

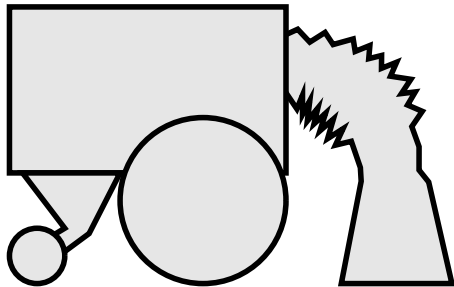
Intelligent Software Agents: A quick introduction

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Overview

- What is an agent?
- Some architectures:
 - deliberative,
 - reactive,
 - teleo-reactive
- Agent-based manufacturing

What is an Intelligent Software Agent?



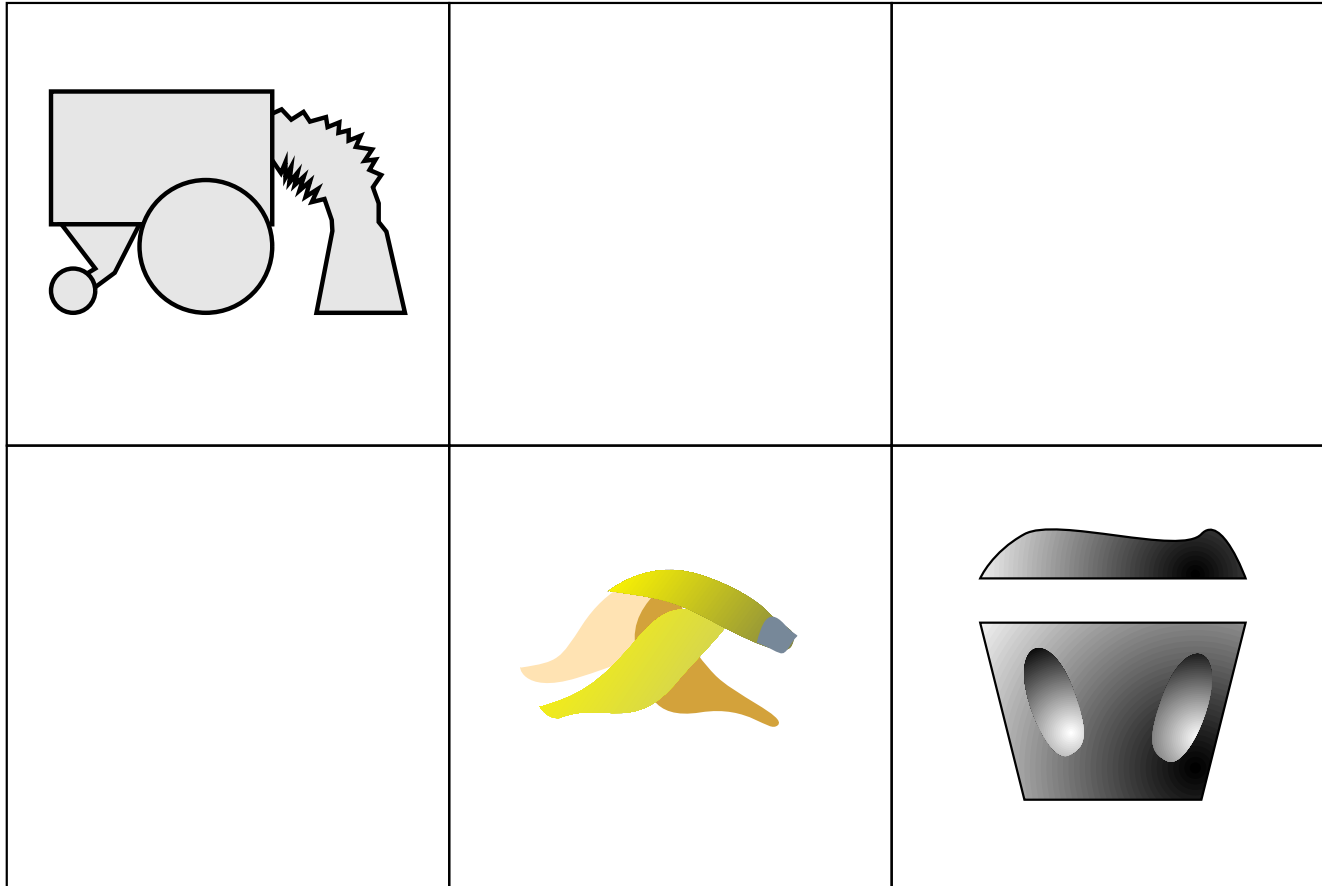
Embodied opposite of disembodied — essentially the whole of the agent is local

Situated has knowledge of / responds to its situation / environment

Autonomous decides what action to take based on its own situation

Cooperating can communicate with other agents to achieve tasks

What do Intelligent Agents do?



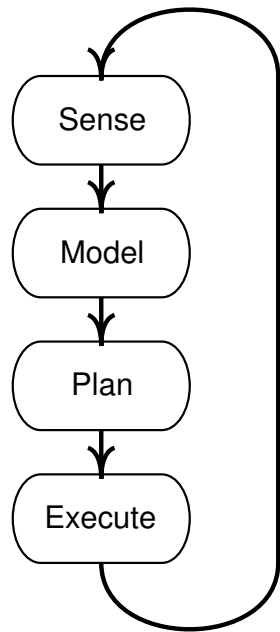
Dichotomy of Usage

- On the one hand, intelligent agents are about designing programs for real robots
- On the other hand, intelligent agents form a model for program design that is widely applicable

Why do we want Intelligent Agents?

