CHECKERS AI GAME

Submitted in partial fulfilment of the requirements

of the degree of

Bachelor of Engineering in

Artificial Intelligence and Data Science

by

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under the guidance of

Supervisor (s):

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Department of Artificial Intelligence and Data Science

Vivekanand Education Society's Institute of Technology

2021-2022

Department of Artificial Intelligence and Data Science

Since 1962

Vivekanand Education Society's

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(Affiliated to University of Mumbai, Approved by AICTE & Recognized by Govt. of Maharashtra)

CERTIFICATE

This is to certify that **Vemburaj Konar, Prathmesh Pawar, Akanksha Singh, Tanvi Kate** of Second Year of Artificial Intelligence and Data Science studying under the University of Mumbai have satisfactorily presented the Mini Project entitled **Checkers AI Game** as a part of the MINI-PROJECT for Semester-III under the guidance of **Dr.(Mrs.) Anjali Shrikant Yeole** in the year 2021-2022.

Date: 17/12/2021

(Name and sign)
Head of Department

(Name and sign)
Supervisor/Guide

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Department of Artificial Intelligence and Data Science

DECLARATION

We, **Vemburaj Konar, Prathmesh Pawar, Akanksha Singh, Tanvi Kate** from **D6AD**, declare that this project represents our ideas in our own words without plagiarism and wherever others' ideas or words have been included, we have adequately cited and referenced the original sources.

We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our project work.

We declare that we have maintained a minimum 75% attendance, as per the University of Mumbai norms.

We understand that any violation of the above will be cause for disciplinary action by the Institute.

Yours Faithfully

1. Akanksha Singh
2. Tanvi Kate
3. Prathmesh Pawar
4. Vemburaj Konar

17/12/2021

(Name & Signature of Students with Date)

Acknowledgement

We take this opportunity to express my profound gratitude and deep regards to my teachers **Dr.(Mrs.) Anjali Shrikant Yeole** for her exemplary guidance, monitoring and constant encouragement throughout the course of this project. The blessing, help and the guidance given by her, time to time shall carry us a long way in the journey

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1. Introduction

1.1. Introduction

Checkers is an exciting board game which can always be further enhanced and developed in a way that it can be difficult to play against the computer.

The algorithms that are provided in this project are focused on to make the computer think before choosing the action, and it provides new techniques in the games and features which can make the game checkers more challenging and difficult depending on the levels that the player will choose when playing with the computer.

1.2. Problem Statement

To develop an AI based Checkers Game using the python module pygame.

- We will create a checkers game from scratch including board and pieces, and implement jumping, king pieces and double jumping graphics.
- We will implement the minimax algorithm with python code. Specifically we will use minimax to create a python AI that can play the game of checkers.

1.3. Objective

To learn the algorithms used to develop the AI game

To develop a game with AI in which opponent will be AI

1.4 Scope

Hopefully in the future more complex deep learning techniques that will be implemented in the game checkers other than minimax, to be able to make the player who plays against the computer more confused whether it is a computer that is playing or a human by not being able to differentiate between the two. And hopefully this goal will be achieved in the future.

2. Literature Survey

2.1Literature/Techniques studied

- We came to know about the minimax algorithm which are used in many games similar to checkers like othello, connect 4 and even in chess.

- But we came to know that the minimax algorithm can still be inefficient and for further optimization we use Alpha-Beta pruning

- Alpha-Beta pruning is exponentially improving in comparison to Minimax as the depth grows

2.2 Papers/Findings

- We came to know about Chinook. Chinook is a computer program that plays checkers (also known as draughts). It was developed between the years 1989 to 2007 at the University of Alberta.

Rules and Regulations

Setup

A classic 8x8 chessboard, only the dark squares are used.

It is positioned so that each player has a light square on the right side corner.

24 discs (12 of 2 colors)

Typically, they are flat and round. The color of one set is black and the other red or white or beige.

Game Play

Checkers is played by two players.

Each player begins the game with 12 discs and places them on the 12 dark squares closest to him or her.

Black opens the game, then players alternate their turns.

Randomly determine who gets the black pieces first. When playing a series of games, the players alternate who gets the black pieces.

MOVE

The pieces always move diagonally and single pieces are always limited to forward moves.

