THADOMAL SHAHANI TSEC ENGINEERING COLLEGE

ASSIGNMENT NO. 1

Q.1] Give one definition on AI for each of the following approaches :-

i) Acting Humanly :

"The art of creating machines that perform functions that require intelligence when performed by people".

ii) Thinking Humanly :

"The existing new effort to make computers think .... machines with minds, in the full and literal sense."

iii) Acting Rationally :

"Computational Intelligence is the study of the design of intelligent agents."

iv) Thinking Rationally :

"The study of mental facilities through the use of computational models."

Q.2] Explain the components of the AI system in detail.

i) Learning :

Just like human beings, the first step in the development process with regard to AI is the learning stage. The learning process involves the memorization of individual items including different solutions to problems, vocabulary, and foreign languages, among others. Simplest form of learning is by trial and error. Through this learning process, programs that utilize AI are able to keep notes of all actions or moves that led to the positive results, allowing program to solve problems arising in the future.

ii) Reasoning :

Reasoning is basically logic or to be able to generate judgements from the given set of facts. It is carried out on the basis of strict rules of validity to perform specified task. Reasoning can be of 2 types, deductive or inductive. In programming logic, deductive inferences are generally used.

iii) Problem Solving :

AI addresses a huge variety of problems. For example, finding out winning moves on the board games, planning actions in order to achieve the defined task, identifying various objects from given images, etc. Problem solving methods are divided into 2 types, special purpose and general purpose methods.

iv) Perception :

In keeping with the comparisons to the function of the human-mind, the way in which individual perceive the world around them is critical to the manner in which they solve problems in their respective minds.

v) Language understanding :

The final component that makes up development of AI is language understanding. It can be defined as a set of different systems signs that justify their various means or methods using the convention.

Q.3] Write a short note on categorization of AI.

i) Based on capabilities :-

(a) Weak AI :

It is a type of AI which is able to perform a dedicated task with intelligence. It cannot perform beyond its field or limitations, as it is only trained for 1 specified task. For example voice assistant.

(b) General AI :

It is a type of Intellisence which could perform any intellectual task with efficiency like a human. The idea behind a general AI is to make a system that can learn, perceive, understand and function entirely like human, with connections and logic.

(c) Super AI :

Super AI is a level of intelligence of systems at which machines could surpass human intelligence, and can perform any task better than human with cognitive properties.

ii) Based on Functionality :

(a) Reactive Machines :

These are most basic types of machines that do not store memories or past experiences for future actions.

These machines only focus on current scenarios and react on it as per the circumstance.

(b) Limited Memory :

These machines can store past experiences or some data for a short period of time.

(c) Theory of Mind Machines :

Theory of Mind AI should understand the human emotions, people, beliefs and be able to react socially like humans. They are yet to be developed.

(d) Self-Awareness AI :

It is the future of AI. These machines will be super intelligent and will have their own consciousness, sentiments and self-awareness. They will be smarter than human mind.

Q.4] Explain problem formulation with the help of eg.

Problem formulation is a crucial step in process of solving problems, it involves defining the problem in a way that allows an intelligent agent to understand it and find a solution.

i) State Formulation :
ii) Initial state
iii) Goal Test
iv) Action Sequence
v) Path Cost

It is associated with each action and represents cost or effort required to perform that action.

Q.5] Explain PEAS properties in detail.

i) Performance Measure : It is a criteria used to evaluate performance, i.e success / quanification.

ii) Environment : It is external context, in which environment acts as a medium for agent operations.

iii) Actuators : It is mechanism or component through which agent interacts with environment and perform actions.

iv) Sensors : These are input devices that allow agent to perceive and gather information about it.

PEAS properties help us in designing efficient intelligent agents for any given task / tasks.

Example agent: Waste Sorting AI agent.

Task: To monitor and sort different waste materials using vision based techniques into various categories like recyclable, non-recyclable and compostable-materials.

PEAS Properties:

1) Performance Measure:
- Accurate classification of waste products in a short span of time.
- Min contamination of inappropriate waste materials into wrong categories by implementing adaptive learning.
- Faster identification, using advanced image analysis algorithms.

2) Environment:
- The agent shall operate in a waste sorting facility, being exposed to multiple kinds of waste product.

3) Actuators:
- Robotic arms for faster seggregation of items.
- Wavelength separator for identifying compostable items.

4) Sensors:
- High resolution cameras for capturing clear images of waste products.
- Weight sensing device pre-attached to conveyor belt for measuring weight of items.

Q.6] Describe different types of environment with suitable examples.

Soln i) Fully vs Partially Observable :
If an agent sensor can sense or access complete state of an environment at each point of time then it is a fully observable else partially observable.

ii) Deterministic vs Stochastic :
If an agent's current state and selected action can be determined by next state of environment, then it is deterministic else stochastic.

iii) In an episodic vs sequential rather episodic environment, there is a series of one-shot actions, and only the current percept is required for action, which is not in sequential one.

iv) Single agent vs Multi-agent :
If only one agent is involved in environment, and operating by itself then it is a single agent, else multi-agent.

v) Static vs Dynamic :
If environment can change itself while an agent is deliberating, then it is called a dynamic environment, else it is called a static environment.