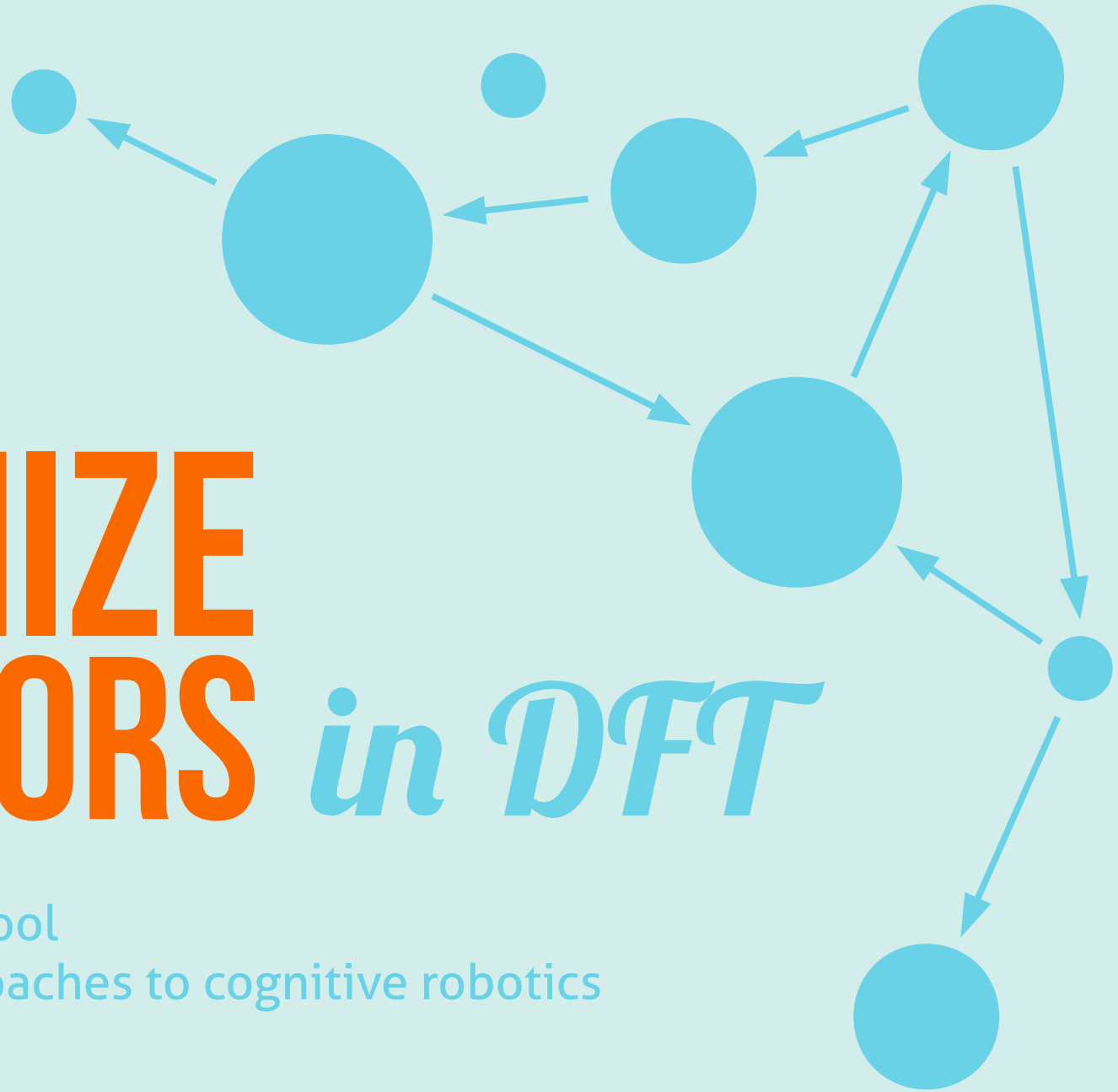


How to ORGANIZE BEHAVIORS in DFT

Hands-on summer school
Neural dynamics approaches to cognitive robotics
August 25-30, 2014
Bochum, Germany

Mathis Richter

ORGANIZING *behaviors*

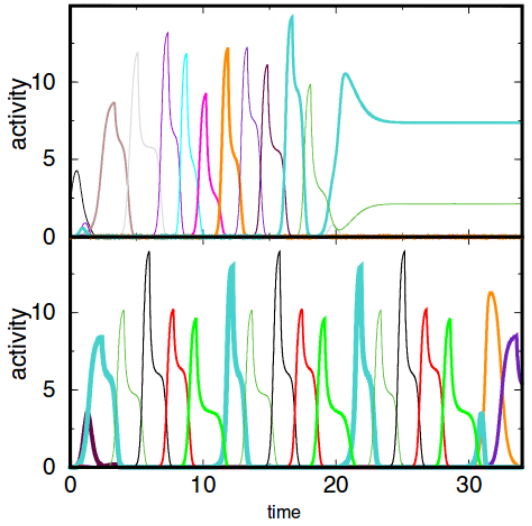
3 TYPES
of organization

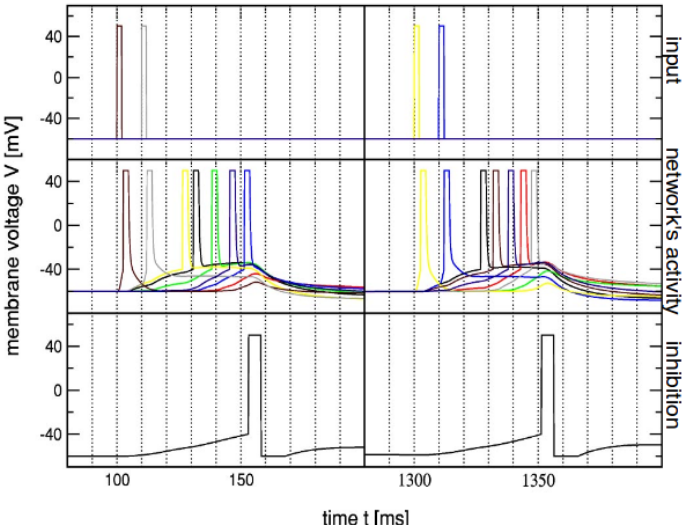
1. Serial order
2. Behavioral organization
3. Goal-oriented sequences