A piece making a non-capturing move may move only one square.

Capture

To capture a piece of your opponent, your piece leaps over one of the opponent's pieces and lands in a straight diagonal line on the other side. This landing square must be empty.

When a piece is captured, it is removed from the board.Only one piece may be captured in a single jump, but multiple jumps are allowed on a single turn.

If a player is able to make the capture, then the jump must be made.If more than one capture is available, then the player decides if he prefers this or not.

Single pieces may shift direction diagonally during a multiple capture turn, but must always jump forward (toward the opponent).

Upgrade a piece to a King

When a piece reaches the furthest row, it is crowned and becomes a king.

One of the pieces which had been captured is placed on top of the king so that it is twice as high as a single piece.

Kings are limited to moving diagonally but can move both forward and backward.

Kings may combine jumps in several directions (forward and backward) on the same turn.

End of the Game

A player wins the game when the opponent cannot make a move.

This happens usually because all of the opponent's pieces have been captured, but it could also be because all of his pieces are blocked in.

3.Analysis and Design

3.1 Analysis of the system

The pieces will move by click of mouse on that piece. The pieces will move diagonally .

The above left image is at start of game and the right image is at middle of game.

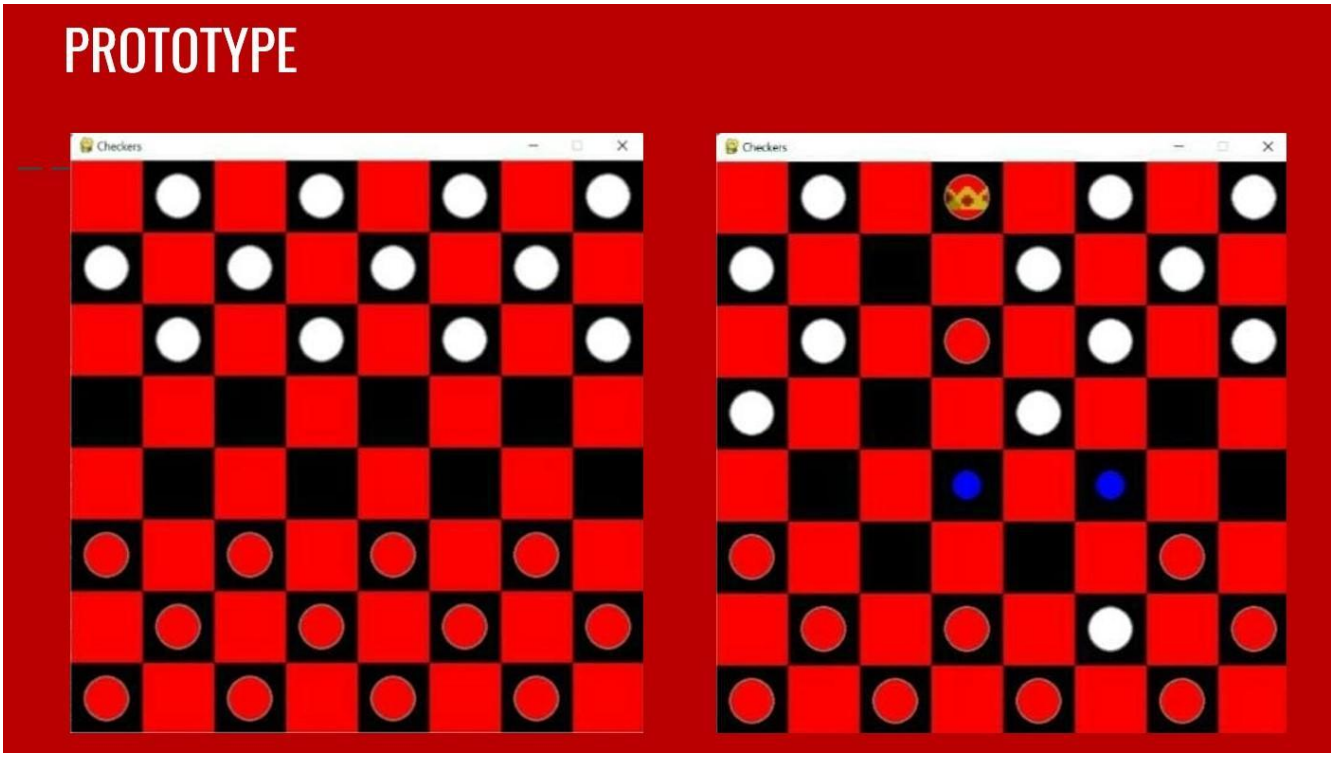
We can close the game and minimize the game by clicking on top right corner of the window.

