Artificial Intelligence

Assignment # 1

Start Date: 30-04-2024 **Section:** F2, F7 **Total Marks: 100**

Due Date: 05-05-2024 **Program:** BSCS

Instructions

1. Upload the scanned PDF on the portal
2. Understanding of the problems is part of the assignments.
3. You will get Zero marks if found any type of cheating.

Task 1

The missionaries and cannibal's problem is usually stated as follows. Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.

a. Formulate the problem precisely, making only those distinctions necessary to ensure a valid solution. Draw a diagram of the complete state space.
b. Implement and solve the problem optimally using an appropriate search algorithm. Is it a good idea to check for repeated states?
c. Why do you think people have a hard time solving this puzzle, given that the state space is so simple?

Task 2

For each of the following activities, give a PEAS description of the task environment and characterize it in terms of the properties. [Hint: Listed in Book Artificial Intelligence "A Modern Approach" Third Edition Stuart J. Russell and Peter Norvig Section 2.3.2.]

- Playing soccer.
- Exploring the subsurface oceans of Titan.
- Shopping for used AI books on the Internet.
- Playing a tennis match.
- Practicing tennis against a wall.
- Performing a high jump.
- Knitting a sweater.
- Bidding on an item at an auction.

Task 3

Read the scenario carefully and answer the following questions with the help of example.

1. What factors might contribute to the first team's robot getting stuck in local optima while attempting to solve the 8-puzzle problem using the Hill Climbing algorithm?
2. Considering the Hill Climbing algorithm's susceptibility to local optima, propose a modification or enhancement that the first team could implement to improve their robot's performance in navigating the 8-puzzle problem.
3. Describe how the second team's robot might have approached the design of their heuristic function to achieve more reliable and effective results in solving the 8-puzzle using the Hill Climbing algorithm.

Scenario: In a simulated robotics competition, teams are tasked with programming an autonomous robot to solve the classic 8 puzzle problem using the Hill Climbing algorithm. The teams are provided with a virtual 3x3 grid representing the puzzle, and the objective is to programmatically move the numbered tiles within the grid to reach the goal configuration. The Hill Climbing algorithm is employed by each team to guide their robot's decision-making process. The teams have the flexibility to choose or design a heuristic function that measures the proximity of the current state to the goal state. The robots make moves based on the local optimization of this heuristic. During the competition, one team notices that their robot consistently gets stuck in certain configurations, struggling to progress beyond local optima. Another team, however, seems to navigate the puzzle more efficiently and consistently reaches solutions.