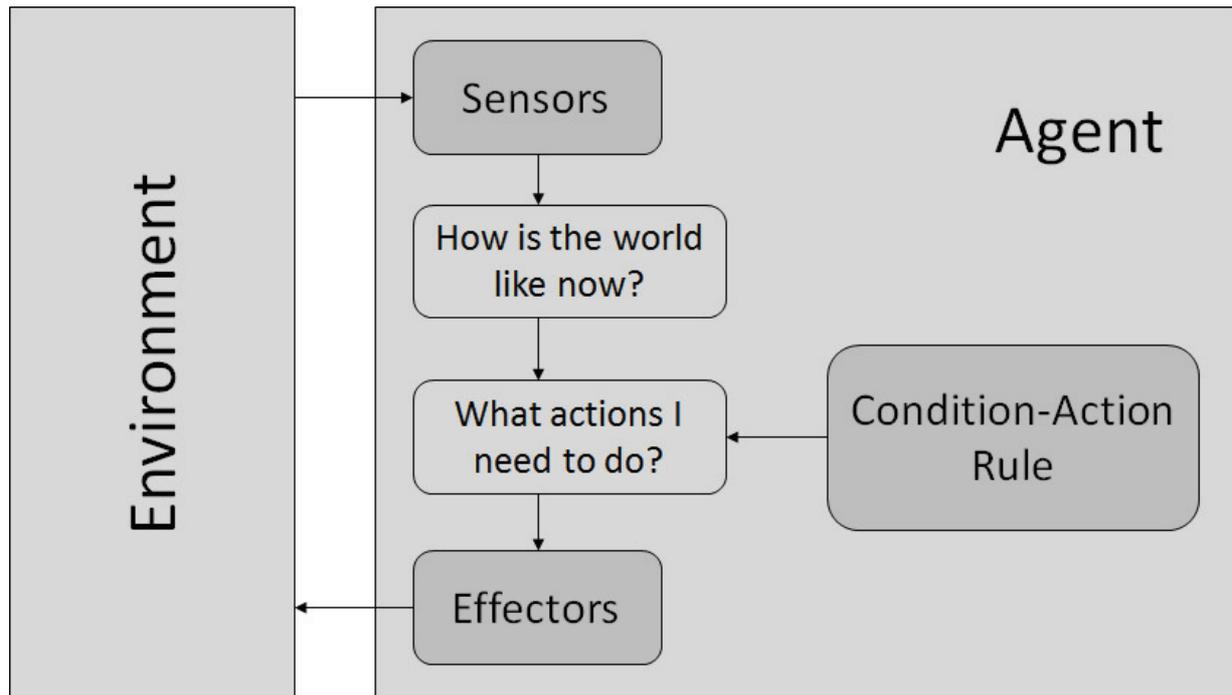


- They choose actions only based on the current percept.
- They are rational only if a correct decision is made only on the basis of current percept.
- Their environment is completely observable.

**Condition-Action Rule** – It is a rule that maps a state (condition) to an action.



### Model-Based Reflex Agents

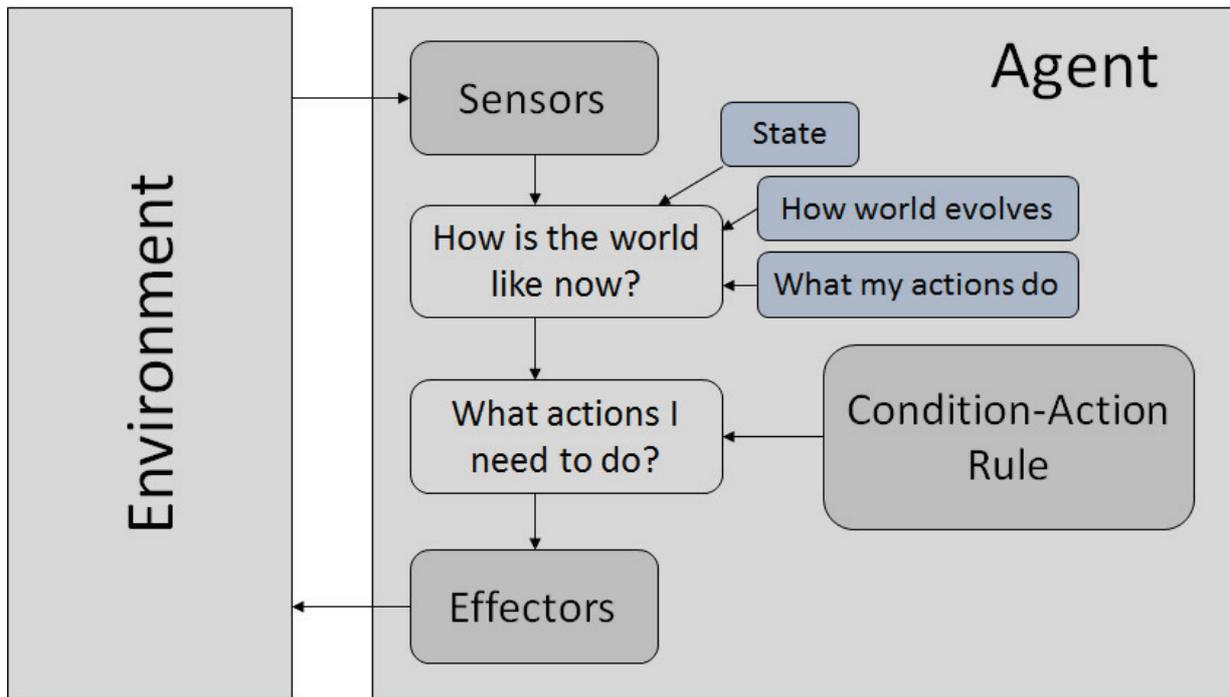
They use a model of the world to choose their actions. They maintain an internal state.