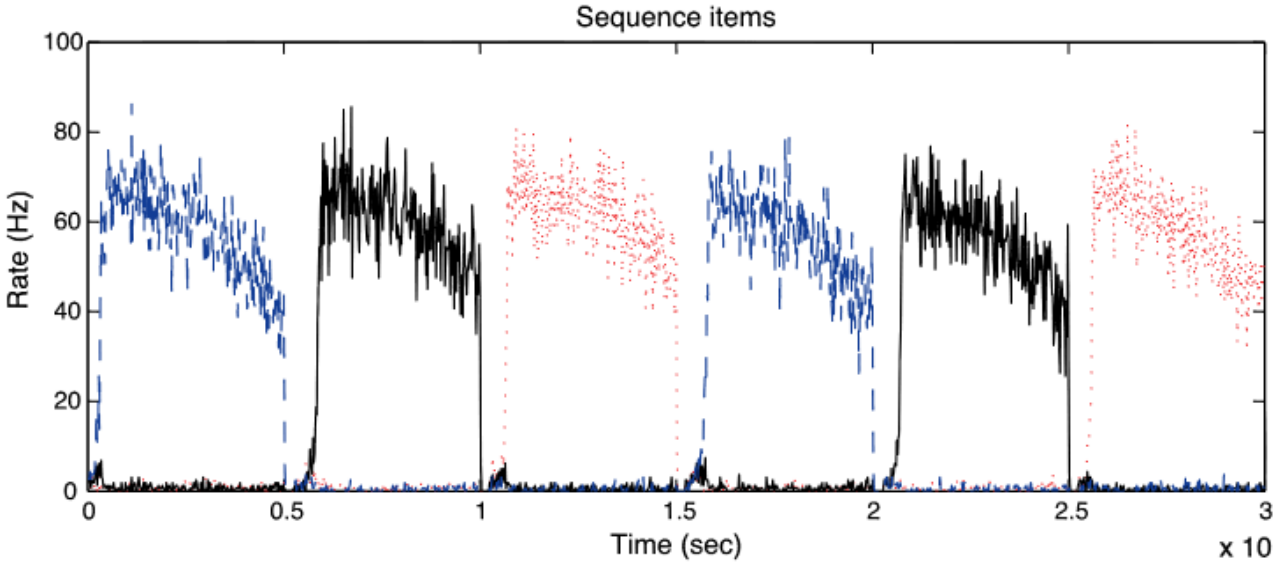
1 SERIAL ORDER

arbitrary sequences

TRADITIONAL
sequence generation



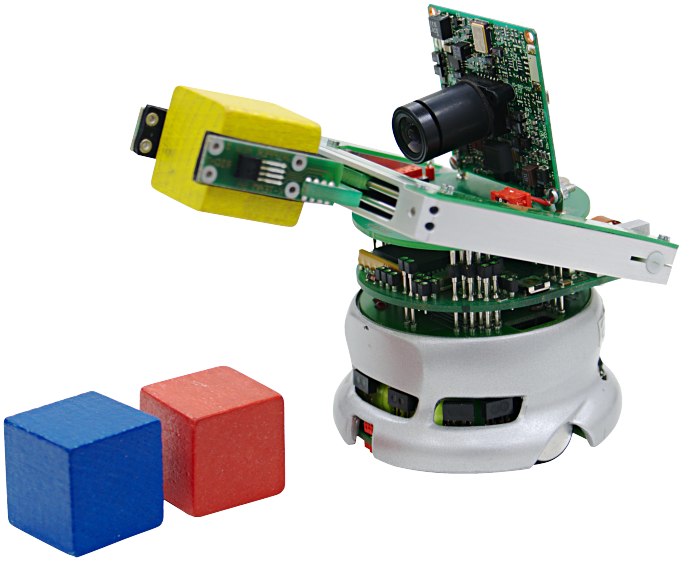




IRREGULAR *timing*

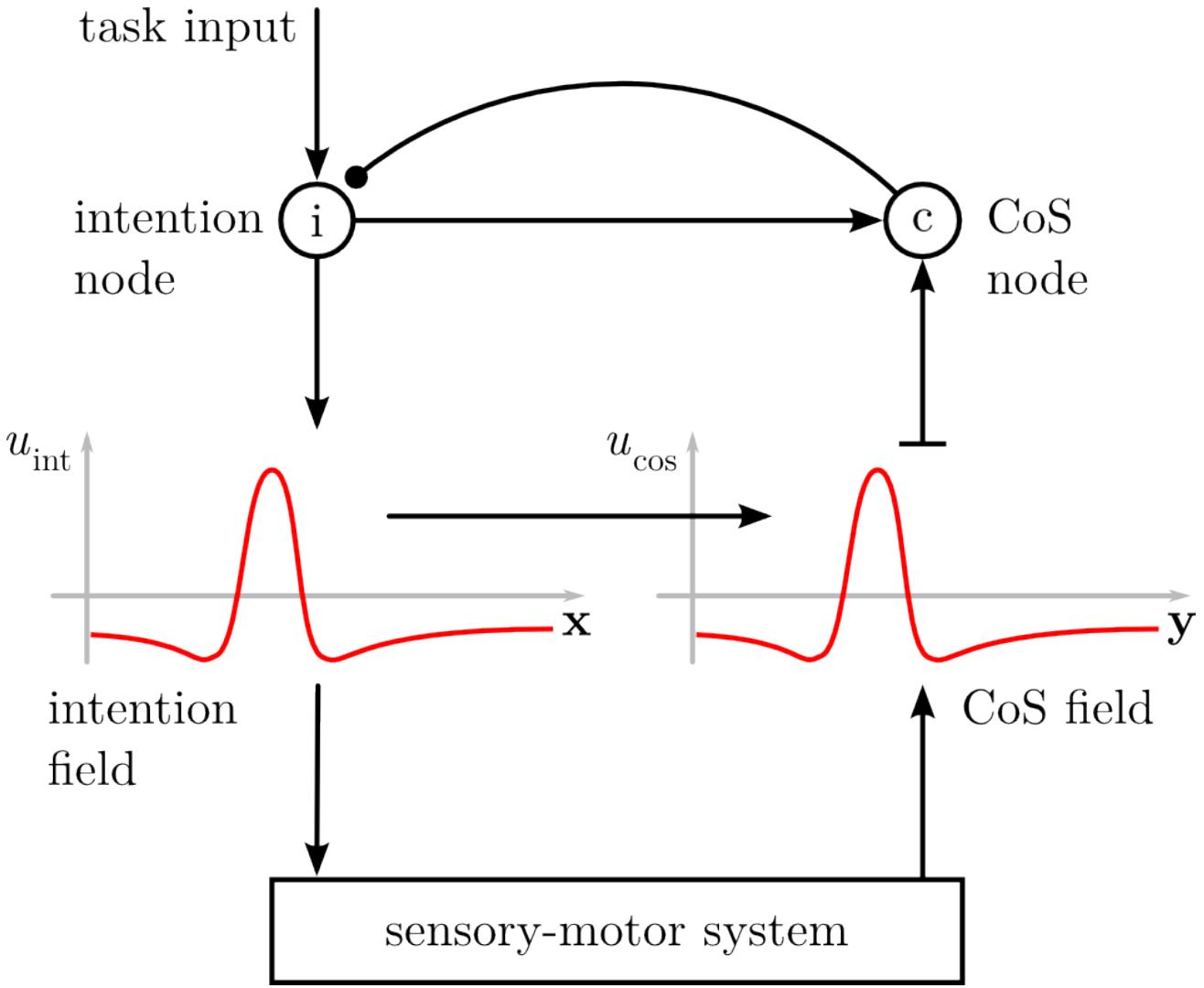
