CSE 4301/5290 Homework 3

Due: Oct 21, Wed, 5pm; Submit Server: class = ai , assignment = hw3

For programming problems (Lisp/Java/C/C++/Python):

• Submit:
  – all files that are needed to compile and run
  – README.txt with compilation and run instructions

• Your program should compile and run on code.fit.edu
  (Linux, remote access via ssh)

1. Q5.9, p197, 3Ed (Q6.1, p189, 2Ed)
2. Programming:

   • **CSE 4301 only** Connect 4 has a rack with 7 columns, each column has a depth of 6. Each player in turn drops a token into one of the 7 columns. The first player achieving 4 in a row/column/diagonal wins. Each move is specified by a column number.
     
     | | | | | | | |
     | | | | | | | |
     | | |X| | | | |
     | | |O|X|O| | |
     | |X|O|O| | | |
     |X|O|X| | | | |
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     0 1 2 3 4 5 6

   • **CSE 5290 only** 4x4x4 3D tic-tac-toe. Each player in turn marks a cell, the first player achieving 4 in a row/column/diagonal wins. Each move is specified by level, row, and column numbers (in that order).

   Program operations:
   
   (a) From keyboard input, assign your program to be player X or player O (the opponent respectively becomes player O or X).
   (b) Player X always starts.
   (c) Display the initial empty configuration
   (d) Display a move or enter a move from the keyboard (connect4: column; 3D tic-tac-toe: level, row and column)
   (e) Check if the move is legal, ask human for confirmation if illegal
   (f) Make the move and display the board
   (g) Repeat steps (d) to (f) until there is a winner
   (h) Declare winner

   Program requirements:
   
   (a) Functions (stated in LISP) including:
       
       ; perform search with alpha beta pruning, return an action
       ; *all* actions must be determined by alpha-beta-search
       ; (you can vary parameters at different states)
       (defun alpha-beta-search (state ...) ...)
       
       ; return the “quality” of the state
       ; description of your evaluation function...
       (defun eval-state (state) ...)
   
   (b) Each move should not take more than one minute. Hence, you might want to have a parameter(s) that sets the limit(s) of your search.

   LISP details
   
   • compile-file prepares a compiled version of your program. You need to load the compiled version. Running the compiled version will be faster than interpreting the source.
   
   • get-universal-time returns the number of seconds since Jan 1, 1970. get-internal-real-time returns the number of time units based on internal-time-units-per-second (a constant)—might need to handle the “wrap-around” issue: end-time < start-time.

   Tournament rules:
   
   (a) Oct 21, Wed, 5-6:15pm
   (b) CSE 4301 and CSE 5290 students compete separately.
   (c) Your program will play against two other programs, which are randomly assigned.
   (d) Your program starts in one game; your opponent starts in the other game.
   (e) You can get up to 10 points, which constitute 10% of your hw3 grade. (win: 5 points; tie: 3.5; lose: 2; non-functioning: 0)
   (f) Your program wins if it functions but your opponent’s doesn’t.
   (g) Each move cannot take more than one minute. Your program is considered non-functioning if it takes too long.
   (h) Your program is considered non-functioning if it suggests or allows illegal moves.
   (i) If a game takes more than half an hour, the game may be declared as a tie.

CSE 5290 only

3. Q5.16, p200, 3Ed