

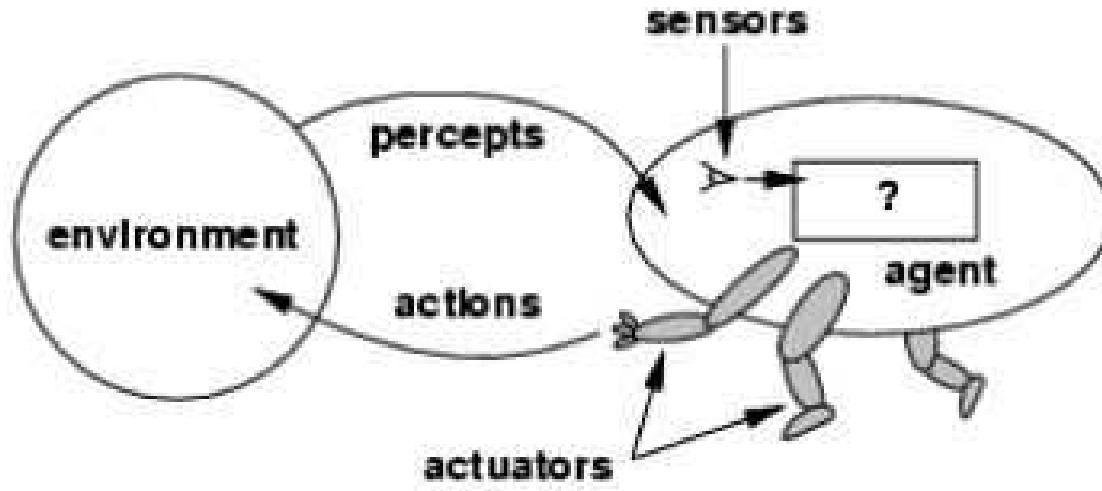


## Chapter 2

### AGENTS

# Agent

- › An AI system is composed of an agent and its environment. The agents act in their environment. The environment may contain other agents
- › An agent is anything that can be viewed as:
  - › perceiving its environment through sensors and
  - › acting upon that environment through actuators



A **human agent** has sensory organs such as eyes, ears, nose, tongue and skin parallel to the sensors, and other organs such as hands, legs, mouth, for effectors.

A **robotic agent** replaces cameras and infrared range finders for the sensors, and various motors and actuators for effectors.

A **software agent** has encoded bit strings as its programs and actions.

# Agent Terminologies

**Performance Measure:** determines how successful the agent is.

**Behavior:** activities the agent performs to achieve the goal

**Percepts:** formation of concepts based on the inputs.

**Percept Sequence:** set of all the perceptions till date

**Agent Function:** mapping of perception

# Agent's structure

Agent = Architecture + Agent Program

- ✓ Architecture = the machinery that an agent executes on.
- ✓ Agent Program = an implementation of an agent function

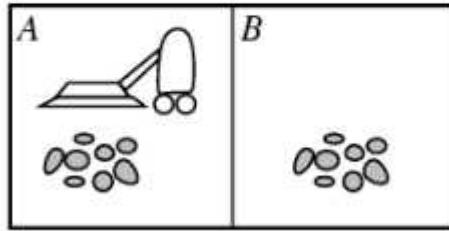
# Agent Function

The agent function maps from percept sequences to actions:

$$[f: \mathcal{P}^* \rightarrow \mathcal{A}]$$

The agent program runs on the physical architecture to produce f

## Vacuum-cleaner world



- **Percepts:**  
location and state of the environment, e.g., [A,Dirty], [B,Clean]
- **Actions:**  
Left, Right, Suck, No Op

# **Agent classification**

- Collaborative Agents
- Interface Agents
- Mobile Agents
- Reactive agents

**Assignment 1:**

**Explain Collaborative Agents , Interface Agents, Mobile Agents and Reactive agents**

# Properties of Agent

- Autonomous
- Interacts with other agents plus the environment
- Reactive to the environment
- Pro-active (goal- directed)

# Environment types

- **Fully observable :**  
An agent's sensors give it access to the complete state of the environment at each point in time
- **Deterministic :**  
The next state of the environment is completely determined by the current state and the action executed by the agent.
- **Episodic :**  
The agent's experience is divided into atomic "episodes" (each episode consists of the agent perceiving and then performing a single action)
- **Static :**  
The environment is unchanged while an agent is deliberating.

