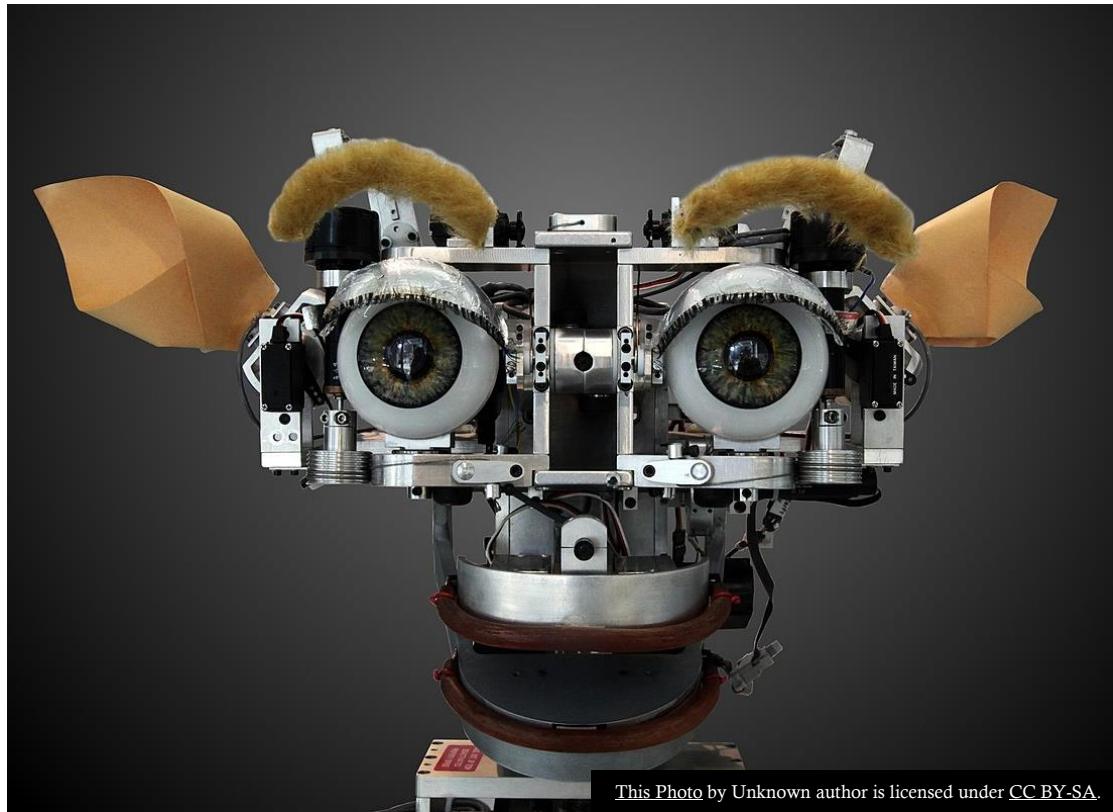

AGENT AND ENVIRONMENT



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- ▶ Unit 1 Artificial Intelligence
- ▶ VBDS 1402
- ▶ Lecture 3

IN THIS SESSION YOU WILL LEARN:

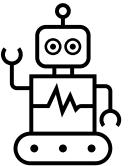
- Agent and Environment
- Agent Terminology
- Rational Approach of AI
- Task Environment
- Summary

WHAT IS AN AGENT?

An agent can be anything that perceive its environment through sensors and act upon that environment through actuators. An Agent runs in the cycle of perceiving, thinking, and acting. An agent can be:



Human-Agent: A human agent has eyes, ears, and other organs which work for sensors and hand, legs, vocal tract work for actuators.



