

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|X| | |
-----
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).

	Level 0	Level 1	Level 2	Level 3
	0 1 2 3	0 1 2 3	0 1 2 3	0 1 2 3
0	X			
1	O	X O		O
2			X	
3				X

Program operations:

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

Program requirements:

- 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) ...)
```

- 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:

- Oct 21, Wed, 5-6:15pm
- CSE 4301 and CSE 5290 students compete separately.
- Your program will play against two other programs, which are randomly assigned.
- Your program starts in one game; your opponent starts in the other game.
- 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)
- Your program wins if it functions but your opponent's doesn't.
- Each move cannot take more than one minute. Your program is considered non-functioning if it takes too long.
- Your program is considered non-functioning if it suggests or allows illegal moves.
- 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