Knowledge-Based Agent in AI(Artificial Intelligence)

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Knowledge-Based Agent

- An intelligent agent needs knowledge about the real world for taking decisions and reasoning to act efficiently.
- Knowledge-based agents are those agents who have the capability of maintaining
  - ✓ an internal state of knowledge,
  - ✓ reason over that knowledge,
  - ✓ update their knowledge after observations
  - ✓ and take actions.
- These agents can represent the world with some formal representation and act intelligently.

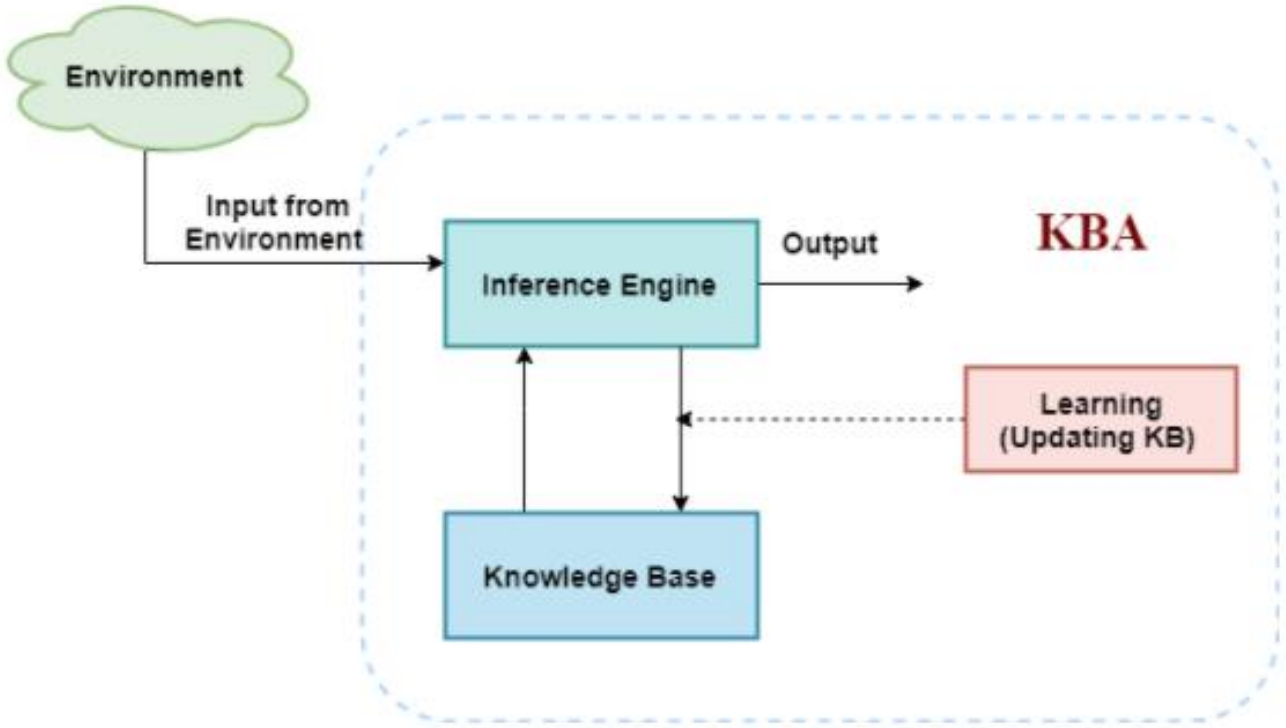
Knowledge-Based Agent

- Knowledge-based agents are composed of two main parts:
  - ✓ Knowledge-base and
  - ✓ Inference system.

A knowledge-based agent must able to do the following:

- An agent should be able to represent states, actions, etc.
- An agent Should be able to incorporate new percepts
- An agent can update the internal representation of the world
- An agent can deduce the internal representation of the world
- An agent can deduce appropriate actions.

The architecture of knowledge-based agent



Knowledge Base

- Knowledge-base is a central component of a knowledge-based agent, it is also known as KB.
- It is a collection of sentences (here 'sentence' is a technical term and it is not identical to sentence in English).
- These sentences are expressed in a language which is called a knowledge representation language.
- The Knowledge-base of KBA stores fact about the world.
- Knowledge-base is required for updating knowledge for an agent to learn with experiences and take action as per the knowledge.

Inference system

- Inference means deriving new sentences from old.
- Inference system allows us to add a new sentence to the knowledge base.
- A sentence is a proposition about the world. Inference system applies logical rules to the KB to deduce new information.
- Inference system generates new facts so that an agent can update the KB. An inference system works mainly in two rules which are given as:
  - ✓ Forward chaining
  - ✓ Backward chaining

Operations Performed by KBA

- Following are three operations which are performed by KBA in order to show the intelligent behavior:
- ✓TELL: This operation tells the knowledge base what it perceives from the environment.
- ✓ASK: This operation asks the knowledge base what action it should perform.
- ✓Perform: It performs the selected action.

Various levels of knowledge-based agent

Knowledge level::

- Knowledge level is the first level of knowledge-based agent, and in this level, we need to specify what the agent knows, and what the agent goals are.
- With these specifications, we can fix its behavior.
- For example, suppose an automated taxi agent needs to go from a station A to station B, and he knows the way from A to B, so this comes at the knowledge level.

Various levels of knowledge-based agent

Logical level::

- At this level, we understand that how the knowledge representation of knowledge is stored.
- At this level, sentences are encoded into different logics.
- At the logical level, an encoding of knowledge into logical sentences occurs.
- At the logical level we can expect to the automated taxi agent to reach to the destination B.

Various levels of knowledge-based agent

Implementation level::

- This is the physical representation of logic and knowledge.
- At the implementation level agent perform actions as per logical and knowledge level.
- At this level, an automated taxi agent actually implement his knowledge and logic so that he can reach to the destination.

Approaches to designing a knowledge-based agent

- **1. Declarative approach:** We can create a knowledge-based agent by initializing with an empty knowledge base and telling the agent all the sentences with which we want to start with. This approach is called Declarative approach.
- **2. Procedural approach:** In the procedural approach, we directly encode desired behavior as a program code. Which means we just need to write a program that already encodes the desired behavior or agent.

Thank You