**Model:** knowledge about “how the things happen in the world”.

**Internal State:** It is a representation of unobserved aspects of current state depending on percept history.

### Updating state requires the information about

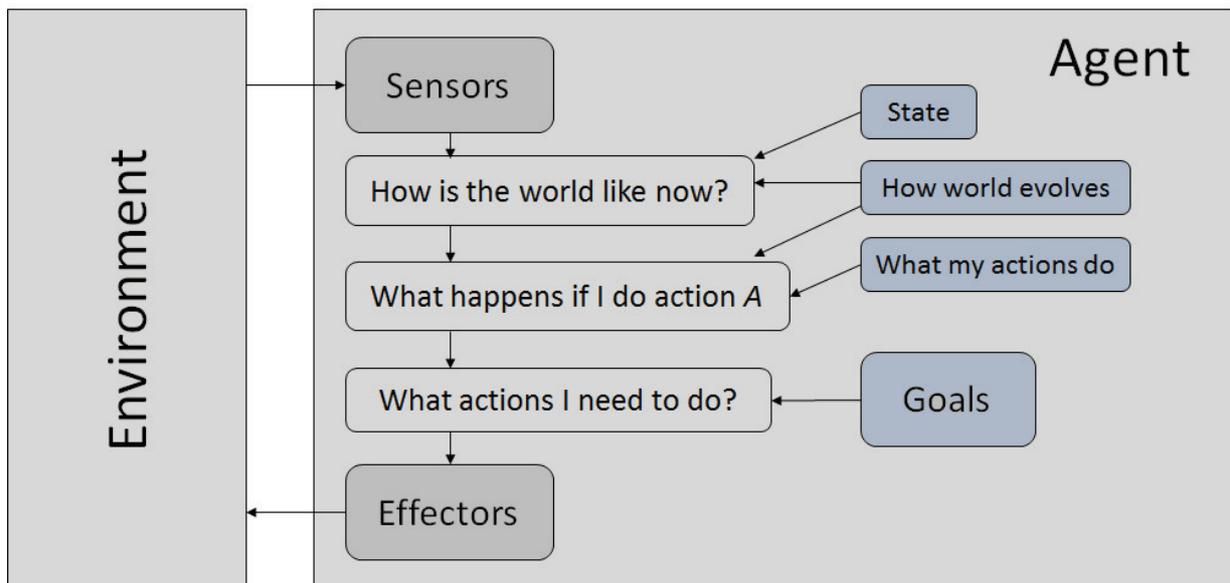
- How the world evolves.
- How the agent’s actions affect the world.



### Goal-Based Agents

They choose their actions in order to achieve goals. Goal-based approach is more flexible than reflex agent since the knowledge supporting a decision is explicitly modeled, thereby allowing for modifications.

- **Goal:** It is the description of desirable situations.