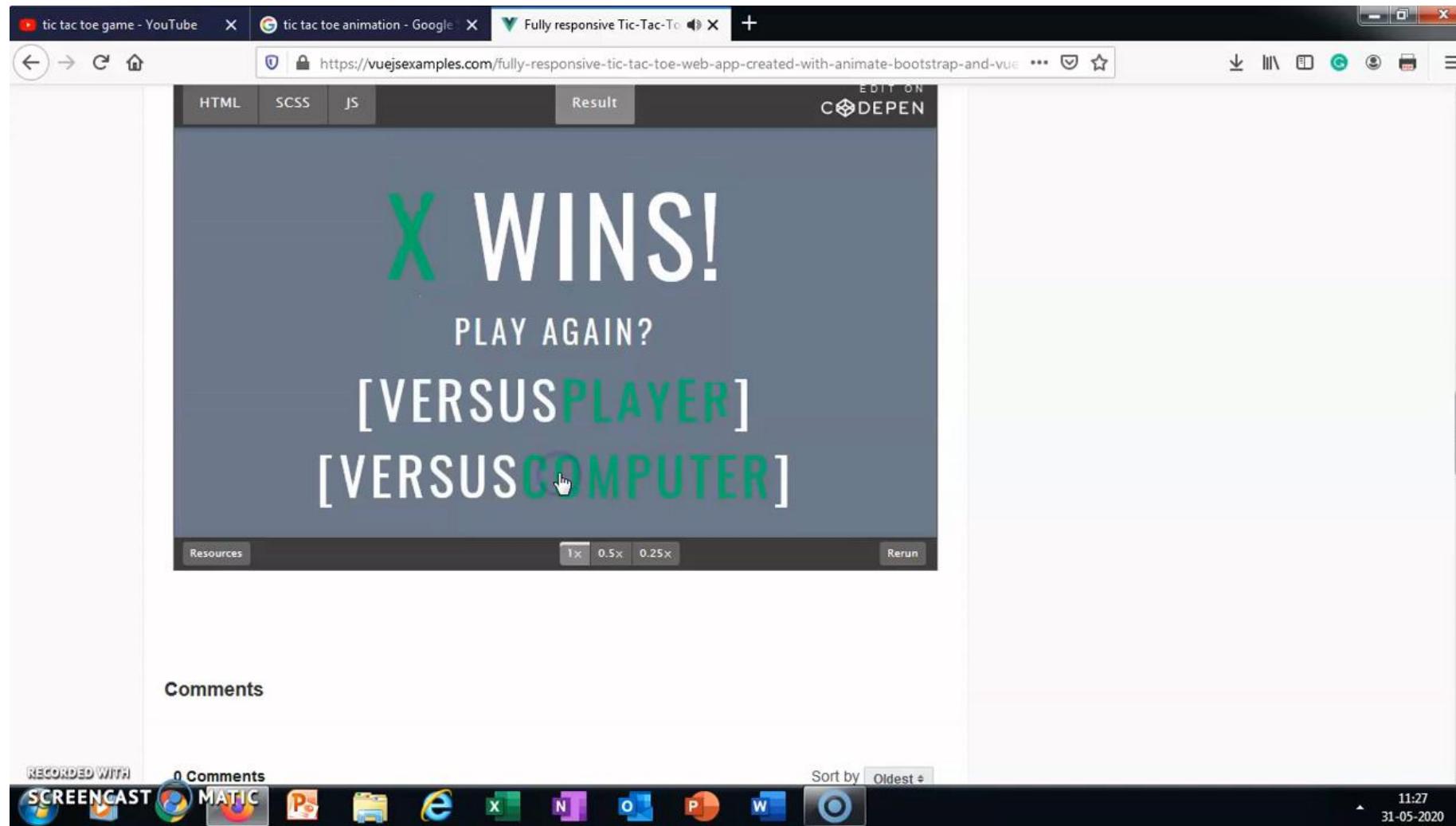
Robotic Agent: A robotic agent can have cameras, infrared range finder, NLP for sensors and various motors for actuators.



Software Agent: Software agent can have keystrokes, file contents as sensory input and act on those inputs and display output on the screen.

Hence the world around us is full of agents such as thermostat, cellphone, camera, and even we are also agents.

