**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**

Batch No. :

**DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION SYSTEMS**

**Artificial Intelligence (BITS F444/ CS F407)**

**I Semester 2019-20**

**Programming Assignment-3**

**Coding Details**

**(October 17, 2019)**

*Instruction: Type the details precisely and neatly*

1. ID \_2017A7PS0068P\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name \_\_J LAKSHMI TEJA\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Mention the names of Submitted files :
   1. alphabeta.py
   2. minmax.py
   3. gui.py
   4. gen.py
   5. driver.py
2. Total number of submitted files: \_\_\_\_5\_\_\_\_\_\_\_
3. Name of the folder :\_\_\_\_\_\_\_\_\_\_\_2017A7PS0068\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Have you checked that all the files you are submitting have your name in the top?(yes/no)

YES

1. Have you checked that all the files you are submitting are in the folder as specified in 4 (and no subfolder exists)?(yes/no)

YES

1. Problem formulation
   1. State representation:

A dictionary with fields ‘config’ and ‘pos’.

‘config’ : A 4X4 list. ‘G’ represents green coin, ‘B’ represents blue coin and ‘0’ represents empty space.

‘pos’: A 4x1 list. jth element represents the row number to be filled for a particular column number j.

* 1. Pseudo code of your successor function

nextState( state, player, column):

if( state == None):

return None #None represents no next state possible

if( state['pos'][column] == 4):

return None #None represents no next state possible

next = deepcopy(state)

color = 'B' #Blue

if(player == 'M'): #M represents machine

color = 'G' #G represents green

next['config'][next['pos'][column]][column] = color

next['pos'][column] += 1

return next

* 1. Terminal states generation process

None. I have checked for the terminal states instead using a isTerminal() function

* 1. Data structure to store terminal states

See the answer to (c) above.

* 1. Method to access terminal states and corresponding utility values

See the answer to (c) above.

1. Minimax Technique details
   1. Node structure:

A dictionary with fields ‘config’ and ‘pos’.

‘config’ : A 4X4 list. ‘G’ represents green coin, ‘B’ represents blue coin and ‘0’ represents empty space.

‘pos’: A 4x1 list. jth element represents the row number to be filled for a particular column number j.

* 1. Method to ensure the correctness of terminal test (describe in maximum 4 lines)

I checked if the required pattern exists first row wise for each row.

Did the same for column and then diagonal.

* 1. Total number of nodes generated to play one game:
  2. Write the statistics here as asked

R1 = Around 300000000 R2 = 240 bytes R3 = 4

R4 = Around 6 minutes R5= 0.05

* 1. Code status (implemented fully/ partially/ not done)

Implemented fully

1. Alpha Beta technique details:
   1. Explain the logic used for pruning (in maximum four lines)

It stops evaluating a move when at least one possibility has been found that proves the next move to be worse than a previously examined move. Such moves need not be evaluated further.

This information is stored in variables alpha, beta and an utility value for each node.

* 1. Total number of nodes generated to play one game: Around 15000
  2. Write the statistics here as asked

R6 = Around 15000 R7 = 20000 R8 = Around 0.6 sec

1. Code status (implemented fully/ partially/ not done)

Implemented Fully

1. Comparative analysis

R9 = minimax uses about 20000 times more memory R10 = Table below R11= Table below R12= Table below

Fill in the following information based of 10 independent games

|  |  |  |
| --- | --- | --- |
|  | Minimax Algorithm | Alpha Beta Pruning |
| Average number of nodes created | 284568932 | 16352 |
| Average time taken | 325.65 s | 0.83 s |
| Number of times machine wins (player M) | Every time | Every time |

1. GUI details
   1. Created the GUI (yes/ No): Yes
   2. Have created it according to the specifications?(yes/No) No
   3. Which module of Python is used for creating graphics? Turtle
   4. Is this under the standard Python library or not? No
   5. If not, why?
2. Graphics details:
   1. Is graphics working fine for displaying the board and coins?

Yes

* 1. How have you calibrated the board and accepted human input to play the game?

A 4x4 grid is shown.

The input from the user( the column number) is provided as a console input (Couldn’t implement event handling)

* 1. How are you showing the base line?
  2. How are you showing the move of the machine?

By a green coin

* 1. How are you showing the move of the human player?

Blue coin

1. Compilation Details:
   1. Code Compiles (Yes/ No):\_\_\_\_\_\_\_Yes\_\_\_\_\_\_\_
   2. Mention the .py files that do not compile:\_\_\_\_\_\_\_\_\_\_None\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Any specific function that does not compile:\_\_\_\_No\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. Ensured the compatibility of your code with the specified Python version(yes/no)\_\_\_\_\_\_Yes\_\_\_\_\_\_
   5. Instructions for compilation of your files mentioning the multi file compilation process used by you (We may use the replica of these for compiling your files while evaluating your code)

Just execute the driver.py

1. Driver Details: Does it take care of the options specified earlier(yes/no):\_\_\_\_\_\_Yes\_\_\_\_\_
2. Execution status (describe in maximum 2 lines)

Everything is working fine. But the user input is provided as a console input and not by a mouse click as required.

1. Declaration: I, \_\_\_\_\_\_\_\_\_\_\_J Lakshmi Teja\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (name) declare that I have put my genuine efforts in creating the python code for the given programming assignment and have submitted only the code developed by me. I have not copied any piece of code from any source. If the code is found plagiarized in any form or degree, I understand that a disciplinary action as per the institute rules will be taken against me and I will accept the penalty as decided by the department of Computer Science and Information Systems, BITS, Pilani.

ID\_\_\_\_\_2017A7PS0068P\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name:\_\_\_\_J Lakshmi Teja\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_17th October 2019\_\_

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