

CSCI 538 Assignment 02

Agent and Problem Formulation

60 Points

Hand-in Instructions:

- This is an individual assignment, not group work. However, you may discuss the general ideas, solutions, or algorithms with classmates and the instructor in order to help you answer the questions. But you are required to use your own words instead of copying and pasting, not explicitly telling each other your solutions or answers, and not to get any answers from the web.
- Neither Turn-in similarity score nor AI writing detection could be more than 10%. In your submission, please avoid including the questions from the assignment.
- Submit your Word file (.doc or docx, not PDF file (.pdf)). No photos or other file types are allowed.
- Submit it electronically through D2L.

Questions:

1. (10 points, 1 point each) Define the following terms in your own words instead of copying and pasting from textbooks, course materials, or online references. *Note that misusing AI or detecting AI-generated writing is strictly prohibited.*
 - (a) agent
 - (b) agent function
 - (c) agent program
 - (d) rationality
 - (e) PEAS
 - (f) reflex agent
 - (g) model-based agent
 - (h) goal-based agent
 - (i) Problem formulation
 - (j) Transition model
2. (50 points, 5 points each for (a)-(g) and 15 points for (h)) **Problem Formulation with Different Goals and Implementation.**

Given an $m \times n$ binary matrix grid which represents a map of '1's (land) and '0's (water). An island is a group of 1's (representing land) connected 4-directionally (horizontal or vertical.) You may assume all four edges of the grid are surrounded by water. The area of an island is the number of cells with a value of '1' in the island.

 - (a) Formulate this problem with [Goal 1: find the number of islands](#) precisely based on the example studied in the lecture "04-csci538_lecture_Search.pdf"
 - (b) Formulate this problem with [Goal 2: find the maximum area of an island in the matrix grid](#). For instance, in Fig.1, the answer is not 11 since the island must be connected 4-directionally.
 - (c) Given a random grid, as an AI expert, you have been hired to develop an intelligent agent to find the solutions for the problems based on the problem formulation. How is your agent going to find a land?

	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	X	0	0	0	0	X	0	0	0	0	0
1	0	0	0	0	0	0	0	X	X	X	0	0	0
2	0	X	X	0	X	0	0	0	0	0	0	0	0
3	0	X	0	0	X	X	0	0	X	0	X	0	0
4	0	X	0	0	X	X	0	0	X	X	X	0	0
5	0	0	0	0	0	0	0	0	0	0	X	0	0
6	0	0	0	0	0	0	0	X	X	X	0	0	0
7	0	0	0	0	0	0	0	X	X	0	0	0	0

Fig.1 Island Problem

- (d) Suppose the agent finds one land. How would the agent find an area?
- (e) Suppose the agent finds one land. What is the number of possible states for the land within an island larger than the land (the area of the island is larger than 1)?
- (f) Draw a diagram of the state space with three (3) levels (the root node is at level 1) by referring to the state space on P36 of the same document. Please note that the example state space just has three (3) levels.
- (g) In our opinion, which is the best search algorithm that we have studied and can be used to solve the problems? Explain why compared to other search algorithms.
- (h) (15 points) Based on (c)-(g), implement your design and submit your code in Python for us to evaluate it. Ple note that you are expected to include your program and screenshots of the outputs in your Word file, name your program "Assign02Q2hXX.py" and submit it along with the Word file in the D2L. XX should be replaced by your initials.

Note:

- Obtain and attach the required screenshots with good resolution quality. All information contained in the screenshots should be readable.
- Show your name and CWID in the background in your captured screenshots. Not providing your name and CWID information in the captured screenshots may result in a zero in Qn2.