VANCOUVER ISLAND UNIVERSITY
CSCI 485 — MIDTERM EXAMINATION
21 October 2010, 10:00 — 11:20

Duration: 80 Minutes   **Instructors:** H. Liu

TO BE ANSWERED IN BOOKLETS
Instructions

- Students must count the number of pages in this examination paper before beginning to write, and report any discrepancy immediately to the invigilator.

- This examination paper consists of 3 pages.

- This is a CLOSED BOOK examination. You are allowed to bring one piece of letter-sized note.

- Calculators are NOT permitted.

- Remember to state any assumptions and show rough work.

- Note carefully the weight of each question, and answer appropriately.

- Attempt all questions. All questions relate to material covered in the lectures, labs and assignments.

1. (20 marks) Describe your own criteria for a computer software to be considered "intelligent".

2. (20 marks) Usually in any informed search strategy, a heuristic function, $h(n)$, is used. Someone says that the heuristic function, $h(n)$, is "the cost of the cheapest path from node n to a goal node". Is that correct? Explain briefly why or why not.

3. (30 marks) Magic Squares Problem
   To create a magic square you need to start with a square grid of empty boxes. Then you have to fill in the square with numbers according to the following three rules:

   - The square has to include all of the numbers from 1 to the number of boxes in your grid.

   - You must put one number in each box and use each number only once.

   - the numbers along every column, row, and main diagonal have to add up to the same number.

   Here is an example of a 4×4 square:

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

   Numbers in each row, column and main diagonal add up to 34.

   (a) Define this Magic Squares Problem as a constraint satisfaction problem.

   (b) Usually, the backtracking search algorithm is used to solve constraint satisfaction problems. Explain succinctly what is the backtracking search algorithm.

   (c) List and succinctly explain at least two(2) heuristics that can be used to improve the performance of the backtracking search algorithm.

4. (30 marks) Consider the following problem:

You are are asked to pass on a letter addressed to Ms Eileen Gallagher, who lives in 223 BURLINGTON ROAD IE DUBLIN 4, IRELAND (note that the address and name together uniquely identify the recipient of the letter, but there is no guarantee that the recipient actually exists). The rule of the game is that you can only send the letter to someone you already know. Anybody who receives the letter but is not the designated recipient of the letter should pick among his/her acquaintances (if he has any) the one person who most likely knows the letter's designated recipient (or who is the designated recipient himself), and send the letter to him/her in the hope that eventually the letter will be delivered. If he does not have any acquaintances other than the person who sends him the letter, he should send the letter back to the sender (note: not the original sender).

   (a) Consider this problem as a standard search problem. What are the states of this problem? What is the initial state of the problem and how can the goal test be performed?

   (b) Would you prefer to apply breadth first, depth first or depth limited search strategies to solve this problem? Why?

   (c) What do you think should be the performance measure of this problem?

   (d) With your performance measure of the problem in mind, design a reasonably good heuristic function to help improve the search efficiency and find a reasonably good solution.

   (e) Is your heuristic function admissible? Why?

====== END OF EXAM QUESTIONS ======