

Agents and Definitions of Artificial Intelligence

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Definitions of AI

Behave Like a Person

- A computer passes the *Turing test* if a person, though written conversation (think instant messaging), cannot tell whether the responses come from a person or not.
- Passing this test requires natural language processing, knowledge representation, automated reasoning, and machine learning.

Think Like a Person

- *Cognitive science* uses computer models from AI and experimental techniques from psychology and biology to construct theories of how the human mind works.
- One problem with this and the previous definition is we can make progress on problems without having a complete robot.
- Another problem is the computer making mistakes like people do.

Think Correctly

- *Logic* and *probability* provide precise notations for knowledge representation and rules for reasoning.
- However, it is very difficult to represent informal knowledge formally, and to reason about it efficiently.

Behave Correctly

- An *agent* inputs percepts from and performs actions on its environment.
- A *rational agent* should do whatever action is expected to maximize its performance measure, on the basis of the evidence provided by the percept sequence and whatever built-in knowledge the agent has.

Agents

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Illustration

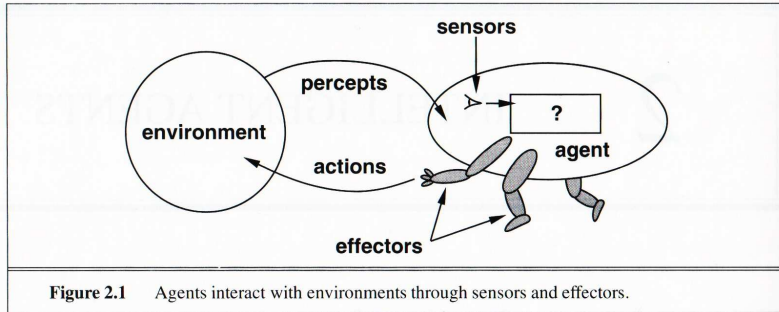
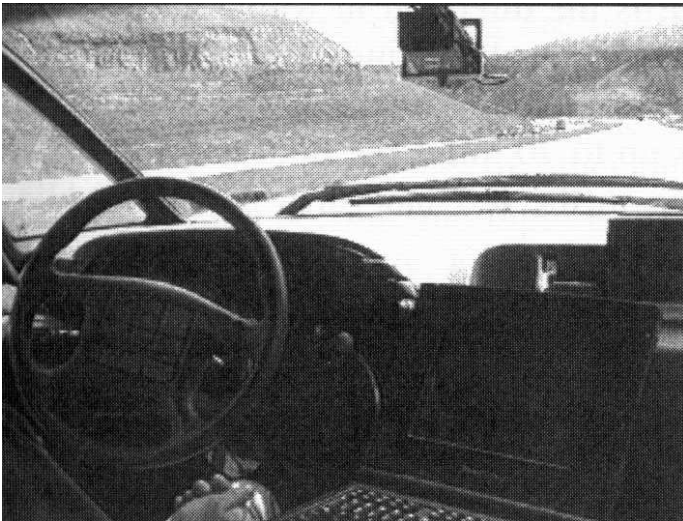


Figure 2.1 Agents interact with environments through sensors and effectors.

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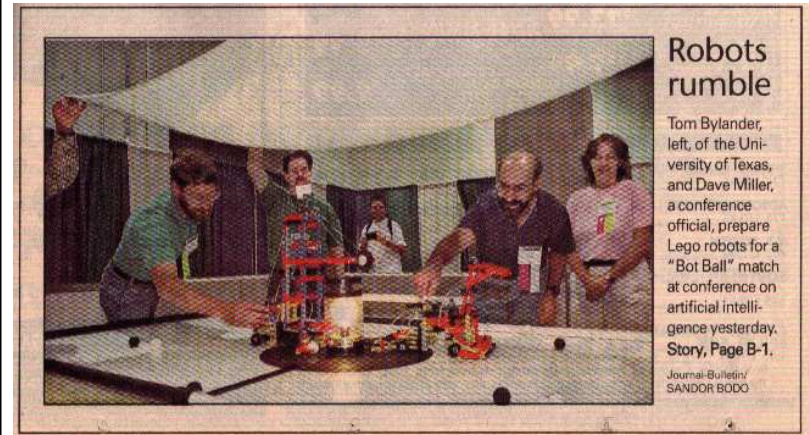
Example 1



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Example 2



Robots rumble

Tom Bylander, left, of the University of Texas, and Dave Miller, a conference official, prepare Lego robots for a "Bot Ball" match at conference on artificial intelligence yesterday.

Journal-Bulletin/
SANDOR BODO

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Agent Behavior

function AGENT(*initial-knowledge*)

variable: *brain*,

the agent's memory and knowledge

brain ← *initial-knowledge*

loop (until a final state)

percept ← perceive environment

brain ← UPDATE-BRAIN(*brain*,*percept*)

action ← CHOOSE-ACTION(*brain*)

perform *action* on environment

brain ← UPDATE-BRAIN(*brain*,*action*)

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Environments

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The Task Environment

The task environment is the problem for which a rational agent is supposed to be a solution. A description of an environment should include:

- Performance Measure: What do we want an agent to accomplish?
- Elements: What does the environment consist of?
- Actuators: What actions are available to the agent?
- Sensors: What information is available to the agent?

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Types of Environments, Part 1

- Fully Observable: The agent knows the current state of the environment and the previous actions of any other agents.

compared to

- Partially Observable: The agent has some uncertainty about the current state and/or previous actions of other agents.

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Types of Environments, Part 2

- Deterministic: The next state of the environment is completely determined by the current state and the action(s) of the agent(s).

compared to

- Stochastic: The next state of the environment is probabilistically determined. In cases of partially observable or complex environments, it is often useful to treat it as stochastic.

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Types of Environments, Part 3

- Episodic vs. sequential: Does the agent perform a sequence of actions for each problem (sequential) or just one?
- Static vs. dynamic: Can the environment change while the agent is thinking (dynamic)?
- Discrete vs. continuous: Are the variables of the environment continuous or discrete?
- Single agent vs. multiagent: Does the agent need to consider other agents in the environment (multiagent)?
- Known vs. unknown: Is the description of the environment given to the agent (known) or does the agent have to learn it (unknown)?

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