Knowledge Representation and Learning for Robotic Systems

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Motivation

- Natural Systems - Best models for understanding intelligence

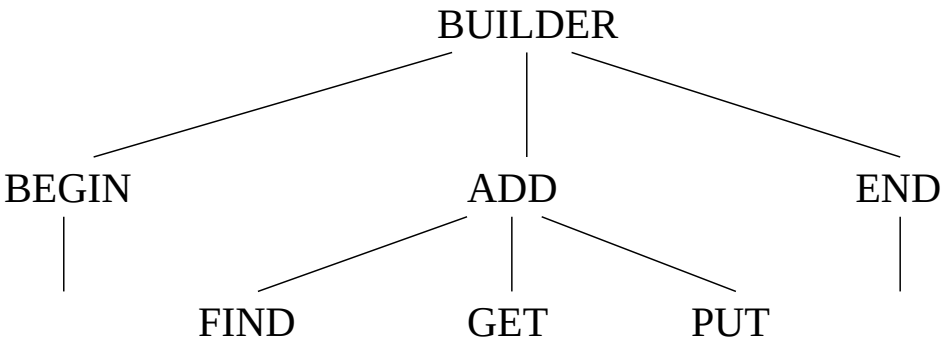
- Why robotic systems ?

  - Intelligence can be isolated and studied: Dangerous assumption

  - Risk of oversimplification

Society of ind

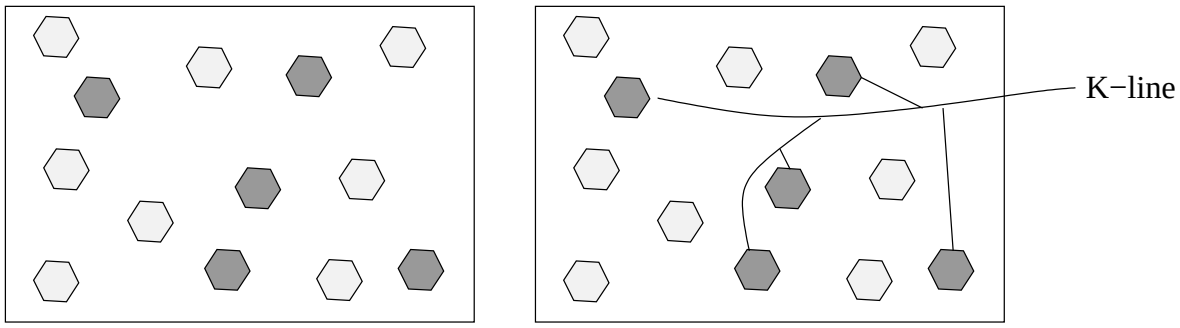
- How Mind Works
- Particles of Mind - Agents



