

Artificial Intelligence

Search Agents

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- What can an agent actually do?
- It is acting according to some process in order to achieve some underlying goal it is working toward via the following:
- **Gather perceptions**
- **Update the working memory to take account of them**
- **On the basis of that memory choose an action**
- **Update the working memory to take this action into account**
- **Perform the chosen action**

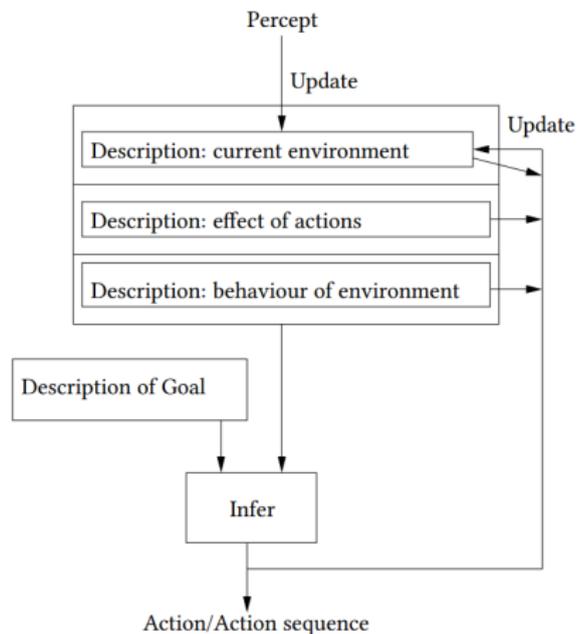
- So what are some things that are wrong with this simplified agent model? We are sweeping a lot of the underlying complexity under the rug with our prior description.
- **A precept might arrive while an action is being chosen.**
- **The world state may change while an action is being chosen.**
- **An action might affect the world in some way that wasn't expected.**
- **We might have multiple goals, and these might be interdependent or interact with each other.**

Agents

What does an agent need to maintain at minimum?

- **Some description of the current state of the environment.**
- **Knowledge of how the environment changes independently of the agent**
- **Knowledge of how the agents actions affect its environment**

Agent Diagram



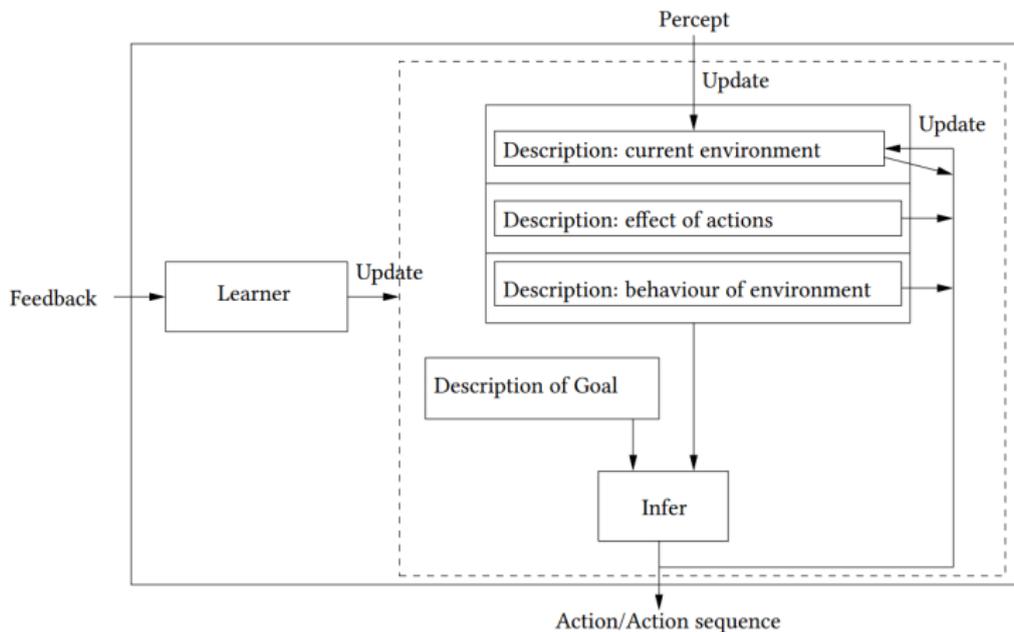
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Agents

What an agent does is dependent on a goal

- **An agent we can assume should be ideally choosing some rational course of action depending on some goal.**
- **If an agent has some knowledge of how its actions affect the environment state, then it has some basis for choosing actions to achieve outcome states (goals).**
- **To actually come up with this sequence of actions we need to be able to do two things, SEARCH and PLAN.**

Agent Model Preview



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- We can start with a brief description that encompasses all search, and then get into specific instances of uninformed search.
- **We can phrase search generally as a technique through which an agent existing in some environ can search for a sequence of actions that achieves some goal.**
- **What do we need to achieve this?**

Search Definition

- **Initial State:** s_0 from some set S of all possible states.
- **A set of Actions:** we denote this with A
- These actions are modelled by specifying what state will result from performing any available action in any given state.
- What does this mean? We can model this by saying there exists some function "Act: $A, S \rightarrow S$ " if the agent is in some state s and performs some action a then the new state is $\text{action}(a, s)$.
- **Goal Test:** We need to be able to tell whether or not the state we are in corresponds to some goal. We can model this by saying there exists some function "GoalCheck: $S \rightarrow \text{Bool}$ ". If the agent is in some state s perform a check and return a Boolean as to whether it is the goal state or not.

- For search to actually be useful we also need some notion of a path cost also. Generically we can say that there exists some function "PathCost: $A, S \rightarrow \mathbb{R}$ " We are saying by this that the cost of performing an action a in some state s is some float.
- So for an agent starting in state s_0 and taking some sequence of actions $a_0, a_1, a_2, \dots, a_n$ the path cost is a sum of running PathCost on each action/state pair in the sequence.