vs

STABILITY
of action representation

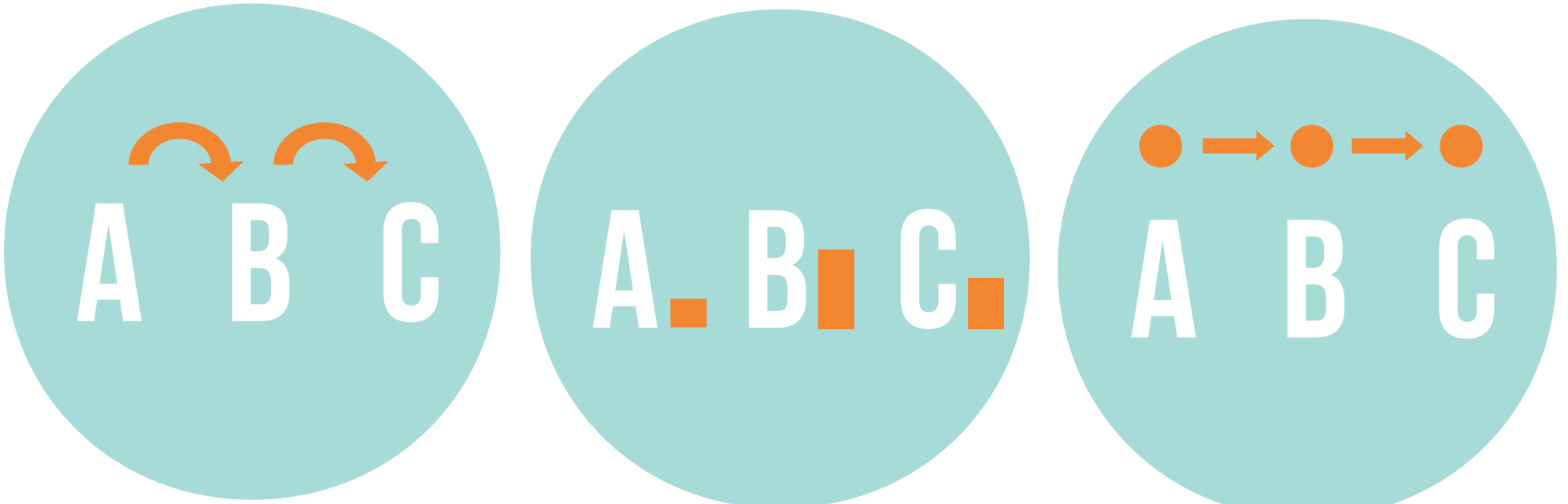


- conflict between stability and sequentiality
- there must be a structure in the (neural) representation of an action