- Society of Mind
- Learning in Society of Mind

Theory of emory

- Concept of **K-line**

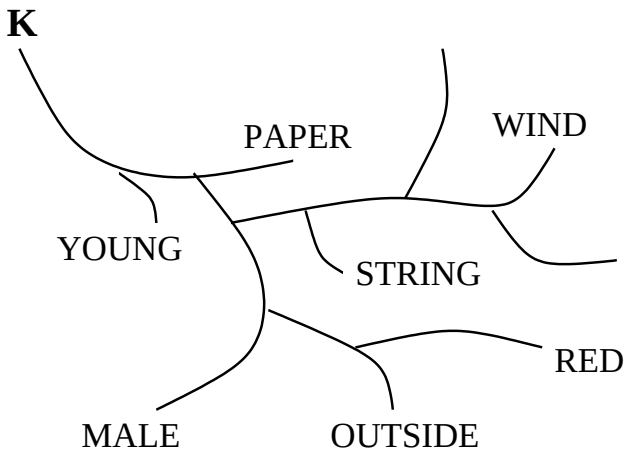


Current mind state K−line formed

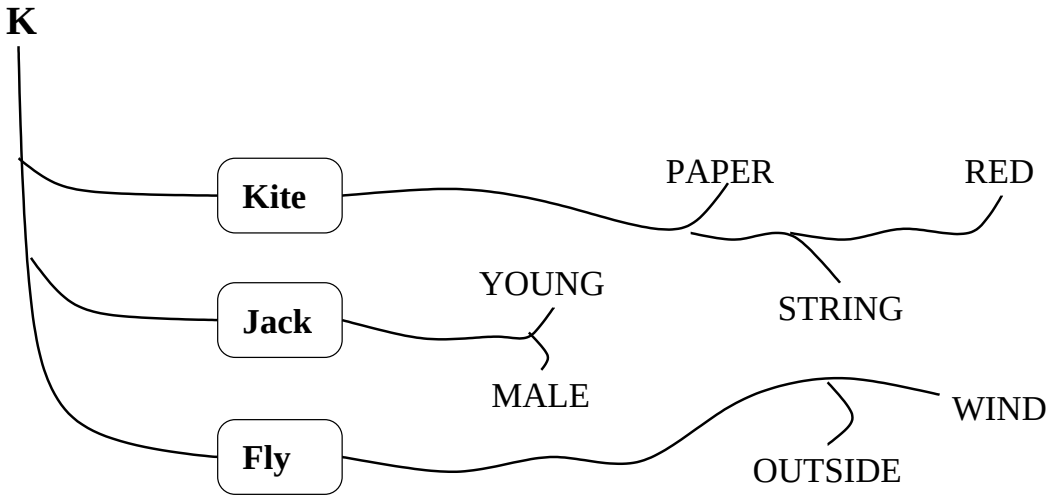
(shaded agents are the active agents)