# Intelligent agents

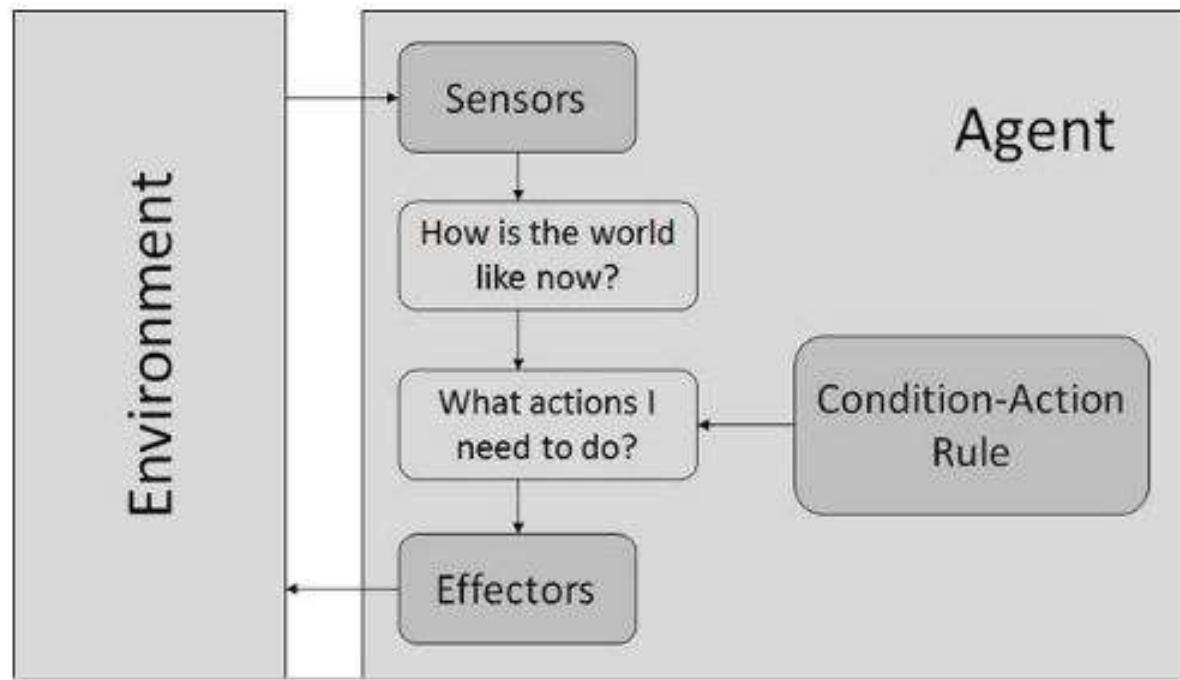
An Intelligent Agent is an **autonomous entity** which observes through sensors and acts upon an environment using actuators and directs its activities towards achieving the goal.

Hence, an agent gets percepts one at a time, and maps this percept sequence to actions.