- Traditional approaches to (say) planning require a large batch of computation with an answer being delivered at the end
- But the situation may change!
- There may be more than one way to solve a problem
- We may need to distribute the workload (SETI)
- Monolithic approaches may be complex and unworkable

Deliberative / BDI architectures



Rational or deliberative agents reason about the effect of their actions using an internal world model

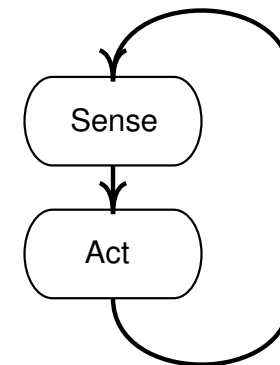
Perfect rationality is not achievable in realistic environments

The Belief Desire Intention (BDI) architecture proposed by Rao and Georgeff (1991) defines each agent as a set of beliefs (in the form of statements in propositional logic), a set of desires or goals, and a set of intentions or commitments

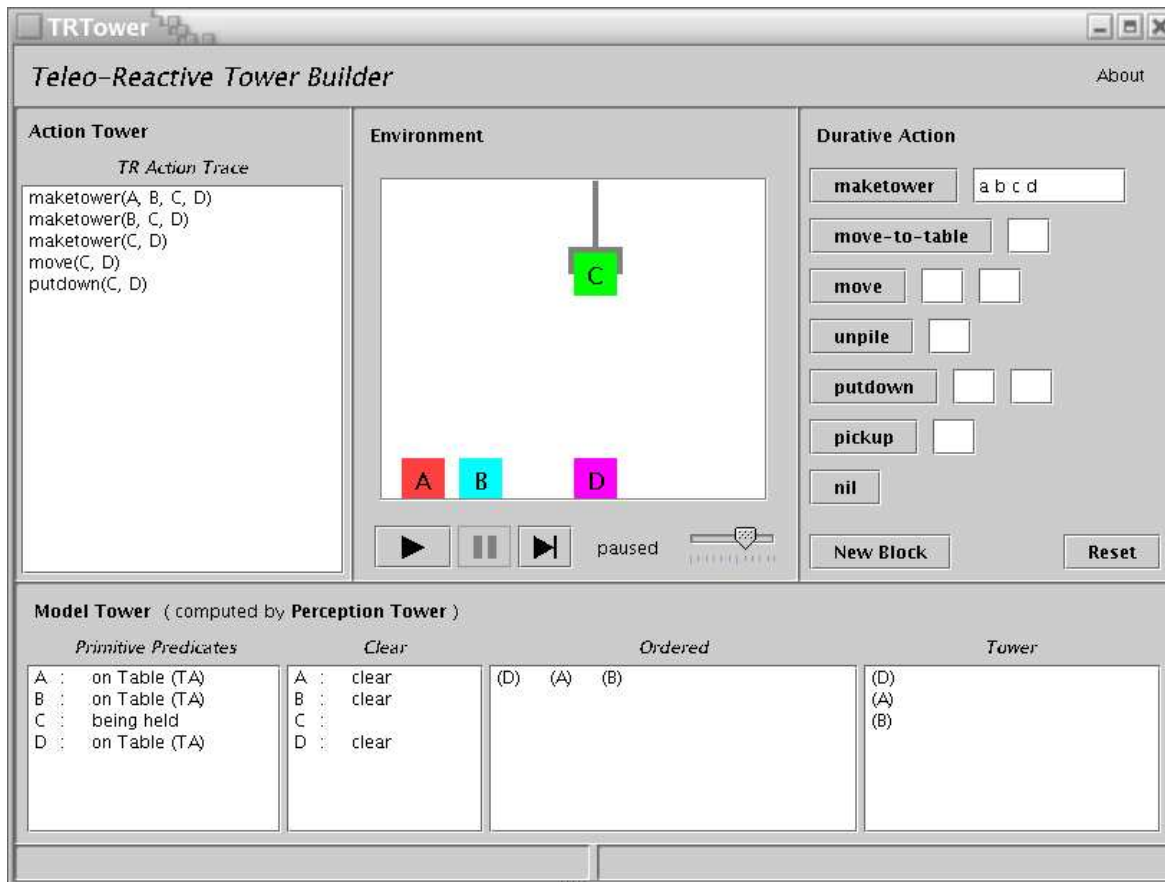
Deliberative approaches are also known as **symbolic** or **mentalist**

Reactive / Subsumption Architecture

- The Subsumption Architecture (Brooks, 1985) decomposes a task into layers, each subsuming lower levels
- e.g. wandering < collision avoidance < seek rubbish
- “... the world is its own best model ...” (Brooks)
- Also known as behaviour-based, reactive, or interactionist



Teleo-Reactive Programs








Nils Nilsson proposed the Teleo Reactive as an architecture for creating goal oriented reactive programs

See <http://www.robotics.stanford.edu/users/nilsson/trweb/tr.html>

Other Agent Architectures

- Learning / adaptive agents — machine learning approaches can be applied to develop the agents decision policy
- Decision theoretic agents — for some environments it is possible to apply decision theory to find the optimal policy
- Hybrid architectures such as JACK combine reactive and BDI components

Agent-based Manufacturing

-  Each machine or valve or conveyor gate has its own agent
-  Agent senses local situation and may interact with other nearby agents
-  Agent acts by sending messages or by controlling its associated machine
-  Intelligent behaviour derives from the interaction of many agents and their associated machinery
-  Distribution assists with the robustness of the overall solution

Summary

Intelligent Agents are about simplifying complex decision tasks by distributing them over a number of independent entities