Organization of -lines

- Disorganised

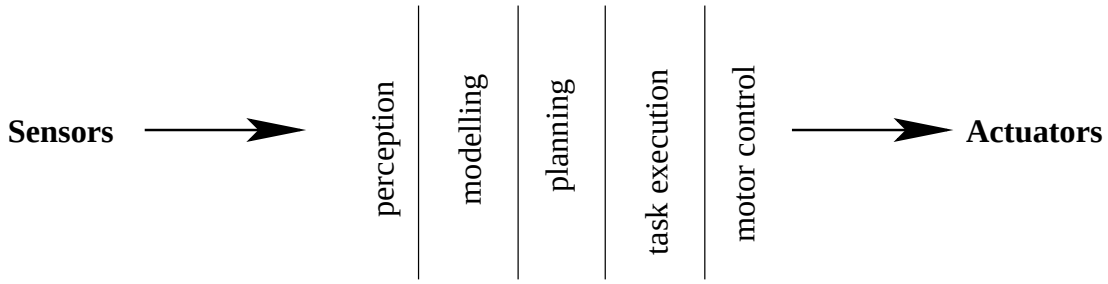


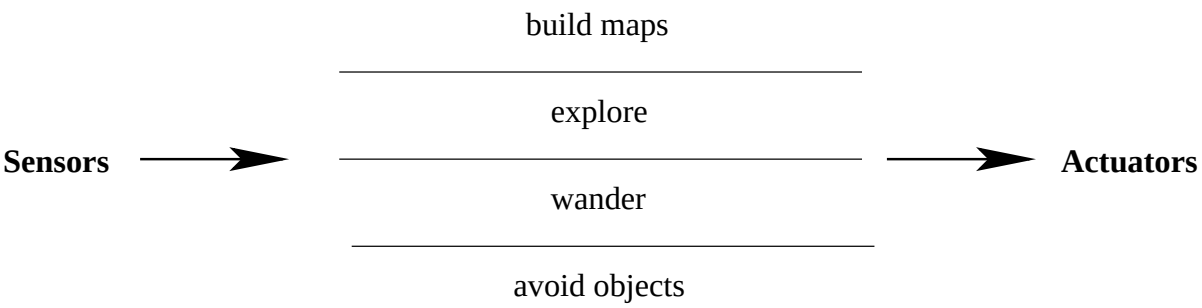
- Organised



Subsumption Architecture

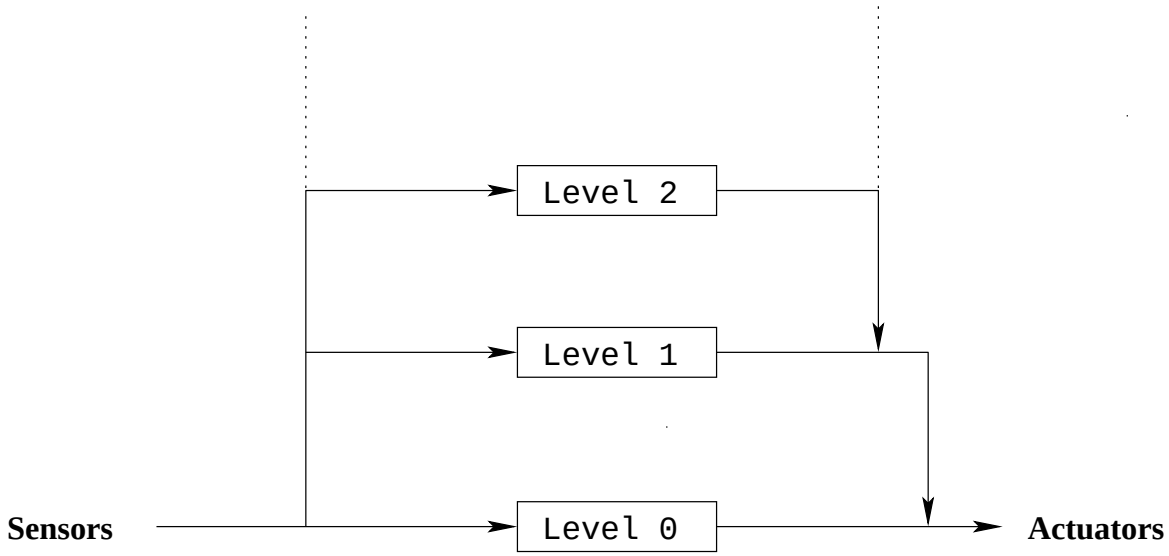
- Motivation
- Traditional Vs Brook's decomposition





Description of rchitecture

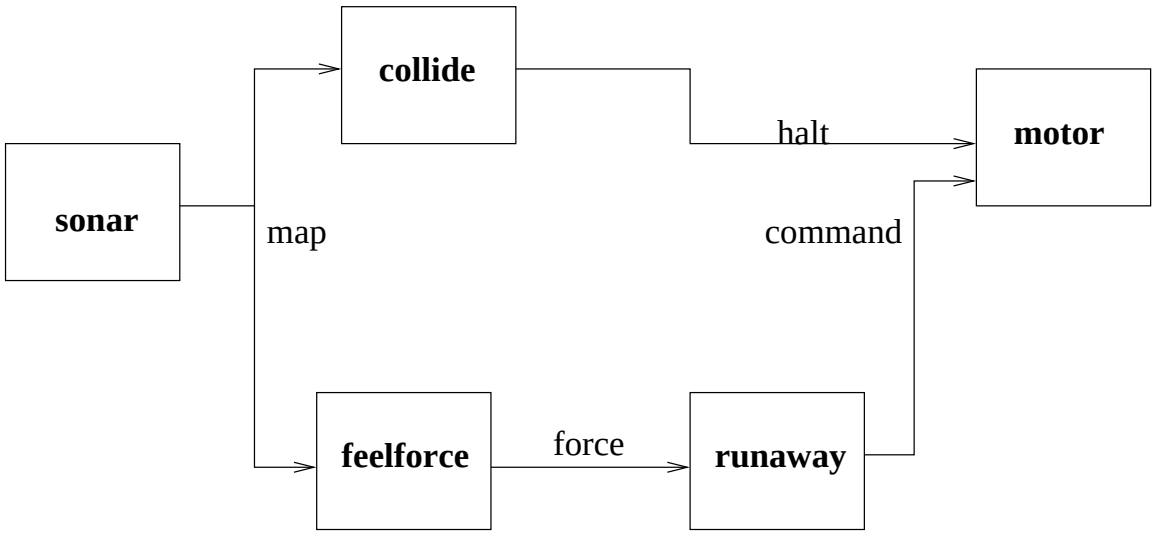
- No central model of world
- Distributed behavior
- Layers of control



