Khulna University of Engineering & Technology, Khulna

Department of Computer Science & Engineering

Course No. - CSE 4110

Project Report on

"AI Blocking Game"

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Objectives

The aim of this game is given below:

- To know about AI games.
- To know about the minimax algorithm.
- To know about Pygame library.
- To understand the logic behind AI practically.

Introduction

Artificial Intelligence has brought revolutionary changes in the aspect of Game Development. Many algorithms such as Minmax, Alpha-beta pruning, etc are regularly being used to develop AI-based games.

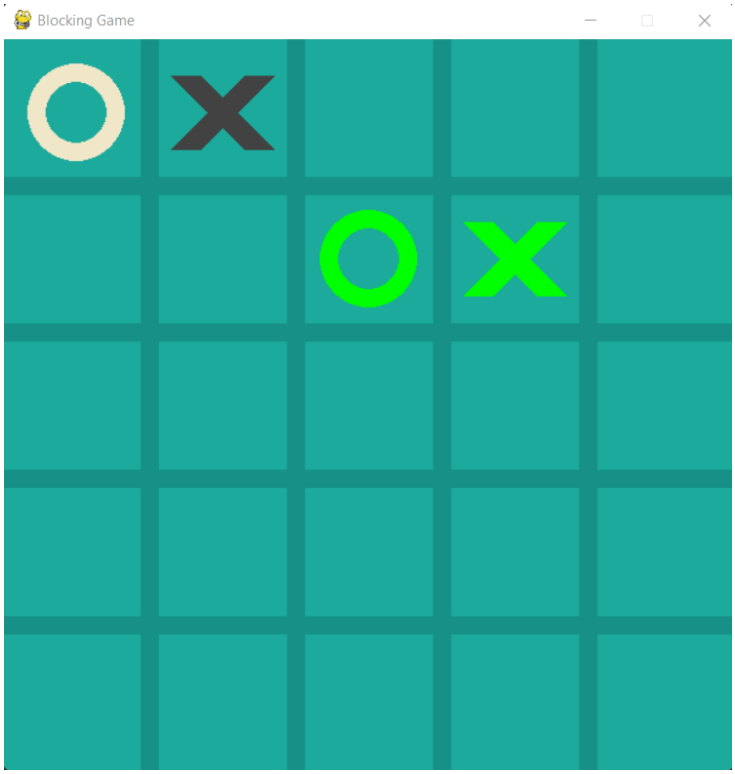

Figure-1: Game Interface

AI challenges an intelligent being by providing the best possible outcome. Minmax is a popular way to make the computer think very wisely. Tic tac toe, Chess, and many other games are being played against a computer. AI can check all possible outcomes and can give the most efficient move. Human vs AI is a very popular method of modern gaming. Previously, the games weren't much interactive. But after the use of AI, games nowadays are much more interactive and fun to play.

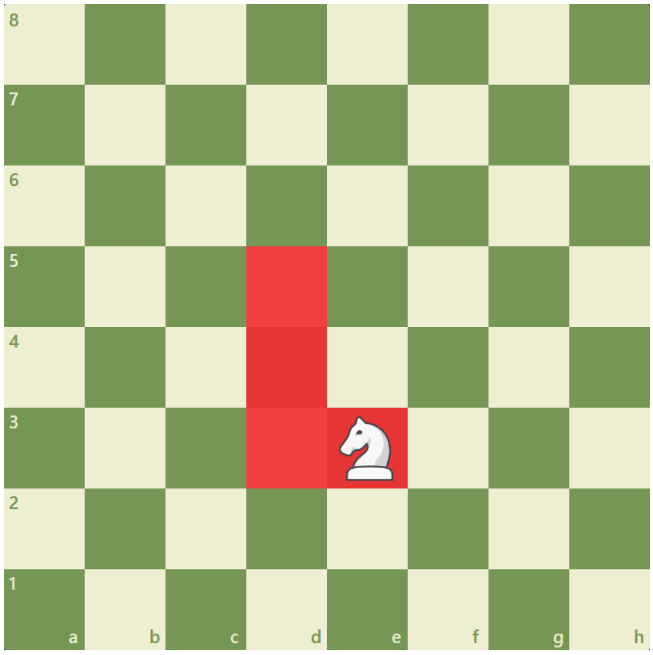

Figure-2: Knight Movement in Chess

There are many ways to create a game including but not limited to Android, PC. For console-based game applications Pyqt, Pygame and many other libraries are being used using Python language. We used the Pygame library to create the AI game.