# **Types of Agent**

## - Simple Reflex Agent

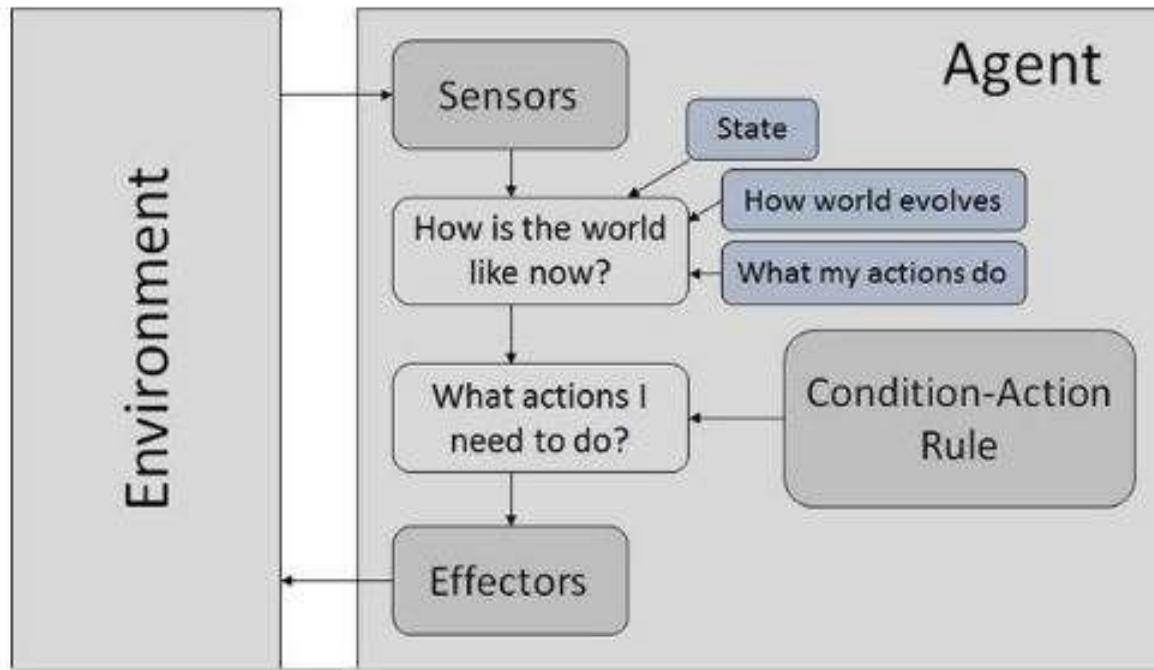
- They choose actions only based on the current percept or situation.
- This is useful when a quick automated system is required. Human have very similar reaction to fire.



(Condition- Action Rule/IF-THEN Rule .... IF hands on fire, THEN pull away)

- **Model Based Agents (Reflex Agent with Internal State)**

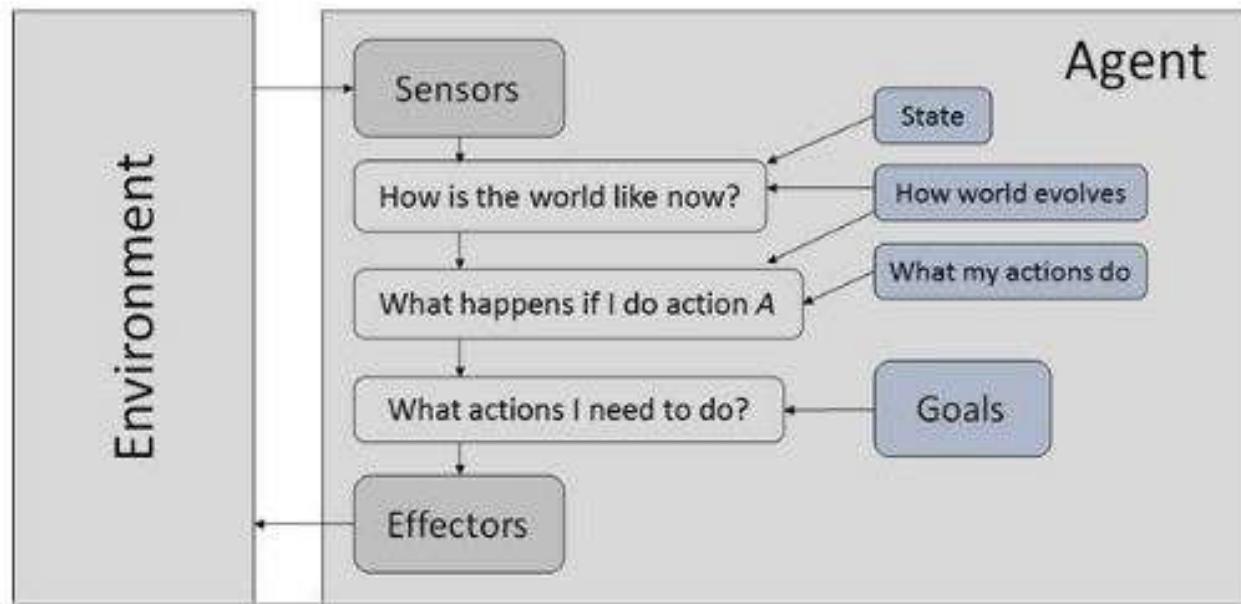
- They choose action only based on their model and maintain their internal state where model means the information about perception function and Internal States are



the representation of unobserved aspects of current state depending on percept history.