- Suppression and Inhibition

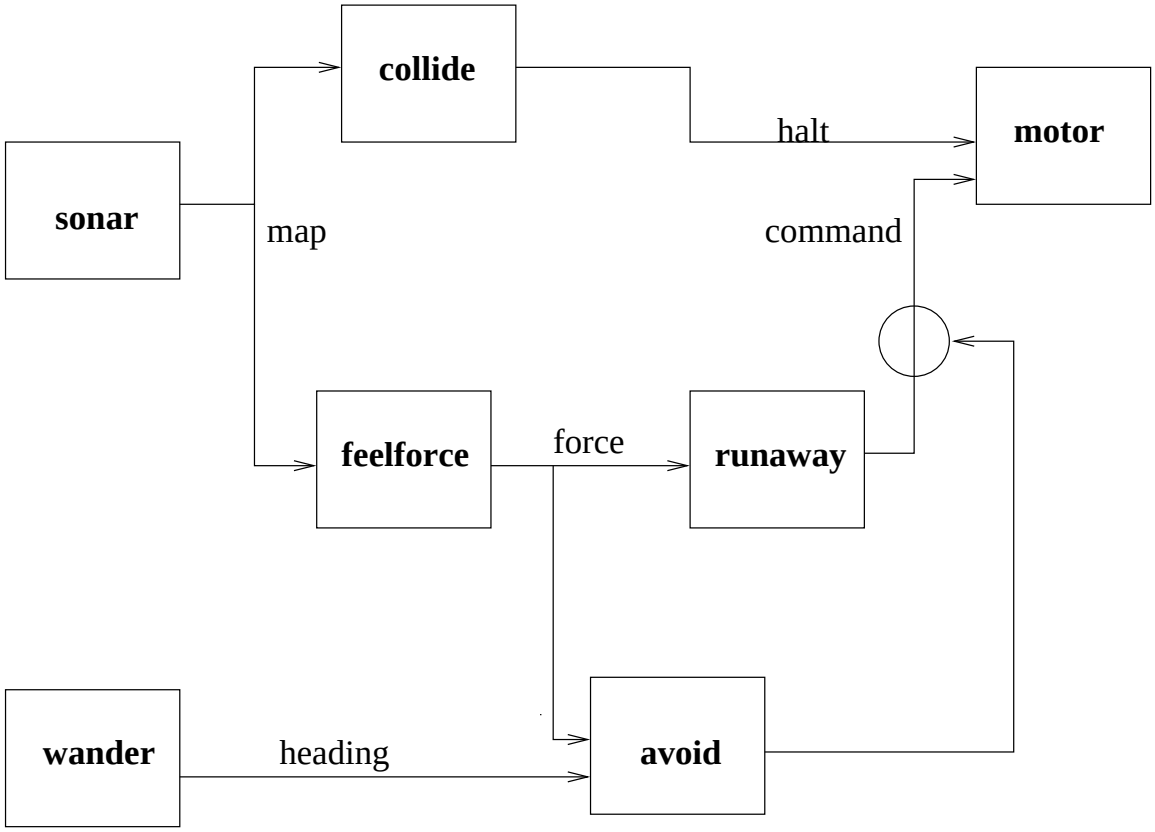
Example

Level 0 control system



Example

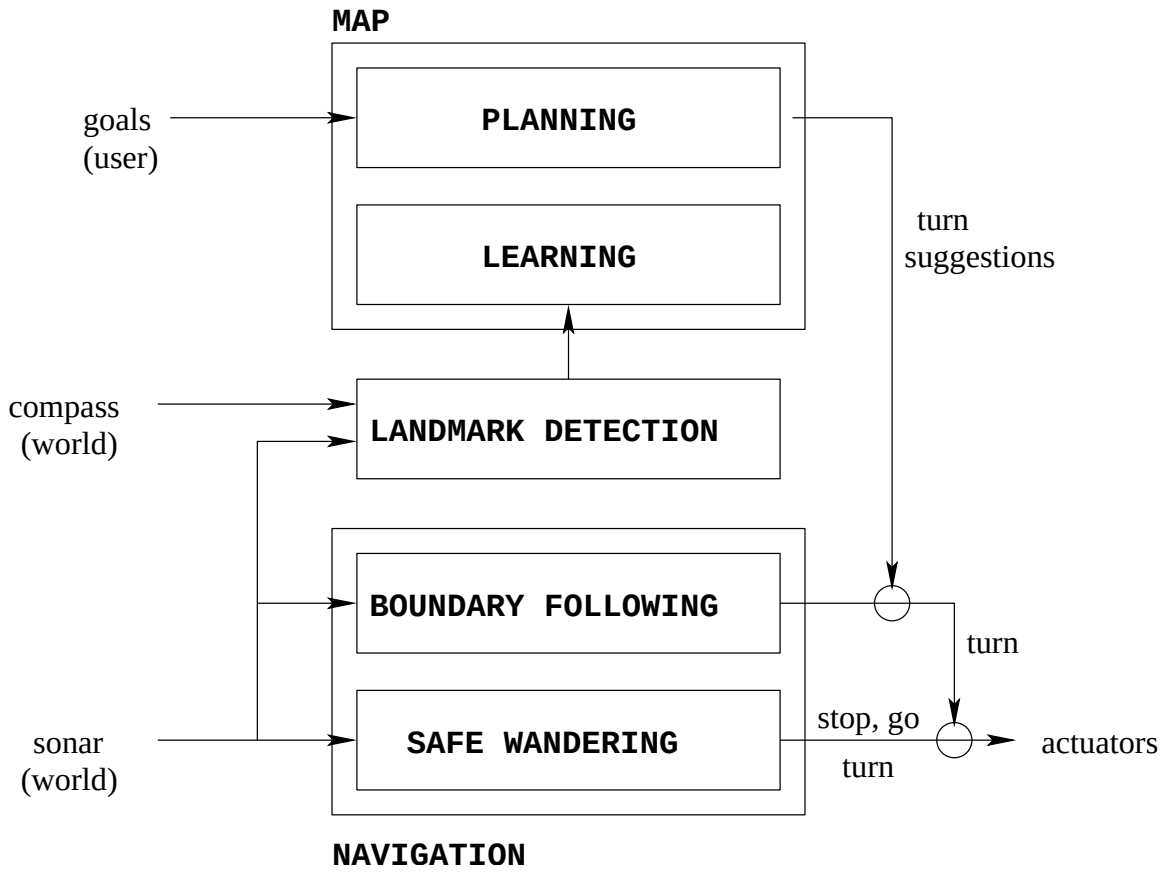
Level 0 augmented with Level 1 control system



