Artificial Intelligence, Fall 2018-2019

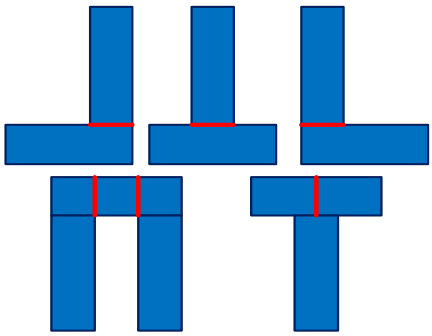
Assignment #2

Due: December 5, 2018

Submission Type: A report and the source code for Q1. Solutions for Q2 and Q3 must be **handwritten** and **scanned/photographed** in your report.

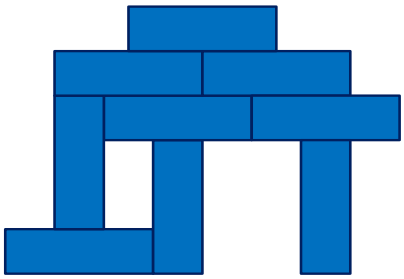
Q1) (60 pts) You are given the block construction problem where a target shape is given to be constructed by using identical rectangular blocks. You are asked to find the order of placements of the blocks in the given structure. The following rules need to be considered for the placement of blocks.

- Any block can be placed horizontally/vertically on the table.
- For a block to be placed vertically, all of its down side must be supported by a block underneath it.
- For a block to be placed horizontally, 2/3 of its down side or its center must be supported by the block(s) below.



a) Model this problem as a CSP and select an algorithm to solve this problem.

b) Implement the code of the algorithm you selected for solving this problem. You can use any programming language for implementation and also use a CSP library in your code. Your implementation must indicate the order of placement for the blocks in the first structure below and show that there is no solution for the second structure below



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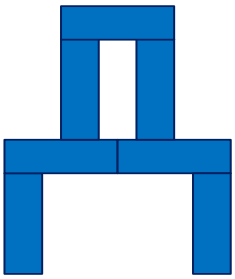

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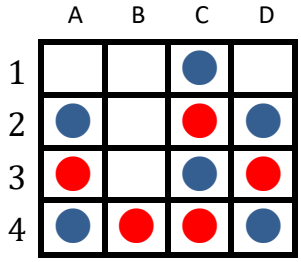
c) Report your findings. Indicate if your algorithm gets stuck, if so, in which conditions.

d) Visualize the output presenting the order in block stacking (with Matlab or any other visualization tool).

Q2) (20 pts) Originally, Connect Four is a 2-player game in which the players take turns dropping one coloured disc from the top into one column. The discs fall straight down and occupy the lowest available location in the column.

In this question, the new version of the game which is called Connect Three will be used as a game board. The objective is connecting the three of the checkers in a row (diagonally, vertically or horizontally) while preventing the opponent from doing the same. The first person to reach the goal is the winner. The game board is 4x4 in size. You are in the middle of the following game and you will select your next action (A, B or D).



a) You are the **blue** player. **Find** your next move using minimax algorithm, assuming that your opponent plays **optimally**. Draw the minimax tree and show the minimax-value for all nodes.

b) You are the **red** player. Find your next move using minimax algorithm, assuming that your opponent plays **randomly**. Draw the minimax tree and show the minimax-value for all nodes.

Q3) (20 pts) Ayşe, Barış and Cem attend at least one student club in their university. Their university has three student clubs: a cinema club, a game club and a literature club. No student in the literature club likes cola and all students in the cinema club like popcorn. Ayşe likes cola, and dislikes popcorn. Barış likes both popcorn and cola. Cem likes whatever Ayşe dislikes.

a) Construct the knowledge-base by using the given facts.

b) Use resolution inference algorithm to find who is attending the game club.