Our game is titled "AI Blocking Game". The idea behind this game is to not let the opponent win. The main purpose for a player is to block the

opponent's movement. The movement is similar to the movement of a knight in Chess. The knight moves multiple squares each move. It either moves up or down one square vertically and over two squares horizontally OR up or down two squares vertically and over one square horizontally. This movement can be remembered as an "L-shape" because it looks like a capital "L".

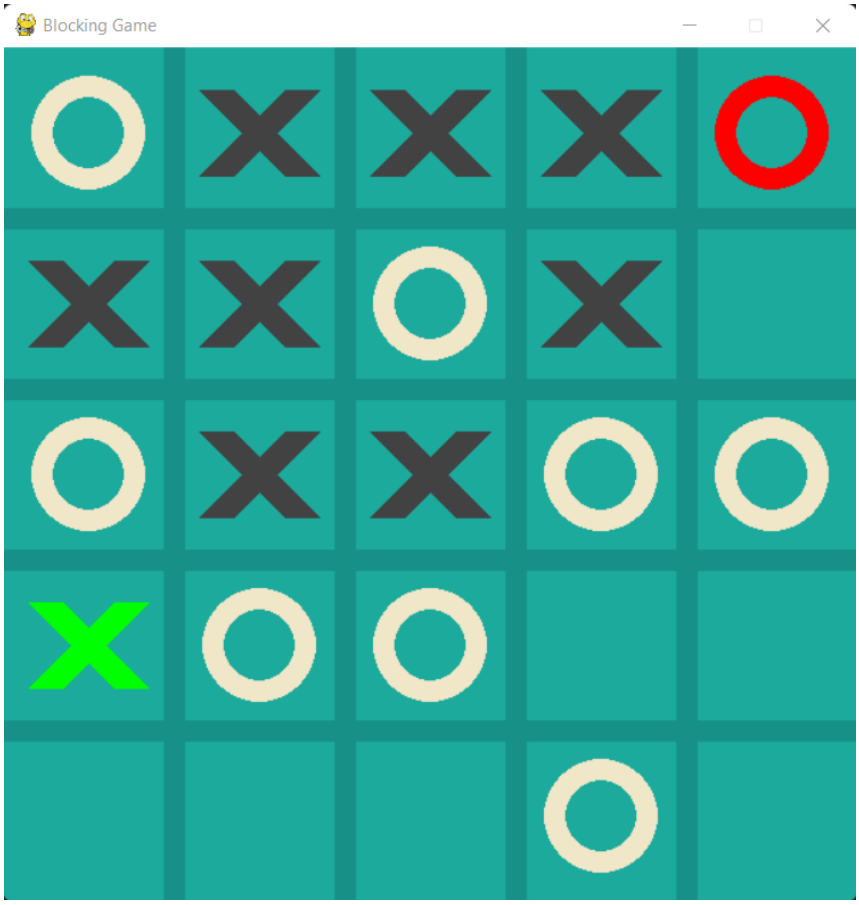

Figure-3: Game Over

Then, there's no move for the opponents, the player wins. This game can be played in two ways. One way is to play against another player and the other approach is to play against an AI.

Methodology

There are two modes for playing the game. The modes are described as follows:

1. Human vs Human
2. Human vs AI

Human vs Human: In this mode, there was no AI used. It is based directly on some simple logic. Both the players play with their intelligence to win the game.

Human vs AI: In this mode, the player will play against an AI. The first player is human and the second player is AI. The AI finds the best move by using the Minmax algorithm.

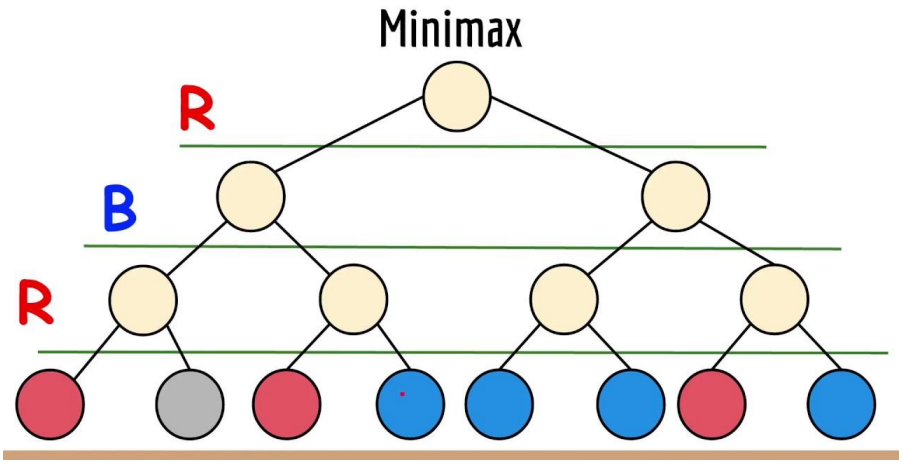

Figure-4: Minmax Algorithm

Minmax Algorithm: The minimax algorithm in AI, popularly known as the minimax, is a backtracking algorithm used in decision making, game theory, and artificial intelligence (AI). It is used to find the optimal move for a player, assuming that the opponent is also playing optimally. Minmax generates a tree. If the depth is increased, The AI performs much more efficiently.

