# Assignement -07

**Dhanush V Nayak**
ee23btech11015@iith.ac.in

## 1 The Structure of Agents

### 1.1 Agent programs

In general, all agents follow a simple structure of action: they receive data by sensors about the environment and thus respond with the help of actuators. Depending on the plan of action, an agent might store its percepts in memory. It formulates all it's past actions in a table and looks up at actions from this table. One problem with this mode of action is that storing such large actions is tough. There are mainly four types of agents Simple reflex-based agents , Model-based reflex agents, Goal-based agents and Utility-based agents.

### 1.2 Simple reflex agents

The simplest kind of agent. These agents make decisions based on current percept without worrying about past actions. These agents have a comparatively simple program structure. These agents have simple reflex behavior which works in complex situations also. But there is a problem sometimes these reflex agents may end up in an infinite for loop. A possible solution is to introduce randomization in its actions.

### 1.3 Model-based reflex agents

An agent keeps track of things it can't see by internal state. For example, in driving car example the agent might where the other cars are while changing lane. It takes the help of a transition model that explains how things work and a sensor model which explains how the world is reflected.Even after all this all it does is to make a best guess as uncertainty is often unavoidable.

### 1.4 Goal-based agents

Knowing the current state isn't always helpful in making the right decision. We need to specify a goal to the agent to achieve best outcome. Sometimes this is simple, but in other cases, like navigating a series of turns, the agent needs to consider a sequence of actions. The Goal-based agents may seem slower but they are flexible. Goal-based taxi agent can go to different destinations just by changing the goal.

### 1.5 Utility-based agents

Goals alone are not enough to ensure high-quality decisions in complex environments. Here comes the use of Utility. Unlike goals , the utility allows the agent to compare different possibilities and take the path with more success probability.The agent's utility function aligns with an external performance measure, ensuring that the agent behaves rationally.

### 1.6 Learning agents

Agents can learn by themselves and improve over time. It has four elements learning element, performance element, critic, and problem generator. The performance element takes action on the

agent's knowledge. The learning element uses feedback and evaluates the agent's action by a set standard. The problem generator helps the agent to explore new actions, which leads to a better plan of action in the long run. By continuously learning from experience and adjusting the plan of action an agent's action becomes optimum over time.

### 1.7 How the components of agent programs work

AI uses different ways to represent the world. In an atomic representation, each state of the world is represented as black box. A factored representation splits the given state into multiple variables with each representing a specific value.The most complex form is the structured representation, where the agent understands objects and their relationships. These representations are a measure of expressiveness. But in general, there is a trade-off between complicated systems and knowledgeable systems.

Ending with a quote:- **"We can only see a short distance ahead, but we can see plenty there that needs to be done," - Alan Turing**