Assignment One: AI Definitions

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AI Definitions

1. **What are the four categories of definitions for AI? List them with a brief explanation of each.**
   1. Thinking Humanly: AI systems that attempt to mimic human thought processes. This involves replicating how humans think and reason, aiming to achieve cognitive processes like those of the human brain. Examples include cognitive modeling approaches. (Artificial Intellligence: A Modern Approach, 2021, p. 1)
   2. Acting Humanly: AI systems that behave or act like humans. The Turing Test is a classic example where the goal is to create a machine that can interact in a way indistinguishable from a human. (Artificial Intellligence: A Modern Approach, 2021, p. 1)
   3. Thinking Rationally: AI systems designed to think logically and rationally, often based on formal logic. These systems follow clear, logical rules to deduce outcomes and make decisions, ensuring consistency in reasoning. (Artificial Intellligence: A Modern Approach, 2021, p. 1)
   4. Acting Rationally: AI systems that act to achieve the best possible outcome or expected outcome. These systems focus on the results of actions, making decisions that maximize their performance based on their goals, regardless of whether they mimic human behavior. (Artificial Intellligence: A Modern Approach, 2021, p. 1)
2. **What is the one definition category that is mostly used in AI, and we will rely on in this course?**
   1. Acting rationally. (Artificial Intellligence: A Modern Approach, 2021, p. 1)
3. **What is an "Agent" within the context of AI?**
   1. An Agent is “something that acts”. (Artificial Intellligence: A Modern Approach, 2021, p. 1) A computer agent “is expected to do more: operate autonomously, perceive their environment, persist over prolonged time period, adapt to change, and pursue goals.” (Artificial Intellligence: A Modern Approach, 2021, p. 1)
4. Define an "Agent Function".
   1. An agent function is an abstract mathematical description that maps given percept sequence to an action. (Artificial Intellligence: A Modern Approach, 2021, p. 37)
5. Define "Percept Sequence".
   1. Percept sequence is the entire history of everything the agent has perceived. (Artificial Intellligence: A Modern Approach, 2021, p. 37)
6. In the context of trying to define an Intelligent Agent, how is "intelligence" or "rationality" defined?
   1. Intelligence or Rationality can be defined as the agent's ability to select actions that maximize its performance measure, based on the information it has received from its environment. A rational agent acts in a way that is expected to achieve the best outcome, given its knowledge and goals. (Artificial Intellligence: A Modern Approach, 2021, p. 37)
7. What are the four factors defining a "Task Environment"?
   1. “PEAS” (Artificial Intellligence: A Modern Approach, 2021, p. 42)
      1. Performance measure
      2. Environment
      3. Actuators
      4. Sensors
8. Define "Deterministic" vs "Stochastic" Task Environments. Give an example for each.
   1. Deterministic – “Environment is completely determined by its current state and action executed by the agent” (Artificial Intellligence: A Modern Approach, 2021, p. 45)
      1. Example: A chess game – rules are defined and each move leads to a predictable outcome.
   2. Stochastic – “If the model of the environment deals with probabilities.” (Artificial Intellligence: A Modern Approach, 2021, p. 45)
      1. Example: Model that predicts weather – “25% chance of rain” (Artificial Intellligence: A Modern Approach, 2021, p. 45)
9. Define "Single-" vs "Multiagent" Task Environments. Give an example for each.
   1. Single task environment - An environment where only one agent operates, without any interaction or competition with other agents. (Artificial Intellligence: A Modern Approach, 2021, p. 43)
      1. Example: An agent solving a puzzle.
   2. Multiagent task environment - An environment where multiple agents operate, and their actions may interact or compete with each other. (Artificial Intellligence: A Modern Approach, 2021, p. 43)
      1. Example: An agent playing chess against an opponent.
10. Define "Goal-based" and "Learning" Agents. Which one is simpler?
    1. Goal based agents - Agents that select actions based on the goal they need to achieve. (Artificial Intellligence: A Modern Approach, 2021, p. 52)
       1. Example: A taxi at an intersection. It has three options; its goal is where it needs to go. It selects the option based on the goal.
    2. Learning agents - Agents that have the ability to improve their performance over time by learning from experiences. (Artificial Intellligence: A Modern Approach, 2021, p. 56)
       1. Example: Autonomous vehicles learning to adapt to driving behaviors of other drivers, pedestrian behavior, and traffic conditions.

# References

Artificial Intellligence: A Modern Approach. (2021). In S. Russell, & P. Norvig. Hoboken, NJ: Pearson.