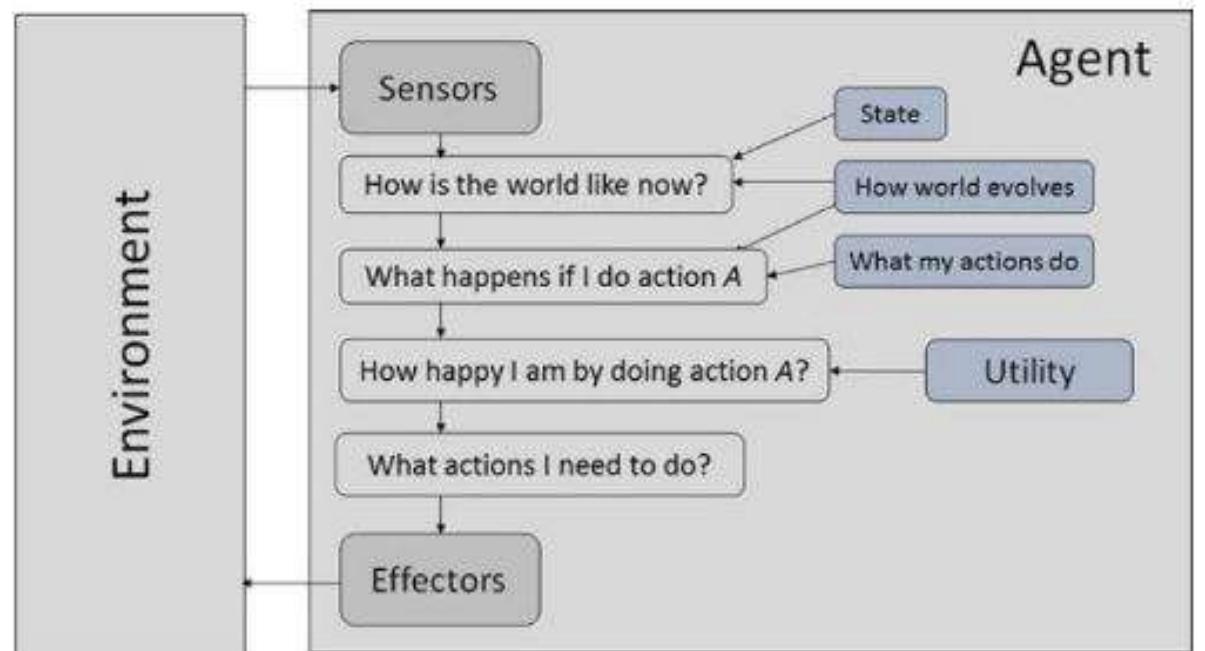
## - Goal Based Agents

- They choose their actions in order to achieve goals. Goal-based approach is more flexible than reflex agent since the knowledge/information is modeled in such a way that they are easy for modifications.



## - Utility Based Agents

- They choose actions based on a utility for each state.
- Utility function maps each state after each action to achieve the goal. This is useful when we either have



many actions for same goal or we have many goals for same actions.

# PEAS

- To design a rational agent we must specify its task environment.
- Standing for performance, environment, actuators and sensors, PEAS define task environments about formulating the performance of intelligent agents.

# **Q. Point out the task of designing an automated taxi driver according to PEAS description.**

- Performance measure: Safe, fast, legal, comfortable trip, maximize profits
- Environment: Roads, other traffic, pedestrians, customers
- Actuators: Steering wheel, accelerator, brake, signal, horn
- Sensors: Cameras, sonar, speedometer, GPS, odometer, engine sensors and keyboard



**Q. Point out the task of designing a Medical diagnosis system according to PEAS description.**

- Performance measure: Healthy patient, minimize costs, lawsuits
- Environment: Patient, hospital, staff
- Actuators: Screen display (questions, tests, diagnoses, treatments, referrals)
- Sensors: Keyboard (entry of symptoms, findings, patient's answers)