LET'S WATCH MOST POPULAR GAME OF OUR CHILDHOOD TIC TAC TOE



AGENT TERMINOLOGY



Performance
Measure of
Agent



Behavior of
Agent



Percept

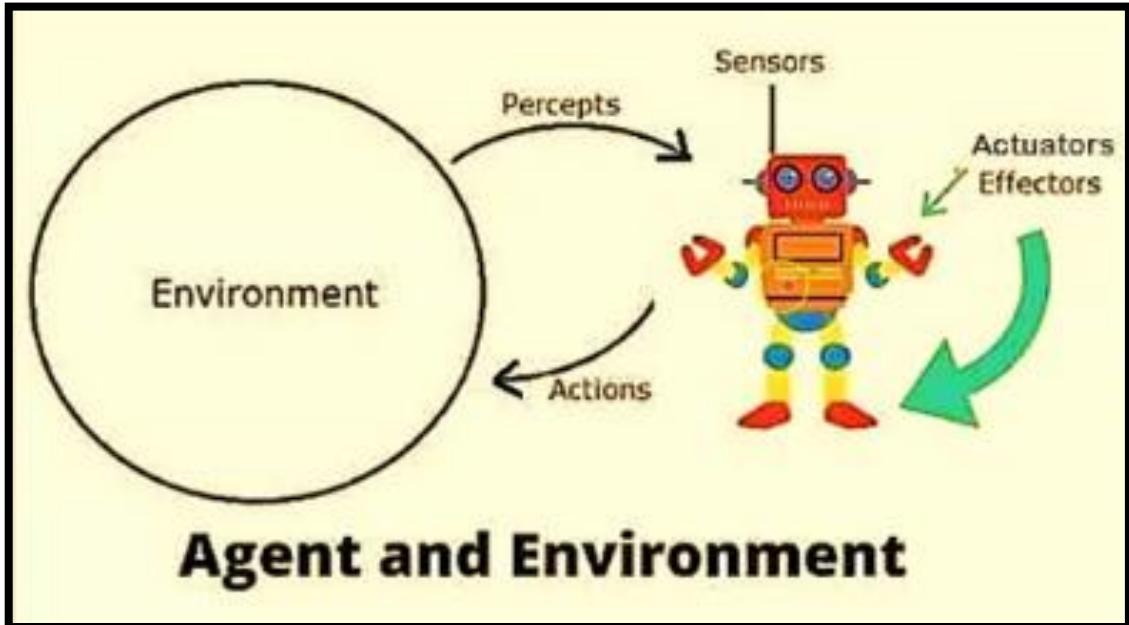


Percept Sequence



Agent Function

AGENT AND ENVIRONMENT



- An agent is anything that can be viewed as:
 - perceiving its environment through sensors and
 - acting upon that environment through actuators
- Every agent can perceive its own actions (but not always the effects)
- A software agent receives keystrokes, file contents, and network packets as sensory inputs and acts on the environment by displaying on the screen, writing files, and sending network packets.

TERMS



Sensor: Sensor is a device which detects the change in the environment and sends the information to other electronic devices. An agent observes its environment through sensors.



Actuators: Actuators are the component of machines that converts energy into motion. The actuators are only responsible for moving and controlling a system. An actuator can be an electric motor, gears, rails, etc.



Effectors: Effectors are the devices which affect the environment. Effectors can be legs, wheels, arms, fingers, wings, fins, and display screen.

INTELLIGENT AGENTS

An intelligent agent is an autonomous entity which act upon an environment using sensors and actuators for achieving goals. An intelligent agent may learn from the environment to achieve their goals. A thermostat is an example of an intelligent agent.

Following are the main four rules for an AI agent:

- **Rule 1:** An AI agent must have the ability to perceive the environment.
 - **Rule 2:** The observation must be used to make decisions.
 - **Rule 3:** Decision should result in an action.
 - **Rule 4:** The action taken by an AI agent must be a rational action.
-

RATIONAL APPROACH OF AI

- Rationality is nothing but status of being reasonable, sensible, and having good sense of judgment.
- Rationality is concerned with expected actions and results depending upon what the agent has perceived.
- Performing actions with the aim of obtaining useful information is an important part of rationality.

