GE-103

Minimax Algorithm and Two Player Games

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***Abstract* — Tic Tac Toe game is a very popular game played between two participants on a 3x3 grid. A special symbol (X or O) is assigned to each player. As this is a pen and paper game, our objective of this game in the python project is to play this game without wasting paper and improve your concentration. We use a minimax algorithm by which our computer is able to look one step forward so that it never loses the game and to make it more interactive we use playsound function. when we run it, if we give invalid input then it will not stop working. it says you give invalid input. These are some small things which we improve in our research. Basically we say that we work on two player game by using the minimax algorithm.**

***Keywords* — Tic Tac Toe, player versus player mode, player versus computer mode, player versus the unbeatable computer mode, pyttsx3(python text to speech), playsound, minimax algorithm.**

I. INTRODUCTION:

Since childhood we have been playing different types of games. But as a programming student how can we define it? So, a game is basically strategic interdependence of different players or teams. Each of them tries to maximize their benefit and opponent's loss. Have you ever wondered how a chess program is designed for different levels? How does a computer perform smarter and smarter moves as the level ups? Minimax algorithm is one of the tools that is used to find the most optimal moves at any state of a game

So, our project is to program a tic tac toe. It's a two-player game. Both players are assigned two different symbols, a nought and a cross, which they can fill on a 3x3 matrix board, with alternating chances. The one who is first to complete a row or a column or a diagonal full of his symbol is the winner. If the board gets filled without a winner, then it is a tie. An interesting observation about this game, also proved mathematically, is that the first mover has more probability of winning the game. All these logics we are going to implant in a code to make our game.

II. LITERATURE REVIEW:

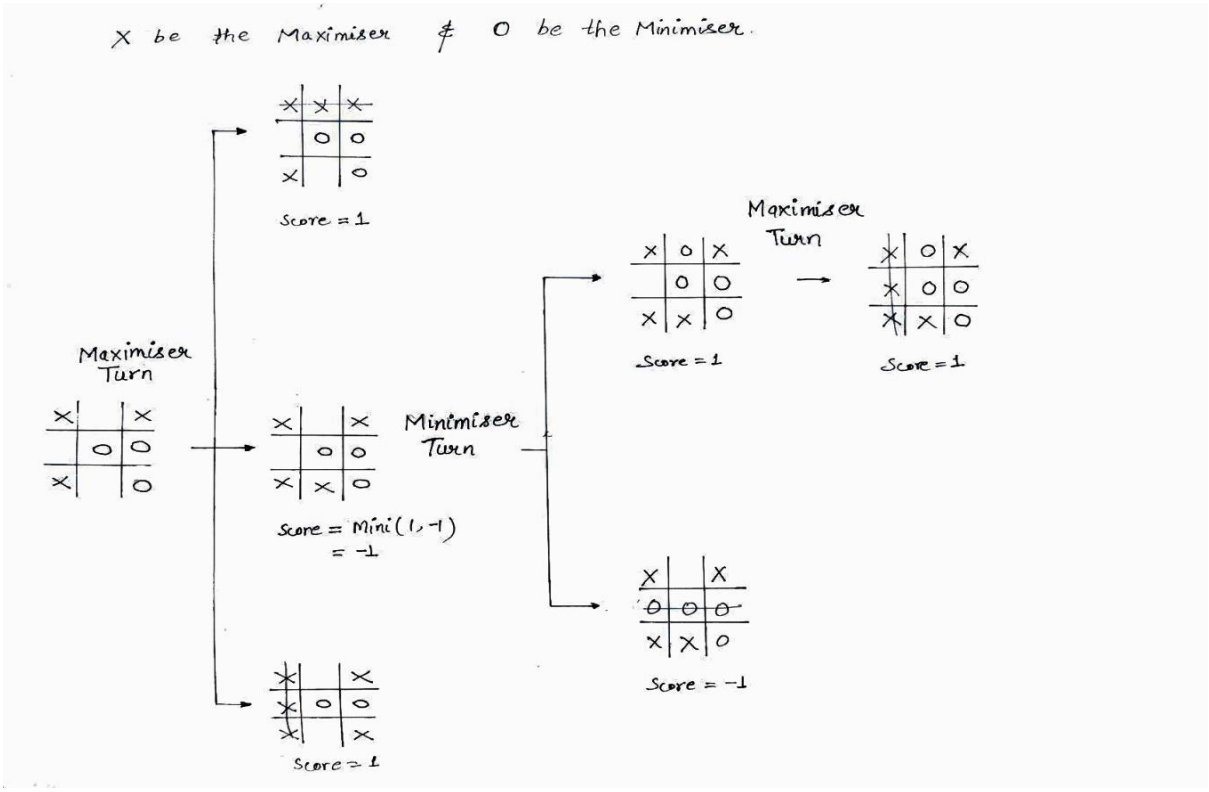
Tic tac toe also called as noughts and crosses game has gone through various phases across the history. In ancient Egypt it was played on tiles and wooden boards. Then in the recent world we used to play it with pen and paper. But it was in 1952 for the first time that it was programmed to be played on computer by British scientist Sandy Douglas in form of a video game which he named OXO. This program he wrote on EDSAC as a thesis on human computer interaction at Cambridge University.

This game was played by the AI equipped EDSAC against a human user. The user input was one of the positions of the 9 squares where he wanted to put the nought or the cross. Then it was followed by the computer's chance. Accordingly, the state of the game was displayed and got updated on the screen.

III. OBJECTIVE:

The objective of our project is to code a Tic Tac Toe game using python. We are using two lists to store each state of a tic tac toe board. The 3 x 3 board is initially filled with numbers from 0 to 8 indicating the positions at which crosses and noughts will be inserted. For users we are taking integer input of their choice. For player versus computer, we are developing two modes. One is when the computer randomly picks an unfilled place on the board.

The other one is when it picks the most optimal move among all. Our goal is to program it using the minimax algorithm as follows.



Here cross is the maximiser and, nought is the minimiser having base scores 1 and -1 respectively. For tie the score is defined zero. Now we backtrack and get the score of previous states. Now we pick the best path, i.e., it neglects the second path having score -1 and chooses either of the first or third path having score 1. Our aim is to achieve it using a recursive function in our python code.

In today's competitive world, we have to take strategic decisions. We have to be futuristic. Just like the computer calculates the score for all the possibilities and takes the most optimal move. Our decision making process should also be similar. Because it is only our decisions which can lead us to a success or failure which is analogous to win or loss in a tic tac toe.

IV. CONCLUSION:

In this project, we learnt how a computer behaves smarter after it is endowed with the minimax algorithm than previously where it was picking positions just by looking at one chance in future or doing it randomly. It is also in resonance with our theoretical knowledge that it is almost impossible to defeat it in this case.

One of the interesting ideas that we gained through this project is how to make our logic more and more perfect, by finding out the cases where our current logic is having limitations.

ACKNOWLEDGEMENT:

We are very thankful to our prof. Sudarshan sir who provided this opportunity. Also, this project would have been incomplete without our mentor Shahid Sir who guided us at every instance.

We would like to express that we have done this project thoroughly on our own without fetching any unethical means.

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