As seen from the Figure-3, the outcome of a game where Player 1 lost against an AI. The outcome can also be observed from another angle.

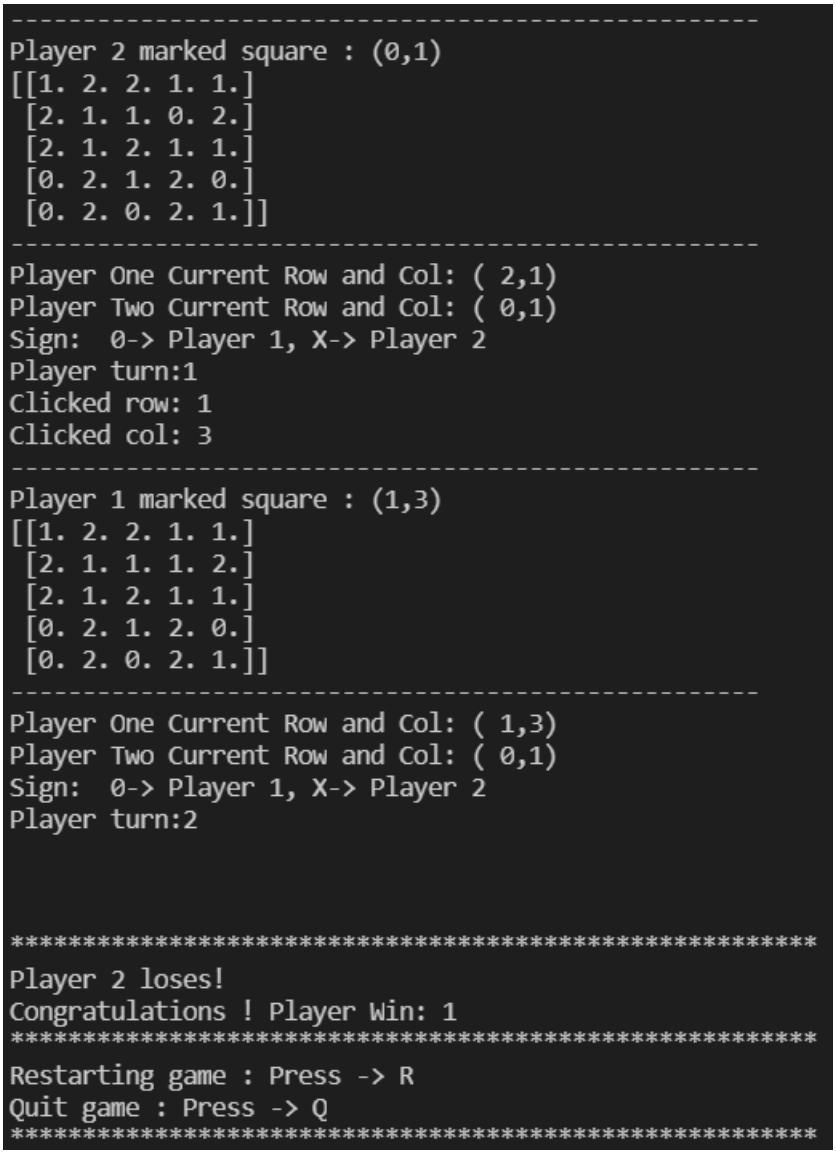

Figure-5: Board Outputs

The game ends when a player doesn't have any remaining moves.

Discussion

From the makers of the blocking game, we learned a lot of things. Sometimes the AI wins, sometimes the player. We learned about the Minmax algorithm, game development using Pygame, a python library. During the procedure, we faced many challenges. Initially, The AI wasn't working very efficiently. The performance sometimes depends on the depth. It takes a lot of processing time depending on the depth of the minimax algorithm. But finally, the AI performed well. This experience motivated us to do more precise and critical thinking. Overall, this game was a success.

Conclusion

To conclude, AI has created a new dimension in the world of game development. The amount of AI-based is increasing exponentially. As for our project, AI performed very satisfactorily. As it is an ongoing process, the work still has some areas to explore and improve.