Hormonal activation

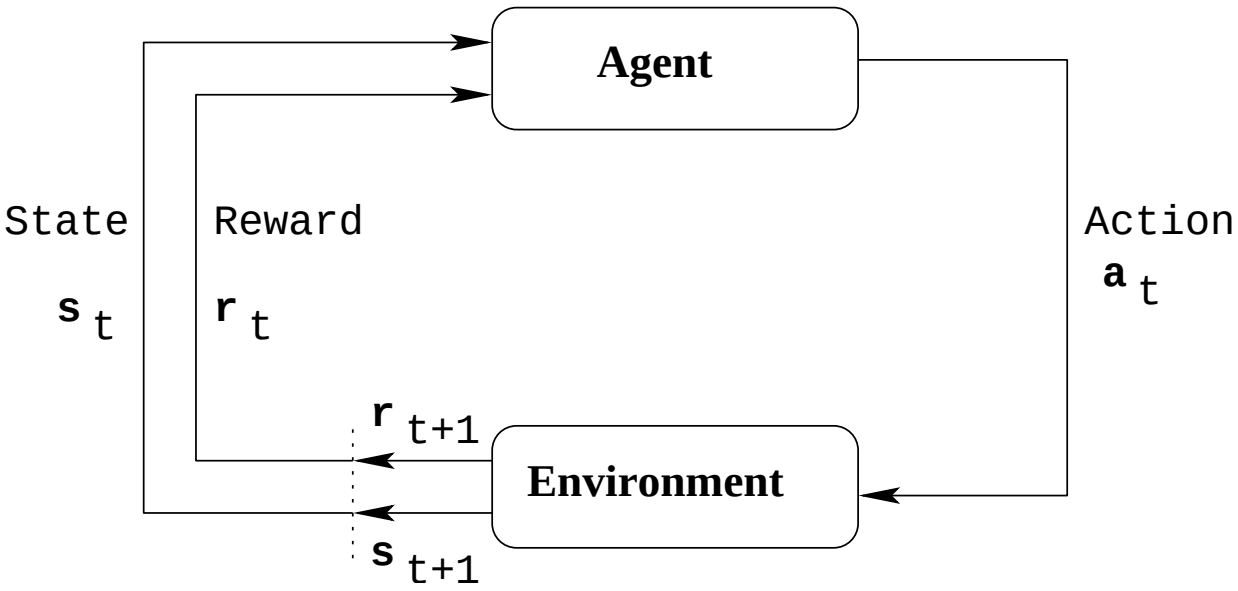
- Resolving conflicts between behaviors
- Based on Animal Hormone system
- Conditions - Panic, Drowsiness
- Releasers - Adrenaline, Sleepine
- Activation of behaviors based on releasers

Planning and learning



einforcement learning

- Motivation
- Agent and Environment



- Goal and Rewards

einforcement Learning

- Returns
  $R_t = \sum_{k=0}^{\infty} \gamma^k r_{t+k+1}$; 0 ¡ γ ¡ 1

- Policy

- Finding an optimal policy
  - Ideal Case
    - Finite Markov Decision process (FMDP)
    - Complete model of system
  - Approximations

Conclusions

- Subsumption Architecture
  - Reflexive and fast
  - Not modular
  - Not appropriate for solving big and complex problems
- Reinforcement Learning
  - Difficult to solve for larger and complex problems
  - Need for instincts
- A possible solution