Elementary BEHAVIOR



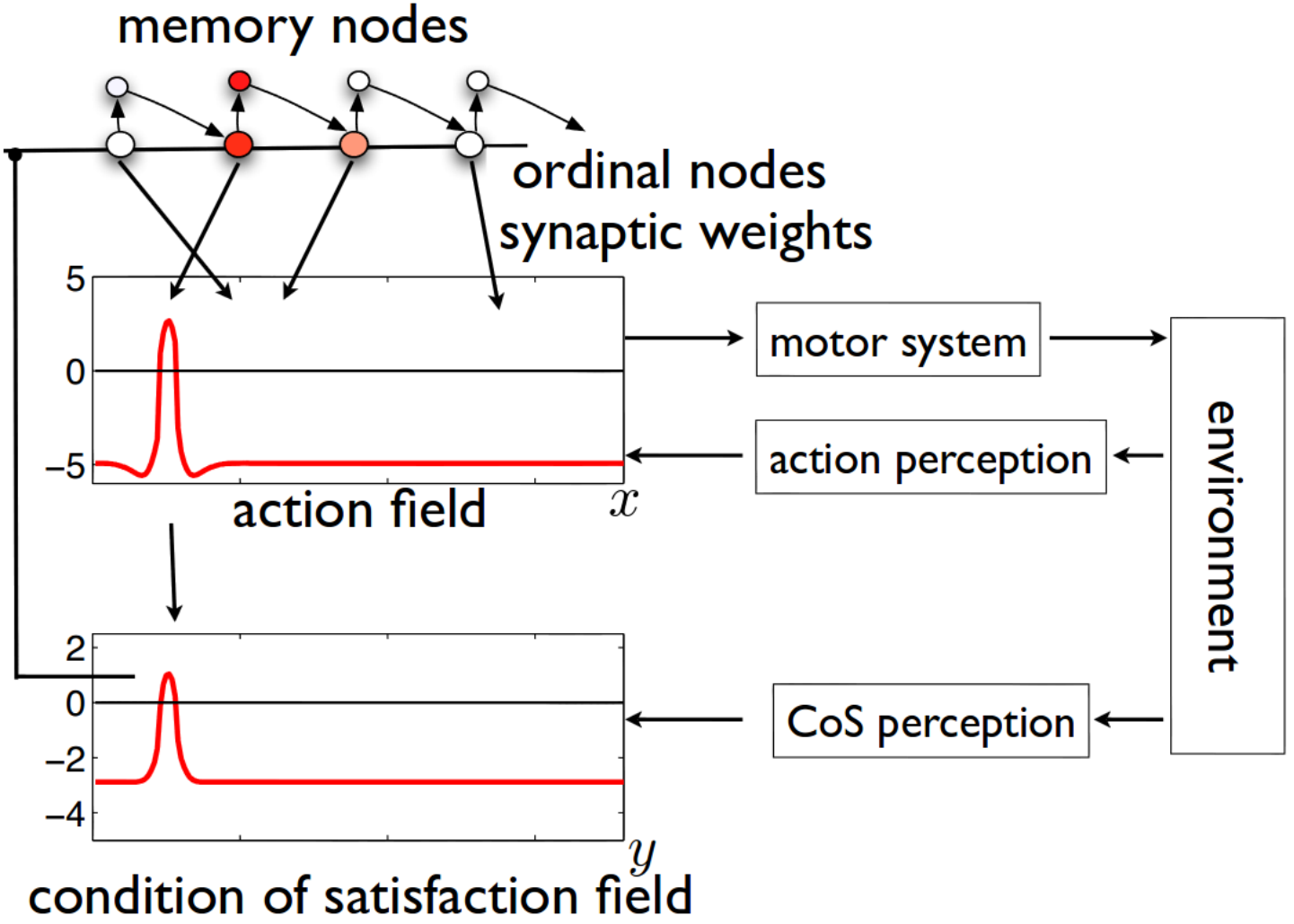
3 COGNITIVE MODELS *of sequences*



chaining *ordinal* *positional*

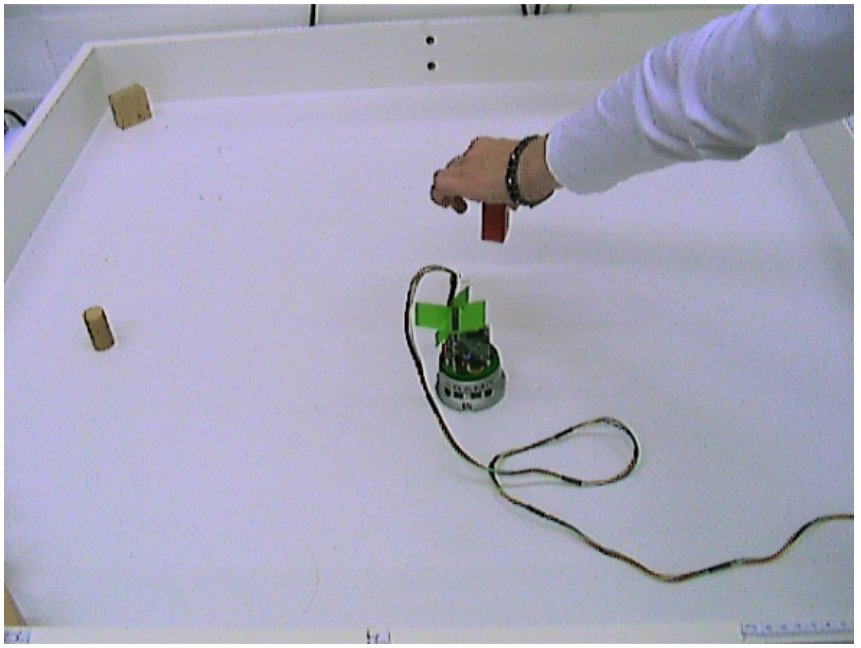
(Henson, 1998)

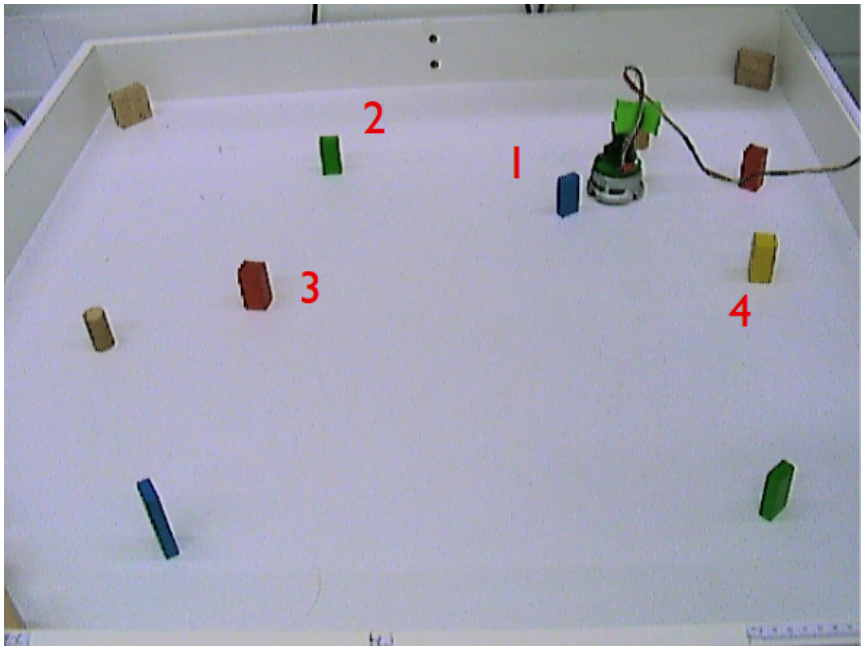
SERIAL ORDER *architecture*



(Sandamirskaya, Schöner, 2010)

