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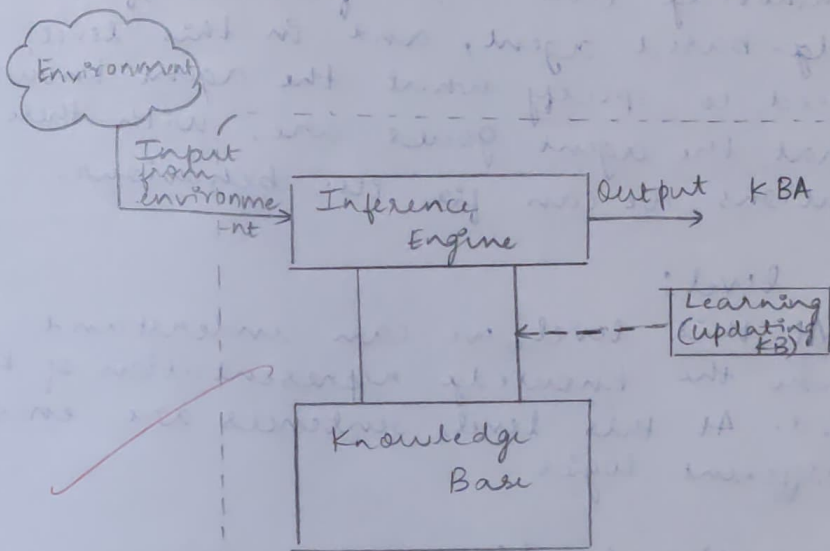
KNOWLEDGE BASED AGENT:

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 are composed of two main parts:

- Knowledge base and
- Inference system

The architecture of knowledge-based agent:



The knowledge based agent take input from the environment by perceiving the environment. The input is taken by the inference engine of the agent and which also communicate with KB to decide as per the knowledge store in KB.

Knowledge Base: It is a central component of a knowledge based agent, it is also known as KB.

These sentences are expressed in a language which is called a knowledge representation language.

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.

A generic knowledge-based agent:

function KB-AGENT(percept):

persistent: KB, a knowledge base

t, a counter, initially 0, indicating time

TELL (KB, MAKE-PERCEPT-SENTENCE(percept, t))

ACTION = ASK (KB, MAKE-ACTION-QUERY(t))

TELL (KB, MAKE-ACTION-SENTENCE(action, t))

t = t + 1

return action

Various levels of knowledge-based agent:

1. 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 behaviour.

2. Logical level:

At this level, we can understand that how the knowledge representation of knowledge is stored. At this level, sentences are encoded into different logics.

3. Implementation level:

This is the physical representation of logic and knowledge. At the implementation level agent perform actions as per logical and knowledge level.

Approaches to designing a knowledge-based agent:

There are mainly 2 approaches:

1. Declarative approach

2. Procedural approach.

WUMPUS WORLD:

The Wumpus world is a simple world example to illustrate the worth of a knowledge-based agent and to represent knowledge representation.

The Wumpus world is a cave which has 4/4 rooms connected with passageways. So there are 16 rooms which are connected with each other. We have a knowledge-based agent who will go forward in this world. The cave has a room with a beast which is called Wumpus, who eats anyone who enters the room. The Wumpus can be shot by the agent, but the agent has a single arrow. In the Wumpus world, there are some pits rooms which are bottomless, and if agent falls in pits, then he will be stuck there forever. The exciting thing with this cave is that in one room there is a possibility of finding a heap of gold. So the agent goal is to find the gold and climb out the cave without fallen into pits or eaten by Wumpus. The agent will get a reward if he comes out with gold, and he will get a penalty if eaten by Wumpus or falls in the pit.

There are some components which can help the agent to navigate the cave:

- The rooms adjacent to the Wumpus room are stinky, so that it would have some stench.
- The room adjacent to PITS has a breeze, so if the agent reaches near to PIT, then he will perceive the breeze.
- There will be glitter in the room if and only if the room has gold.
- The Wumpus can be killed by the agent if the agent is facing to it, and Wumpus will emit a horrible scream which can be heard anywhere in the cave.

Performance measure:

- +1000 reward points if the agent comes out of the cave with gold
- -1000 points penalty for being eaten by the wumpus or falling into the pit
- -1 for each action, and -10 for using an arrow
- The game ends if either agent dies or came out of the cave

Environment:

- A 4x4 grid of rooms
- The agent initially in room [1,1] facing toward the right
- Location of wumpus and gold are chosen

Actuators:

- Left turn
- Right turn
- Move forward
- Grab
- Release
- Shoot

Sensors:

- Rooms adjacent to wumpus have stench
- There will be a breeze percent if the agent is adjacent to the pit
- Room with glitter has gold in it
- Wumpus will scream when it is killed
- Agent will feel bump if it hit a wall

Done
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