Unit 2

Intelligent Agents

Intelligent Agent Paradigm

Objectives:

- Agent

- Intelligent Agent

- Rational Agent

- Different types of environment

- Explain classes of intelligent agents

- Applications of Intelligent agent

Agents:

- An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators/effectors.

- A human agent has eyes, ears and others for sensors Similarly hands, legs, mouth and other body parts for effectors.

- A robotic agent substitutes cameras and infrared range finders for the sensors and various motors for the effectors.

Agent and Environment
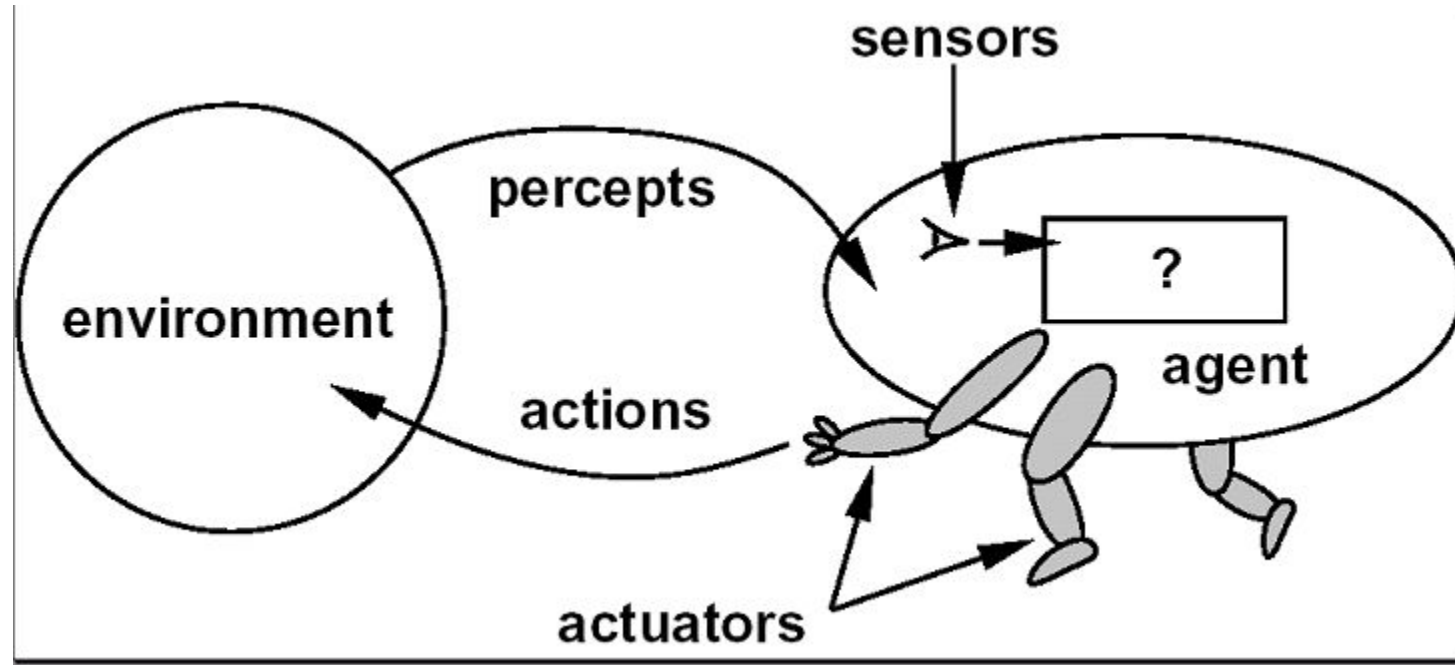
Agents

- Operates in an environment

- Perceives its environment through sensors.

- Acts upon its environment through actuators/effectors

- Have goals.

Sensors and Effectors

- An agent perceives its environment through sensors.

- The complete set of inputs at a given time is called percept.

- The current percept or a sequence of percepts can influence the actions of an agent

Sensors and Effectors

- It can change the environment through effectors

- An operation involving an actuator is called an action.

- Actions can be grouped into action sequences.

- So an agent program implements mapping from percept sequence into actions.

Agents

- Autonomous Agent: Decide autonomously which action to take in the current situation to maximize progress towards its goals.

- Performance measure: An objective criterion for success of an agent's behaviour.

- Eg. Performance measure of vaccum cleaner agent could be amount of dirt cleaned up, amount of time taken, amount of electricity consumed , amount of noise generated etc.

Structure of Agent

Agent Function:

- The agent function maps from percept sequences to actions:

$$F: P^* \rightarrow A$$

- Where p* is the complete set of percept sequence and A is the action

- The term percept

Intelligent Agents

- Intelligent Agent

✔ Must sense

✔ Must act

✔ Must be autonomous (to some extent)

✔ Must be rational.

Rational Agent

- AI is about building agents

- An agent is something that perceives and acts.

- A rational agent always does the right thing.

✔	What are the functionalities (goals)?

✔	What are the components ?

✔	How do we build them ?

Rationality

- Perfect Rationality:

  Assumes that the rational knows all and will take action that maximizes utility

  Human beings do not satisfy the definition of rationality.

Environments

•To design a rational agent we must specify its task environment. Task environment means:

•PEAS description of the environment:

– Performance

– Environment

– Actuators

– Sensors

Properties of Environment/Types of Environment

Fully observable: can access complete state of environment at each point in time	vs	Partially observable: could be due to noisy, inaccurate or incomplete sensor data
Deterministic: if next state of the environment completely determined by current state and agent's action	vs	Stochastic: a partially observable environment can appear to be stochastic. (Strategic: environment is deterministic except for actions of other agents)
Episodic: agent's experience divided into independent, atomic episodes in which agent perceives and performs a single action in each episode.	Vs	Sequential: current decision affects all future decisions
Static: agent doesn't need to keep sensing while decides what action to take, doesn't need to worry about time	vs	Dynamic: environment changes while agent is thinking (Semidynamic: environment doesn't change with time but agent's performance does)
Discrete: (note: discrete/continuous distinction applies to states, time, percepts, or actions)	vs	Continuous
Single agent	vs	Multiagent: agents affect each others performance measure – cooperative or competitive

AI Agents with PEAS Framework Examples

Agent	Performance Measure	Environment	Actuator	Sensor
Hospital Management System	Patient's health, Admission process, Payment	Hospital, Doctors, Patients	Prescription, Diagnosis, Scan report	Symptoms, Patient's response
Automated Car Drive	The comfortable trip, Safety, Maximum Distance	Roads, Traffic, Vehicles	Steering wheel, Accelerator, Brake, Mirror	Camera, GPS, Odometer

Advantages of PEAS in AI

1. Structured Design:

2. Versatility:

3. Goal-Oriented:

4. Systematic Development: