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

Batch No. :

**DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION SYSTEMS**

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

**I Semester 2017-18**

**Programming Assignment-2**

**Coding Details**

**(October 3, 2017)**

*Instruction: Type the details precisely and neatly*

1. ID : 2015A7PS0111P

Name :T Naga Datta Madhu Kiran

1. Mention the names of Submitted files :
   1. Analyses.py
   2. function.py
   3. gui.py
   4. main.py
   5. 2015A7PS0111P.docx
2. Total number of submitted files: 5
3. Name of the folder : 2015A7PS0111P
4. Have you checked that all the files you are submitting have your name in the top? YES
5. Have you checked that all the files you are submitting are in the folder as specified in 4 (and no subfolder exists)?YES
6. Problem formulation
   1. State representation:

State consists of 4 by 4 list representation of board with -1 for empty ,1 for machine 2 for human coin.

* 1. Pseudo code of your successor function

function successor function(state) return action

return max(Min-value(Result(state,a)) for all a belongs to Action(s)

* 1. Terminal states generation process

On fly generation of terminal states as in the problem statement it is mentioned to

write a terminal\_state\_check to dynamically check the states generated.

* 1. Data structure to store terminal states

terminal state is stored in 4 by 4 list.

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

terminal state is sent to terminal\_state\_check() funtion to check whether it terminal state or not and for calculate utility value state is sent to Utility function()

1. Minimax Technique details
   1. Node structure:

Implicit Node structure state and along with possible children

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

It is correct as I am checking for every possible pattern in board (24 pattern possible for each machine and human ) so This ensures terminal test is always correct. In my terminal test function I am taking current position and checking for patterns this ensures state which comes here is not a terminal state before placing the current coin. And I am checking for terminal state after placing the coin and if it is terminal state I am returning else continuing. Current position-just to reduce comparisions.

* 1. Total number of nodes generated to play one game: 503589 Nodes
  2. Write the statistics here as asked

R1 = 503589 Nodes R2= 104 Bytes R3= 16

R4 = 4.872414 seconds R5=0.1300452379

* 1. Code status → implemented fully

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

In Min node I am sending beta value as minimum (beta,current minvalue) to the children afterwards and in the Max node if min-value of its children (I.e min-nodes)is greater than beta value above do not check next min values of this max node and proceed(In deed these remaining nodes are getting pruned) and viceversa for Max n node.

* 1. Total number of nodes generated to play one game

19519

* 1. Write the statistics here as asked

R6 = 19519 nodes R7 =0.96124021 R8 = 0.489393

1. Code status → implemented fully

1. Comparative analysis

Fill in the following information based of 10 independent games

|  |  |  |
| --- | --- | --- |
|  | Minimax Algorithm | Alpha Beta Pruning |
| Average number of nodes created | 529888 Nodes | 24560 Nodes |
| Average time taken | 4.145271 seconds | 0.44324 seconds |
| Number of times machine wins (player M) | 10 | 10 |

1. GUI details
   1. Created the GUI :YES
   2. Have created it according to the specifications?YES
   3. Which module of Python is used for creating graphics? Turtle
   4. Is this under the standard Python library or not? YES
   5. If not, why?
2. Graphics details:
   1. Is turtle 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?

Took the human input using onscreenclick(),turtle function.

* 1. How are you showing the base line?

By using Red line on top along with text as ”BASELINE”

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

By using “Green coin”

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

By using “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:None
   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) Only this command is enough to compile and run the code >>python main.py
2. Driver Details: Does it take care of the options specified earlier(yes/no):yes

Execution status (describe in maximum 2 lines)

Working fine as per problem statement requirements. I am expecting Human to place coin as per instructions in the problem statement.

1. Declaration: I, T Naga Dattta Madhu Kiran 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 2015A7PS0111P Name: T Naga Dattta Madhu Kiran

Date: 3-Oct-2017

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* Should not exceed three pages