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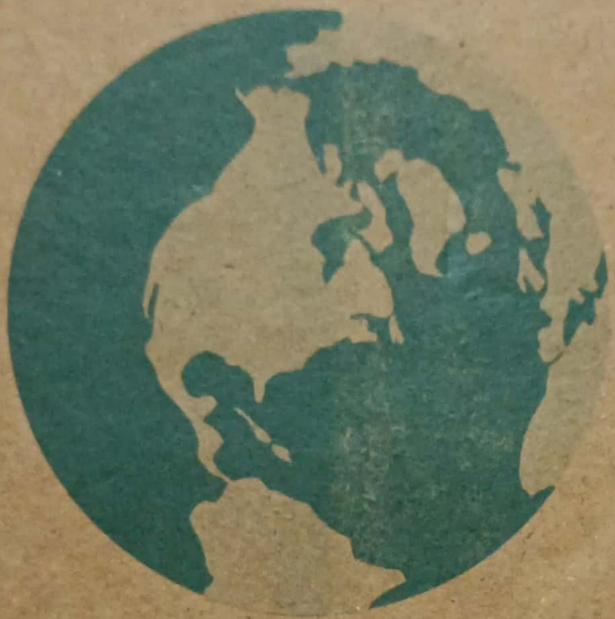

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EXERCISE BOOK

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SUBJECT: AI

CLASS: BE CMP ROLL NO.: 019-357 SECTION: II

Assignment - 1

1. What is Intelligence?.

→ It is the computational part of the ability to achieve goals in the world.

→ It is capacity to learn & solve problems.

2. What is AI?.

→ It is the science & engg at making intelligent machine, especially intelligent computer programs.

3. Briefly discuss history of AI & its achievements.

→ Here is a brief timeline of the past six decades of how AI evolved:

- In 1956:

John Mc Carthy coined the term artificial intelligence & had the first AI conference

- In 1969:

Shakey was the first general purpose mobile robot built. It was now able to do things with a purpose with just little instruction.

- In 1997:

Supercomputer 'Deep Blue' was designed & it defeated world champion chess player in a match.

- In 2002: F

First commercial robotic vaccum cleaner was developed.

- In 2005-2009:

Speech recognition, Robotic Process Automation (RPA), DARPA ground challange, face recognition s/w, etc. developed.

4. Explain important objectives of AI with eg.

→ The objectives of AI are:

- Replicate human intelligence
- Solve knowledge-intensive task
- Intelligent connection of perception & action
- Enhance human-human, human-computer & computer-computer interaction / communication

5. Write fields where you think AI could be applied.

→ The application areas of AI are:

- Game Playing
- Speech Recognition
- Computer Vision
- Mathematical Theorem proving
- Healthcare & drug discovery

6. Explain 4 categories of AI views:

a. Think humanly

- It is automation of activities that we associate with human thinking abilities such as decision making, problem solving & learning.
- Also called cognitive-based approach

b. Think Rationally

- Ability of AI to perceive reason & act by thinking
- Also called law of thought approach.

c. Acting humanly
- AI performing functions which require intelligence when performed by people.
- Also called turing test.

d. Acting Rationally
- AI acts so to achieve the best outcome or when there is uncertainty, best-expected outcome.
- It is able to reason logically to the conclusion that a given action will achieve one's goals & then act on that conclusion.

7. State & explain Turing test with eg.

→ Turing test, proposed by Alan Turing (1950), was designed to provide a satisfactory operational defⁿ of intelligence. The Turing test measures the performance of intelligence machine against that of a human being.
The Turing test is a method for determining whether or not a computer is capable of thinking like a human.

Acc. to this test, a computer is deemed to have AI if it can mimic human responses under specific condⁿ.

Eg There are 2 rooms A & B. one room contains computer & other humans. The interrogator is outside & does not know which room has a computer. He can ask questions through a teletype & receives answers from both rooms A & B. The interrogator needs to identify whether a human is in room A or in room B. To pass Turing test, computer has to fool the interrogator into believing that it is human.

8) What capabilities must a computer have to pass a turing test.

→ The turing test assesses a computer ability to exhibit intelligent behavior indistinguishable from that of a human. To pass the turing test, a computer posses:

i) NLP

Understand & generate human like language

ii) Reasoning & problem solving

Display logical thinking & problem solving skills.

iii) Knowledge Base

Access a brand range of information & exhibit general knowledge.

iv) Learning Ability

Adopt & learn from experiences, improving performance overtime.

v) context Awareness

Grasp and respond appropriately to the context of a conversation.

vi) Emotional Intelligence

Recognize & respond to emotions in a manner consistent with human behavior.

vii) preception and sensory i/p

Interpret & respond to sensory i/p such as vision or audio cues.

viii) Memory

Retain information from past interactions for coherent and meaningful conversation.