- Rationality of an agent depends on the following four factors –
 - The performance measures, which determine the degree of success.
 - Agent's Percept Sequence till now.
 - The agent's prior knowledge about the environment.
 - The actions that the agent can carry out.
- The problem the agent solves is characterized by Performance Measure, Environment, Actuators, and Sensors (PEAS).

RATIONAL AGENT



A rational agent is an agent which has clear preference, models uncertainty, and acts in a way to maximize its performance measure with all possible actions.

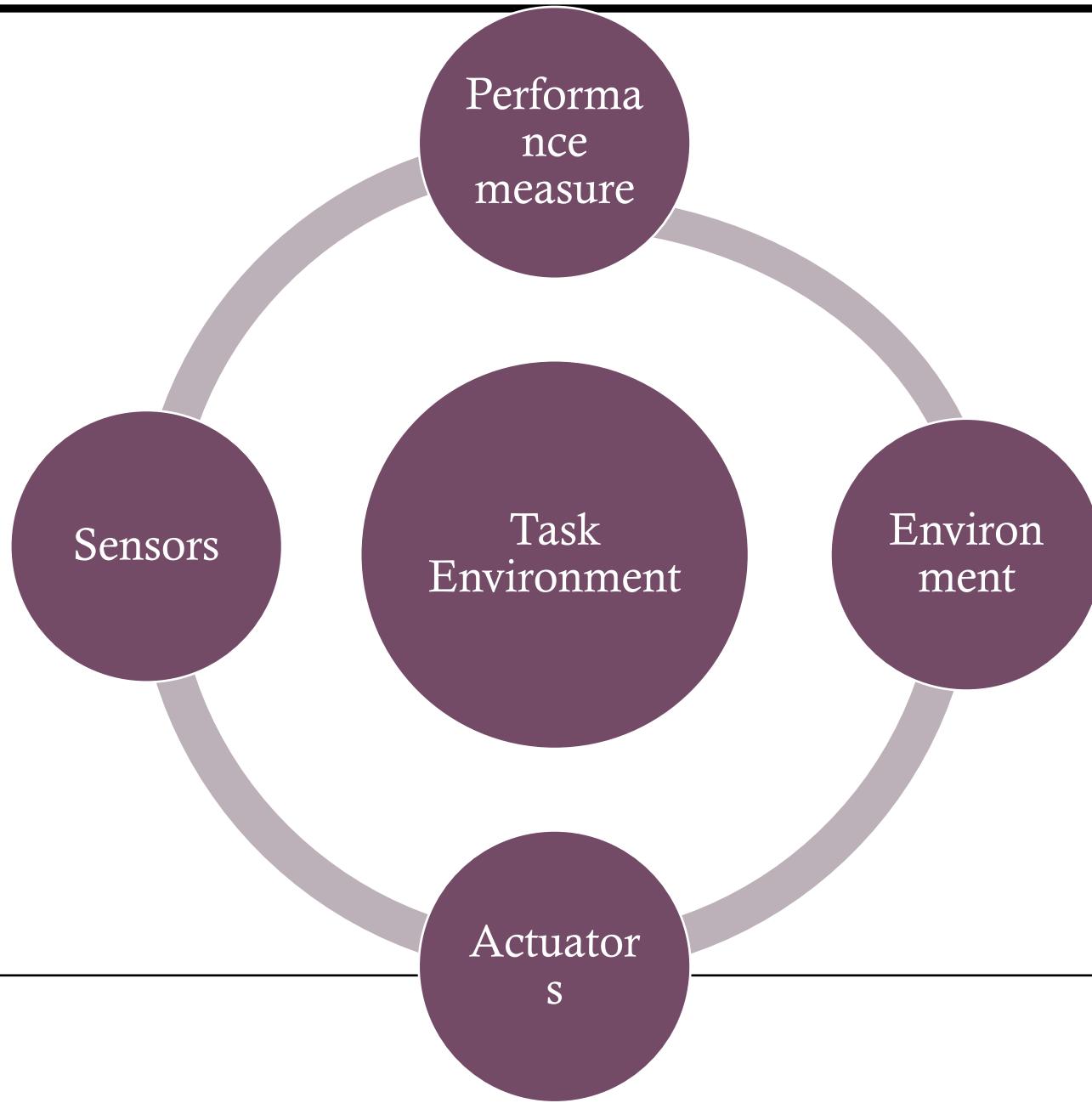


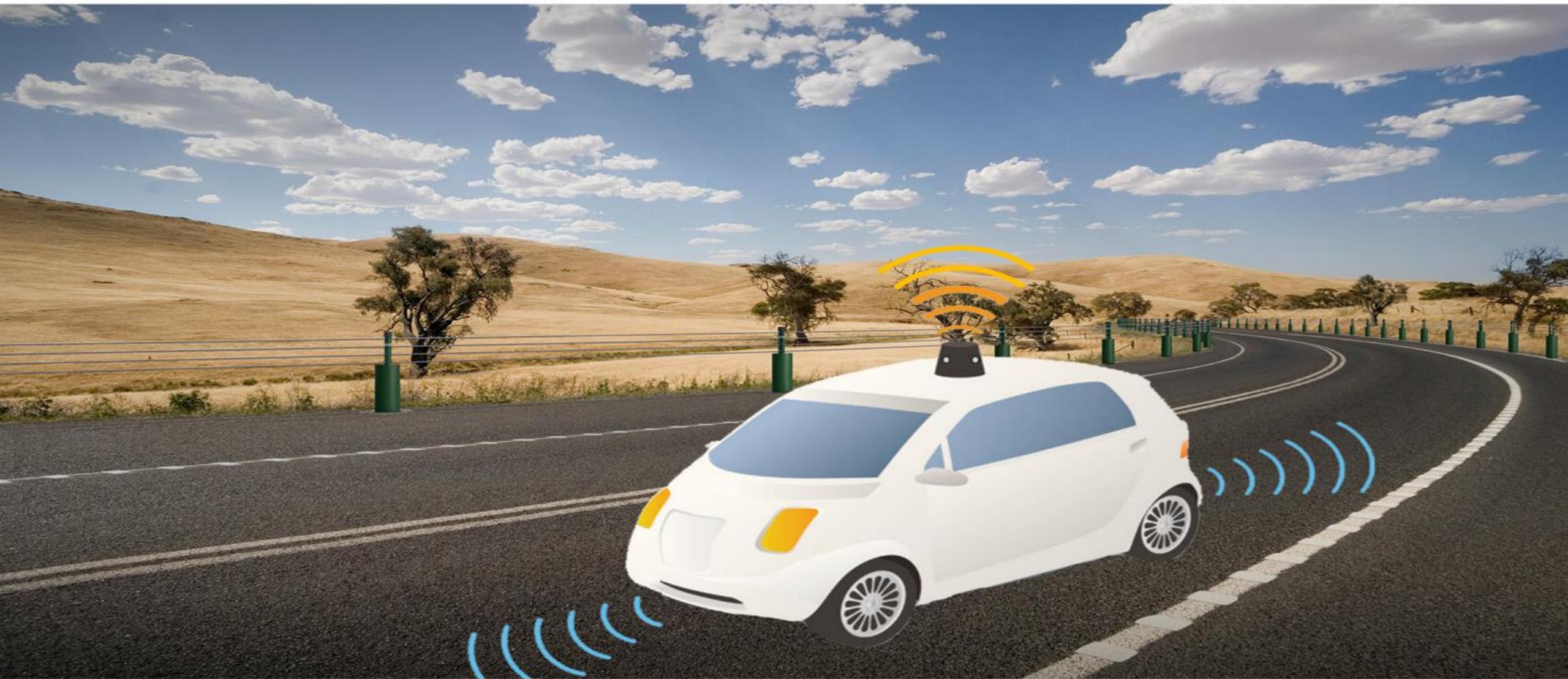
A rational agent is said to perform the right things. AI is about creating rational agents to use for game theory and decision theory for various real-world scenarios.