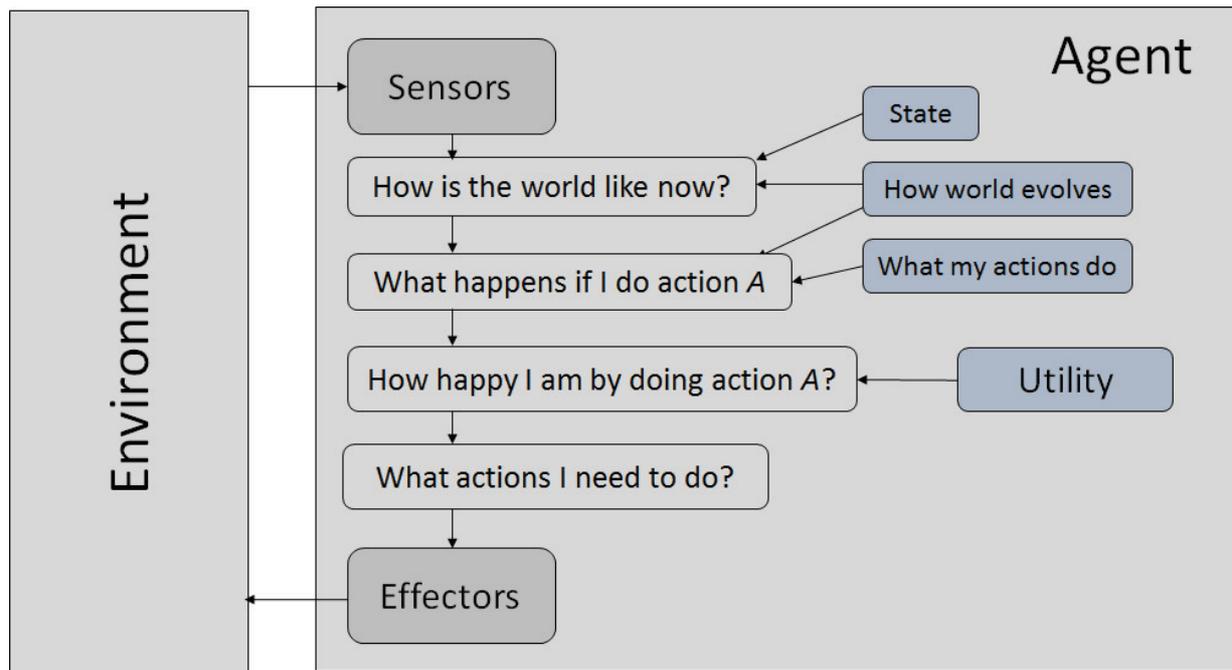


### Utility-Based Agents

They choose actions based on a preference (utility) for each state.

Goals are inadequate when:

- There are conflicting goals only some of which can be achieved.
- Goals have some uncertainty of being achieved and one needs to weigh likelihood of success against the importance of a goal.



## The Nature of Environments

Some programs operate in the entirely **artificial environment** confined to keyboard input, database, computer file systems and character output on a screen.

In contrast, some software agents (software robots or softbots) exist in rich, unlimited softbots domains. The simulator has a **very detailed, complex environment**. The software agent needs to choose from a long array of actions in real time. A softbot designed to scan the online preferences of the customer and show interesting items to the customer works in the **real** as well as an **artificial** environment.

The most famous **artificial environment** is the **Turing Test environment**, in which one real and other artificial agents are tested on equal ground. This is a very challenging environment as it is highly difficult for a software agent to perform as well as a human.

## Turing Test

The success of an intelligent behavior of a system can be measured with Turing Test.

Two persons and a machine to be evaluated participate in the test. Out of the two persons, one plays the role of the tester. Each of them sits in different rooms. The tester is unaware of who is machine and who is a human. He interrogates the questions by typing and sending them to both intelligences, to which he receives typed responses.

This test aims at fooling the tester. If the tester fails to determine machine's response from the human response, then the machine is said to be intelligent.

## Properties of Environment

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The environment has multifold properties:

- **Discrete / Continuous:** If there are a limited number of distinct, clearly defined, states of the environment, the environment is discrete (For example, chess); otherwise it is continuous (For example, driving).
- **Observable / Partially Observable:** If it is possible to determine the complete state of the environment at each time point from the percepts it is observable; otherwise it is only partially observable.
- **Static / Dynamic:** If the environment does not change while an agent is acting, then it is static; otherwise it is dynamic.
- **Single agent / Multiple agents:** The environment may contain other agents which may be of the same or different kind as that of the agent.
- **Accessible vs. inaccessible:** If the agent's sensory apparatus can have access to the complete state of the environment, then the environment is accessible to that agent.
- **Deterministic vs. Non-deterministic:** If the next state of the environment is completely determined by the current state and the actions of the agent, then the environment is deterministic; otherwise it is non-deterministic.
- **Episodic vs. Non-episodic:** In an episodic environment, each episode consists of the agent perceiving and then acting. The quality of its action depends just on the episode itself. Subsequent episodes do not depend on the actions in the previous episodes. Episodic environments are much simpler because the agent does not need to think ahead.