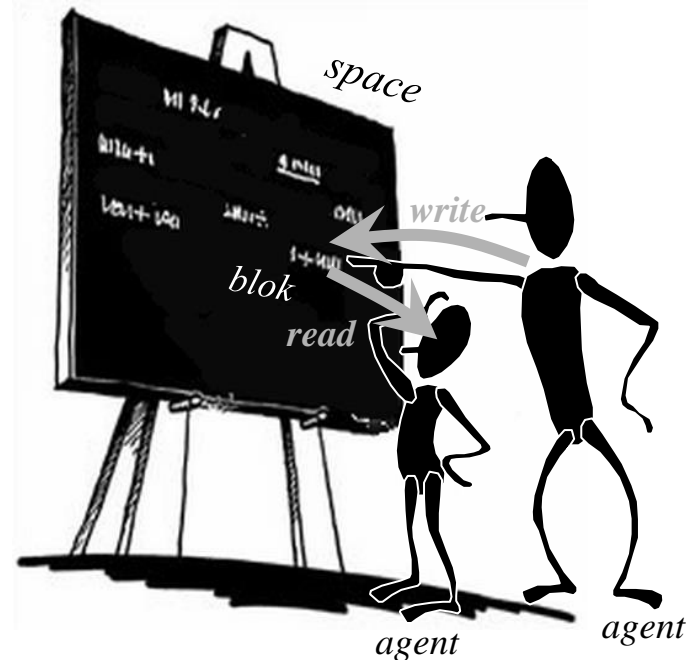


Architecture Agent-Space

- System consists of agents

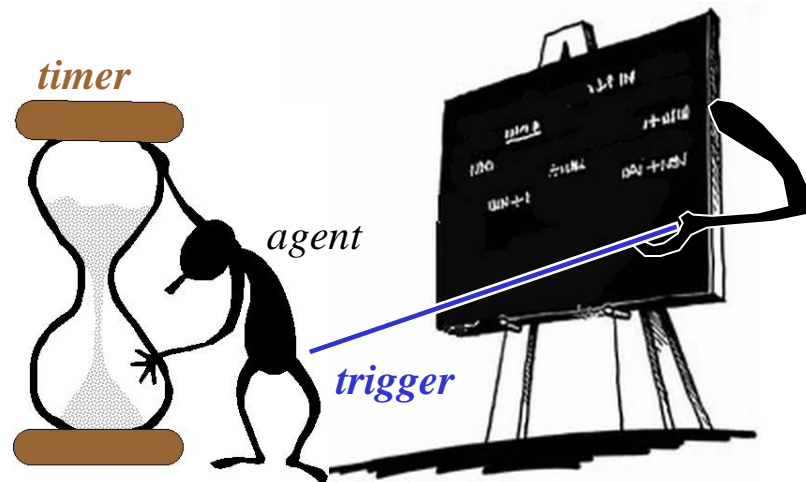


- Agents communicate through Space



Implementation in Python

- Each agent is object with own thread
- It calls *read* and *write* methods of singleton object *Space*
- Agent is regularly waken up by timer or trigger (by the *write* operation performed by another agent)



Robot ALLEN

- Built by Brook at AI Lab on MIT
- Predecessor of robotic vacuum cleaners

Brooks 1986