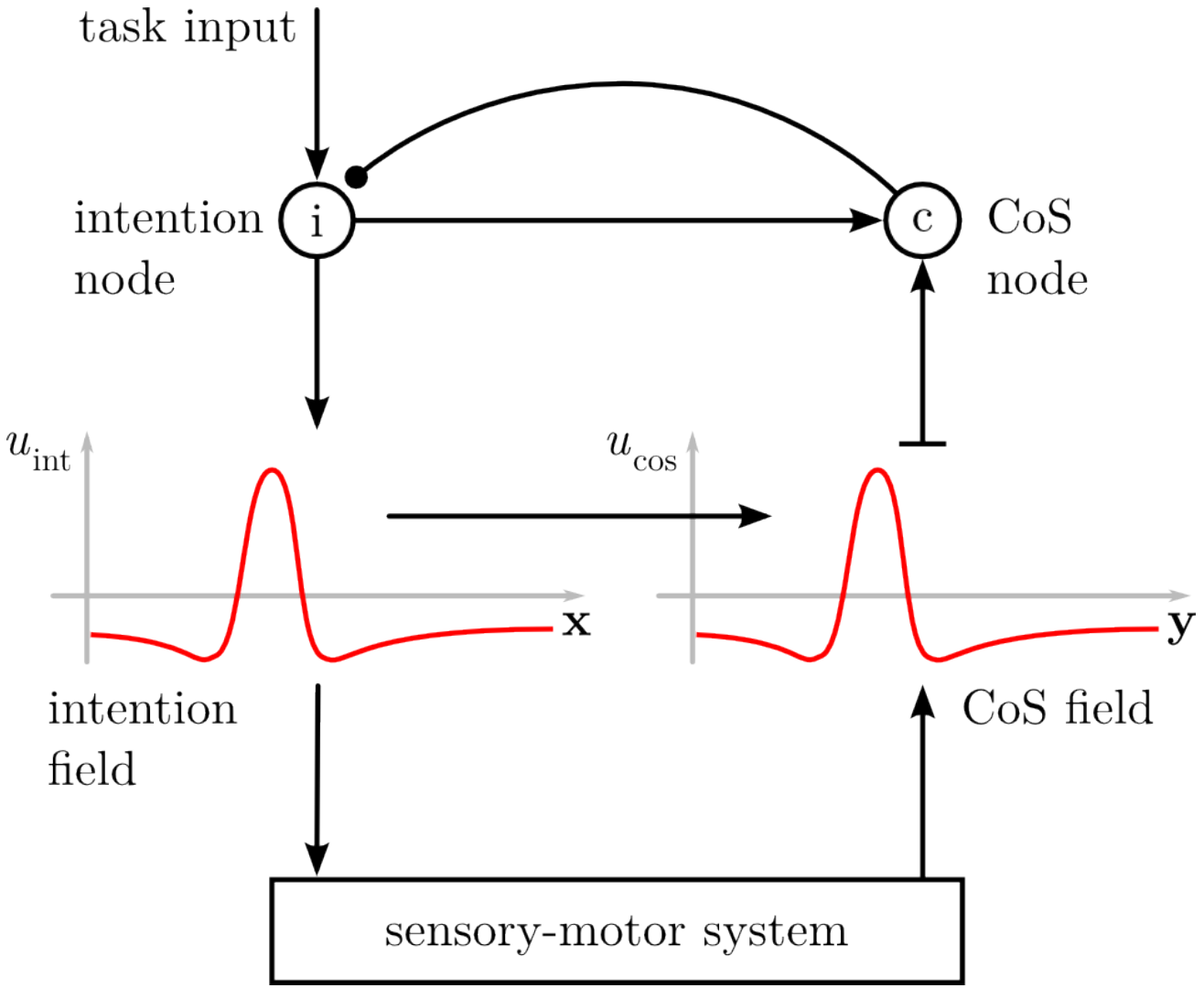
a ROBOTIC *example*



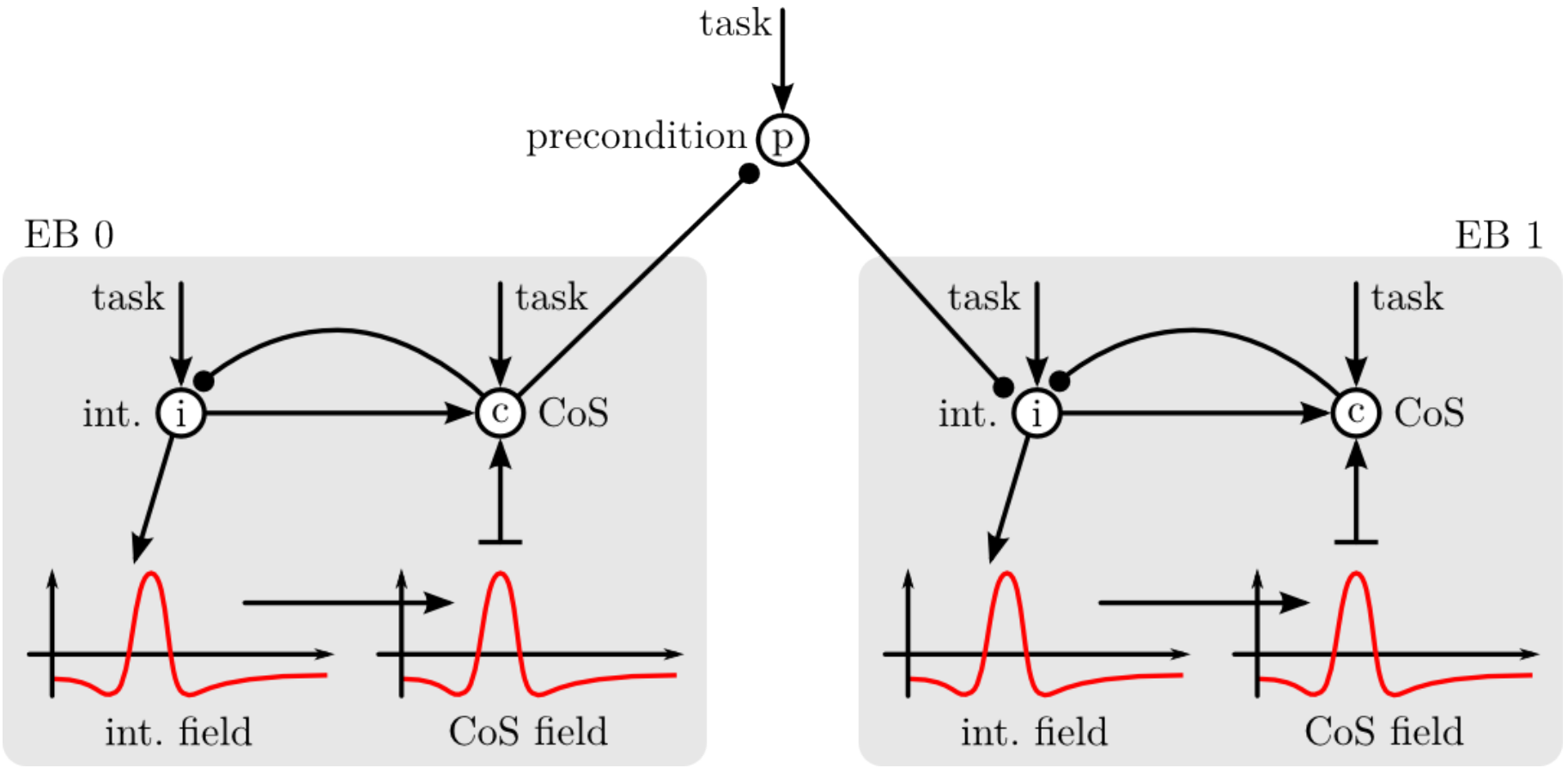



2
BEHAVIORAL ORGANIZATION
flexibility
QUARTZ

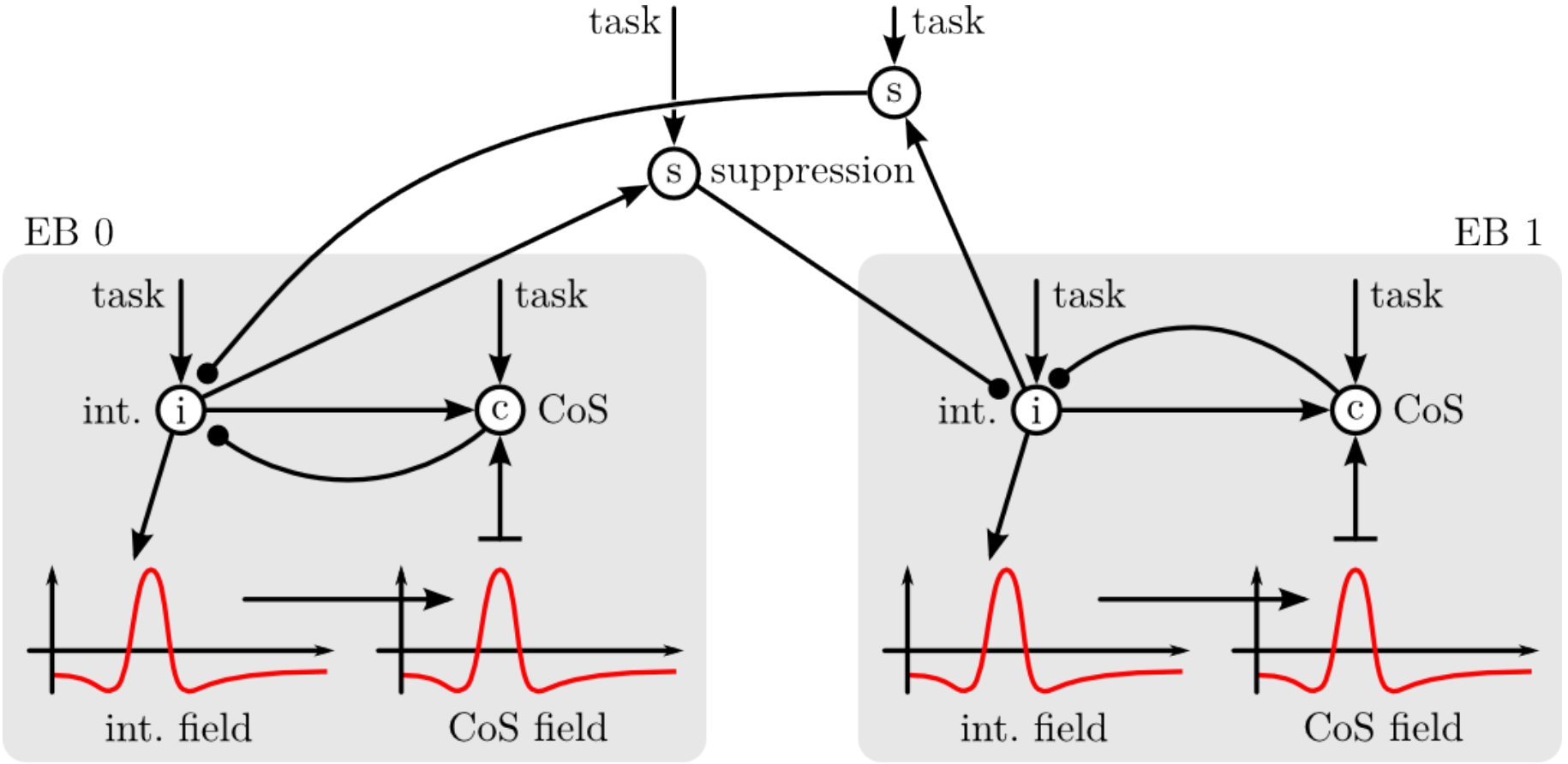
Elementary BEHAVIOR



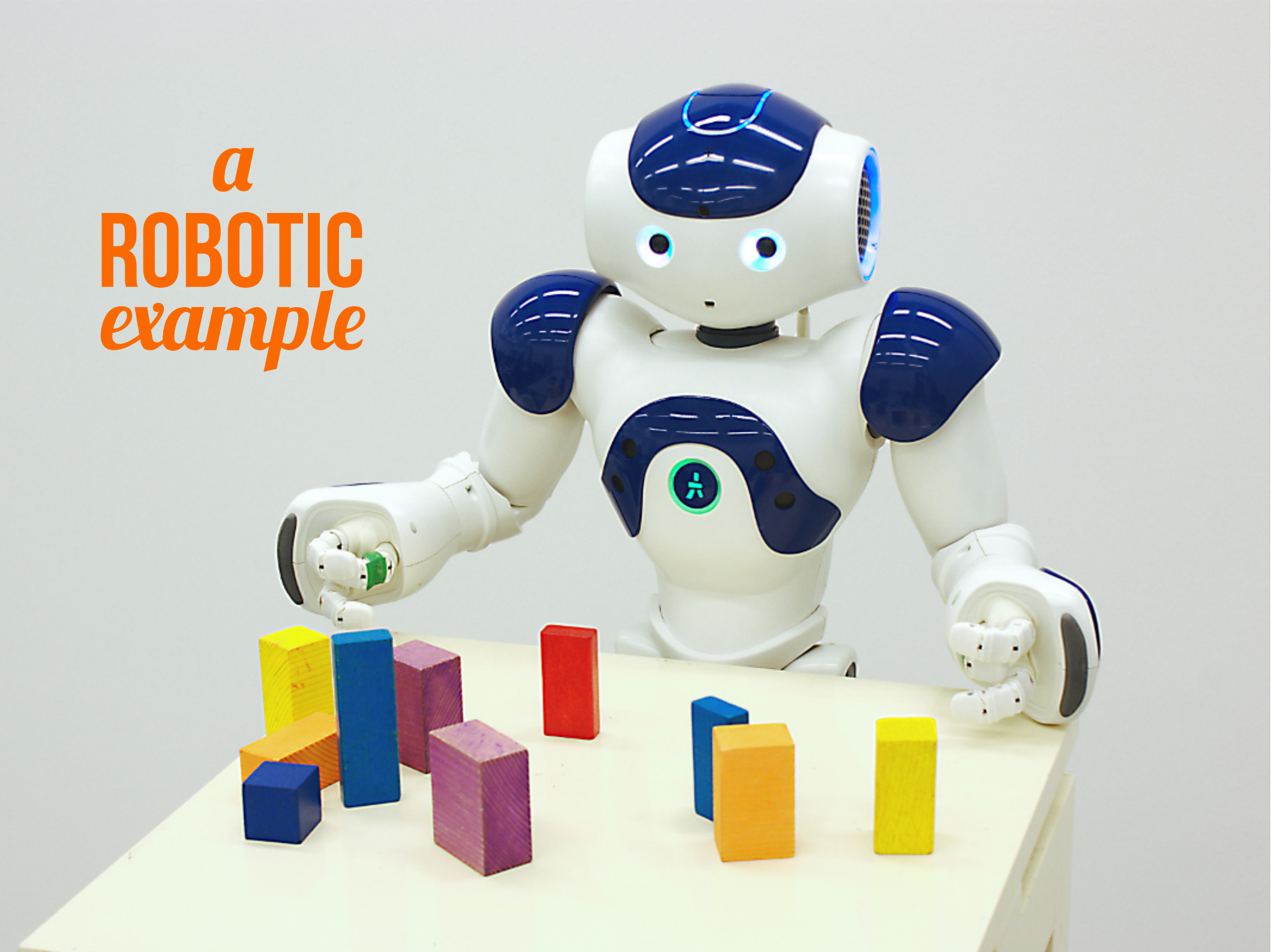
PRECONDITION *constraint*



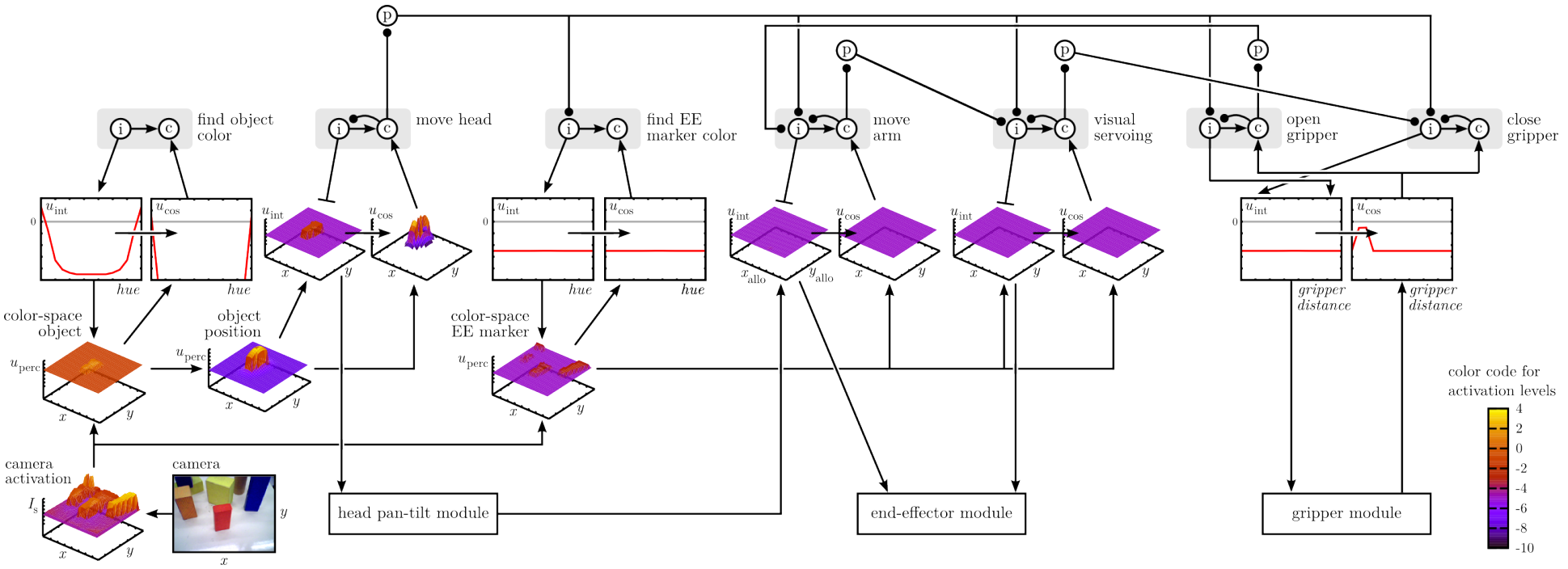