For an AI agent, the rational action is most important because in AI reinforcement learning algorithm, for each best possible action, agent gets the positive reward and for each wrong action, an agent gets a negative reward.

TASK ENVIRONMENT





PEAS DESCRIPTION OF TAXI'S TASK ENVIRONMENT

PEAS DESCRIPTION OF TAXI'S TASK ENVIRONMENT



Agent Type

Taxi Driver



Performance Measure

Safe

Fast

Legal

Comfortable trip

Maximize trips



Environment

Roads

Other Traffic

Pedestrians

Customers



Actuators

Steering

Accelerator

Brake

Signal

Horn

Display



Sensors

Cameras

Sonar

Speedometer

GPS

Odometer

Accelerometer

Engine sensors

Keyboard

PEAS DESCRIPTION OF TAXI'S TASK ENVIRONMENT

Performance measure:

Desirable qualities include getting to the correct destination; minimizing fuel consumption and wear and tear; minimizing the trip time or cost; minimizing violations of traffic laws and disturbances to other drivers; maximizing safety and passenger comfort; maximizing profits.

Driving environment:

Any taxi driver must deal with a variety of roads, ranging from rural lanes and urban alleys to 12-lane freeways. The roads contain other traffic, pedestrians, stray animals, road works, police cars, puddles, and potholes. The taxi must also interact with potential and actual passengers.

PEAS DESCRIPTION OF TAXI'S TASK ENVIRONMENT

Actuators:

include those available to a human driver: control over the engine through the accelerator and control over steering and braking. In addition, it will need output to a display screen or voice synthesizer to talk back to the passengers, and perhaps some way to communicate with other vehicles, politely or otherwise.

Sensors:

include one or more controllable video cameras so that it can see the road; it might augment these with infrared or sonar sensors to detect distances to other cars and obstacles. To avoid speeding tickets, the taxi should have a speedometer, and to control the vehicle properly, especially on curves, it should have an accelerometer. To determine the mechanical state of the vehicle, it will need the usual array of engine, fuel, and electrical system sensors. Like many human drivers, it might want a global positioning system (GPS) so that it doesn't get lost. Finally, it will need a keyboard or microphone for the passenger to request a destination.

VARIOUS AGENTS AND THEIR PEAS DESCRIPTION

Agent Type	Performance Measure	Environment	Actuators	Sensors
Medical diagnosis system	Healthy patient, reduced costs	Patient, hospital, staff	Display of questions, tests, diagnoses, treatments, referrals	Keyboard entry of symptoms, findings, patient's answers
Satellite image analysis system	Correct image categorization	Downlink from orbiting satellite	Display of scene categorization	Color pixel arrays
Part-picking robot	Percentage of parts in correct bins	Conveyor belt with parts; bins	Jointed arm and hand	Camera, joint angle sensors
Refinery controller	Purity, yield, safety	Refinery, operators	Valves, pumps, heaters, displays	Temperature, pressure, chemical sensors
Interactive English tutor	Student's score on test	Set of students, testing agency	Display of exercises, suggestions, corrections	Keyboard entry

DIFFERENT PROPERTIES OF TASK ENVIRONMENTS

-  Fully observable vs. Partially observable
-  Single agent vs. Multiagent
-  Deterministic vs Stochastic
-  Episodic vs. Sequential
-  Static vs. Dynamic
-  Discrete vs. Continuous
-  Known vs. Unknown

In this session you have learned:

- Agent and its relationship with Environment
 - Various terminologies of Agent
 - Definition of Rationality
 - Factors on which rationality depends
 - Full form of PEAS
 - PEAS Description
 - Different types of task environments
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