9) What is total turing test?. what capabilities must a computer have to pass this test?.

→ The total turing test includes video signals & manipulation capability so that the interrogator can test the subjects perceptual abilities and object manipulation ability.

To pass the total turing test computer must have following additional capabilities.

Computer vision: To ~~prepare~~ perceive objects

Robotics: To manipulate objects & move

10) Define & describe the difference between knowledge, belief, hypothesis & data.

→

Aspect	Knowledge	Belief	Hypothesis	Data
Def^n	True, justified information based on evidence.	Personal acceptance of truth	Testable explanation for a phenomenon	Raw facts or information.
characteristics	Reliable, accepted in a community	personal & subjective	Formulated before testing subject to verification	objective measurable
Basis	Evidence or experience	May or may not be supported by evidence	Formulated before testing based on observation	Raw observation or measurements
verification	Justified & true within a certain	subjective and may vary among individuals	Tested through experimentations and observation	used as evidence to support conclusion
Role	Foundation for informed decision making	Influenced by personal cultural factors.	Initial step in the scientific method	Basis for drawing conclusions.

11) Define inteligent-Agent. Differentiate intelligent agent & rational agent:

→ 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.

Intelligent Agent	Rational Agent
- System capable of perceiving and acting in its environment	- Intelligent agent making choices to achieve its goals
- Emphasizes adaptability and smart actions	Emphasizes rational decision-making to maximize goals.
- Demonstrates adaptive actions.	Make choices logically to achieve goals based on beliefs.
- Responsive to environment stimuli	Makes rational decisions considering knowledge & goals.
- May or may not always align actions with goals.	choice are expected to align with goals in a rational way.

(2) Discuss the architecture featured for each types of agents.

→ The architecture and features for each types of agents are:

i) Simple Reflex Agents
- select action on the basis of only the current percept. eg:- The vaccum-agent
- Large reduction in possible percept/action situations.
- Implemented through condition-action rules
- If dirty then suck

ii) Reflex and state
- To tackle partially observable environments
- maintain internal state
- overtime update state using world knowledge
- How does the world change
- How do actions affect world

iii) Goals based
- The agent needs a goal to know which situation are desirable.
- Things become difficult when long sequences of actions are required to find the goal.
- Typically investigated in search & planning research.
- Major difference:
  - Future is taken into account
- Is more flexible since knowledge is represented explicitly & can be manipulated.

iv) Utility based agents

- Certain goals can be reached in different way, some are better, have a higher utility.
- utility function maps onto a real no.
- Improves on goals.
  - selecting betⁿ conflicting goals.
  - Select appropriately betⁿ several goals ~~betⁿ~~ based on likelihood of success.

13. What do you mean by PEAS?.

→ PEAS means:

P → Performance Measure

E → Environment

A → Actuators

S → Sensors

14. Specify task environment i.e. PEAS for following agents:

a. Taxi Driver

P → safe, fast, legal, comfortable trip, maximize profit

E → Roads, pedestrian, other traffic

A → Steering, accelerator, brake, signal, horn, display

S → cameras, sonar, speedometer, GPS, odometer, accelerato-meter, engine sensors.

b. Medical diagnosis system

P → Healthy patient, minimize cost

E → Patient, Hospital staff

A → Display questions, tests, diagnoses, treatment, referrals

S → Keyboard entry symptoms, findings, patient's answers.

c. Vaccum cleaner

P → Through cleaning of the designated area, minimal time.

E → Indoor space, furniture, obstacles, dirt

A → Vaccum motor, wheels

S → Floor sensor, obstacles sensor, dirt sensor.

6) Do you consider smart phone are intelligent? Justify.

→ Yes, I consider smartphone are intelligent because:

- Powerful processing:
  Smartphones have strong processor for efficient task handling.
- sensor
  Equipped with various sensors environment awareness.
- Connectivity
  Internet access allows for vast data exchange and information retrieval.
- AI Integration
  utilizes AI for feature like voice recognition & image processing.
- User Interaction
  offers intuative interface through touch & voice commonds.
- Application
  Diverse apps, often using AI, enhance functionality
- Adaptability
  Learns from user behavior for personalized experiences
- Multifunctionality
  Integrates multiple features acting as versatile all in one devices.

18) Discuss about physical symbol system hypothesis

→ physical symbol system hypothesis states that processing structures of symbol is sufficient in principle, to produce AI in a digital computer and that moreover human intelligence is the result of the some type of symbolic manipulations. A physical symbol system has the necessary and sufficient means for intelligent action.

Necessity

Anything capable of intelligent action is a physical symbol system.

- sufficiency: Any pss is capable of intelligent action
- symbols multi designate
- symbol must be atomic
- symbol may combine to form expressions.