COMPETITION *constraint*

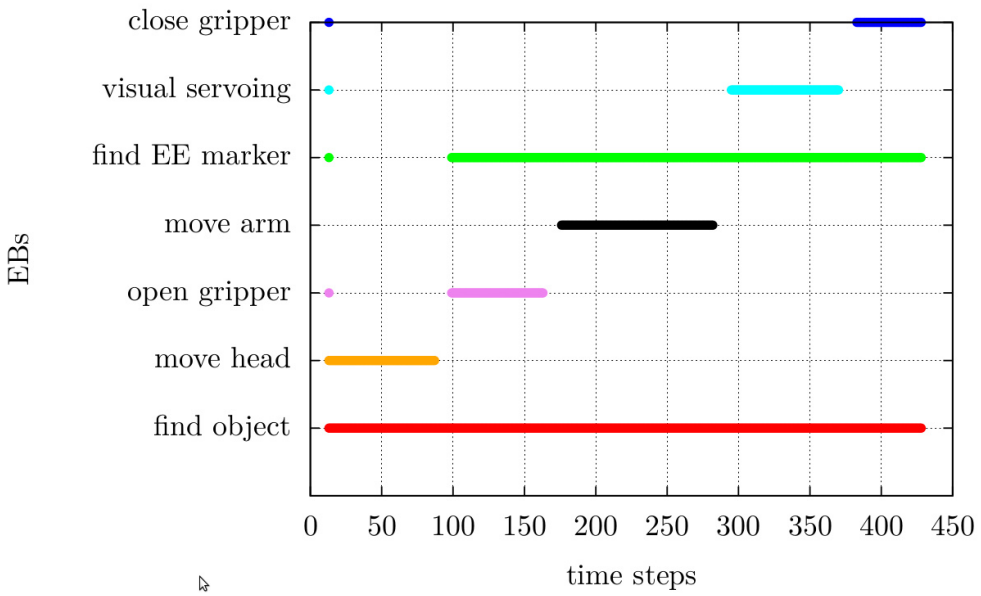


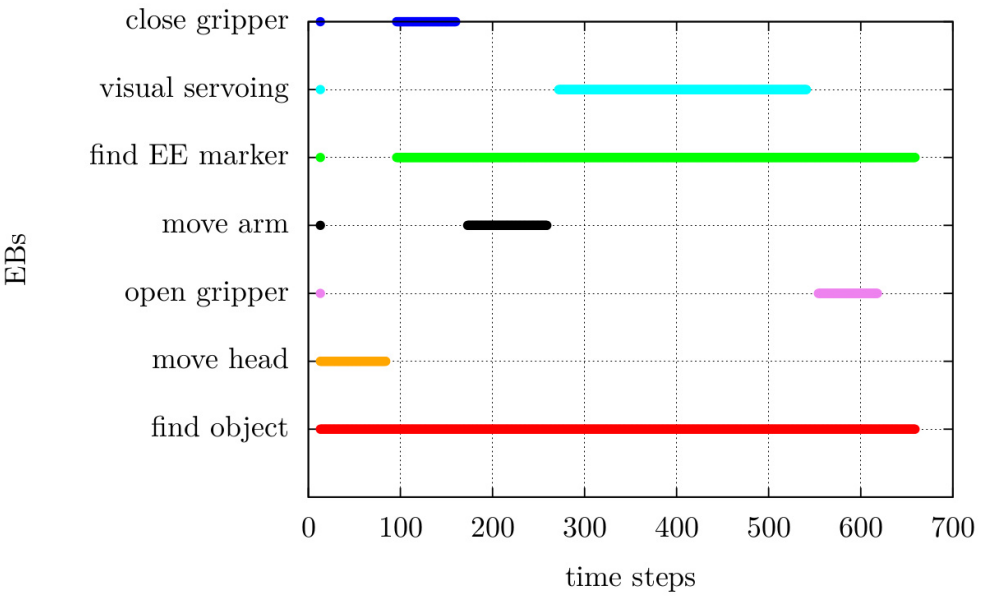
a
ROBOTIC
example



(almost) the whole
ARCHITECTURE

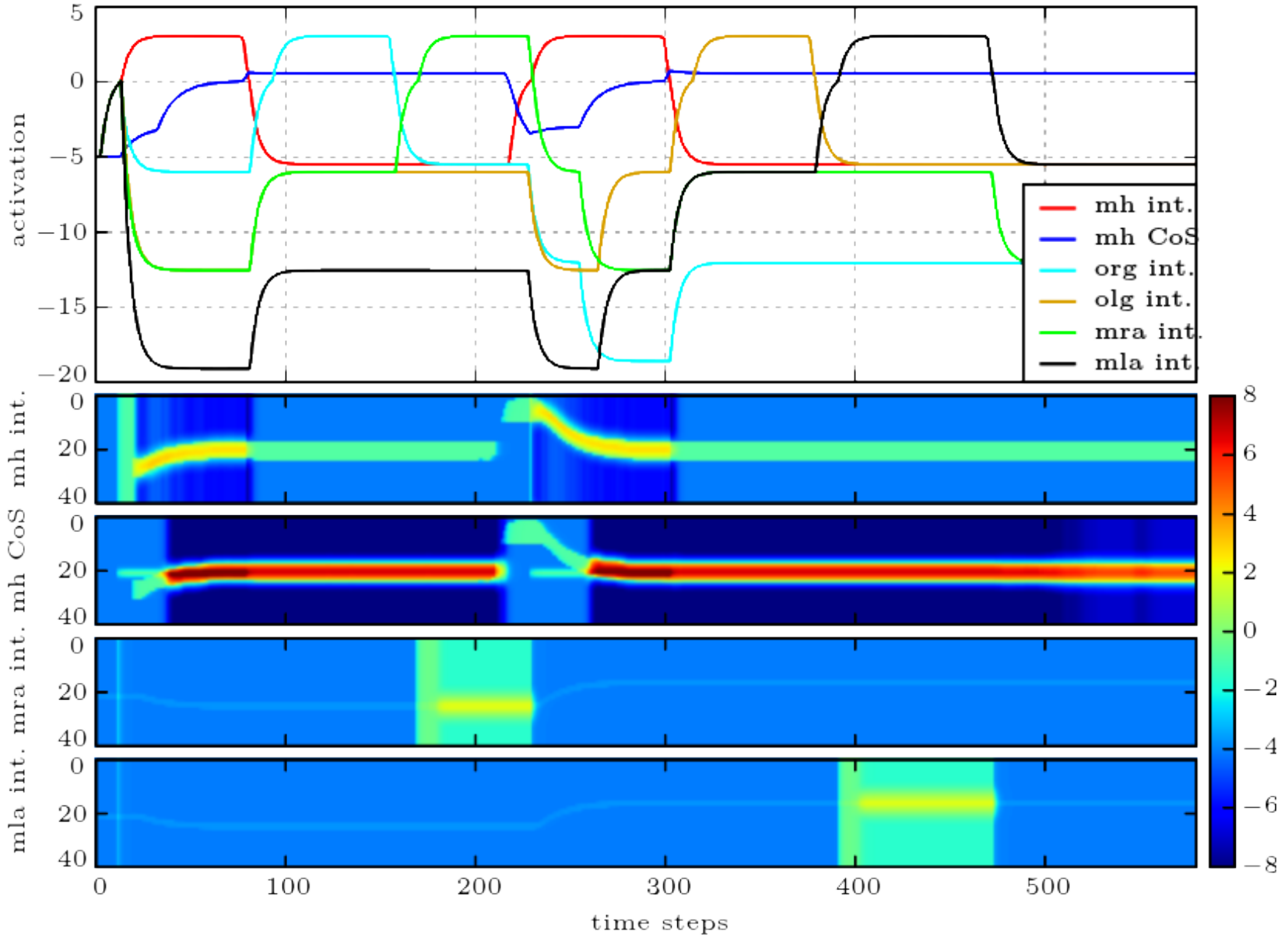






GRASPING *and* POINTING

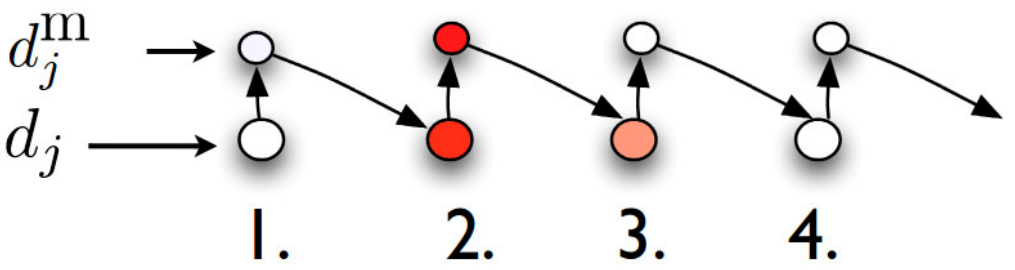
ACTIVATION *over time*



3 TYPES
of organization

1. Serial order
2. Behavioral organization
3. Goal-oriented sequences

Serial order EQUATIONS



$$\begin{aligned}\tau \dot{d}_i(t) \;=\; & -d_i(t) + h_d + c_0 f\left(d_i(t)\right) \\ & - c_1 \sum_{i' \neq i} f\left(d_{i'}(t)\right) + c_2 f\left(d^m_{i-1}(t)\right) \\ & - c_3 f\left(d^m_i(t)\right) - I_C(t)\end{aligned}$$

$$\begin{aligned}\tau \dot{d}^m_i(t) \;=\; & -d^m_i(t) + h_m + c_4 f\left(d^m_i(t)\right) \\ & - c_5 \sum_{i' \neq i} f\left(d_{i'}(t)\right) + c_6 f\left(d_i(t)\right)\end{aligned}$$

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SEVENTH FRAMEWORK PROGRAMME

EUCOG