The application will run on desktop and it will be like a desktop based application.

3.2 Proposed Solutions :

Python(pygame module) and minmax algorithm will be solutions to develop a AI checkers game

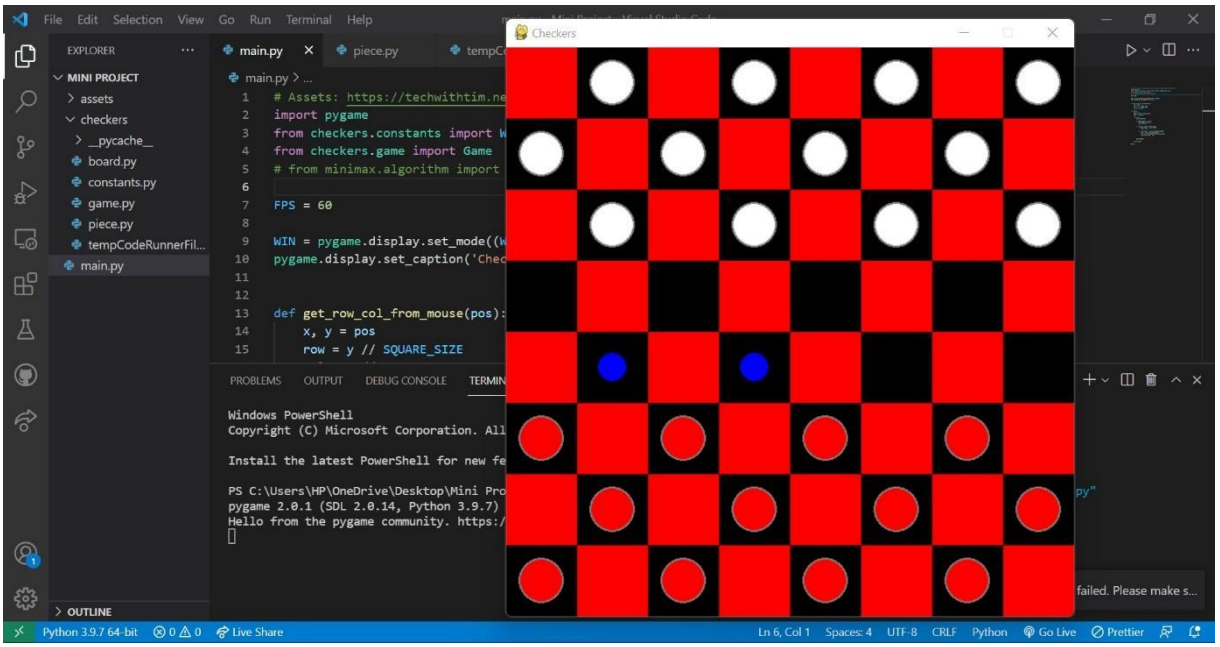
3.3 Design of the proposed system



3. Results and Discussion

RESULT

We have successfully created a 2 player game from scratch including the game board and pieces.
We have planned on introducing AI in the next semester.



DISCUSSION

As per discussion with ma'am we confirmed the project topic, rules and regulation, prototype, libraries, algorithms for AI, environment in which we are going to do project.
During discussion in team we came to know about minmax algorithm and refernces of the project.

4. Conclusion and Future Work

- We Will learn the python language
- Through pygame module in python we will create board, pieces and implement jumping, double jumping and piece to a king piece. So by this we will develop a two player game in python
- now further, We will learn the minimax algorithm and using the algorithm we will develop AI which play the game as opponent.
- Through minimax algorithm we can develop a more complex AI as compared to random AI which makes Random moves
- The project will run in desktop and it will be like a desktop application.

References:

Video for Python->
https://www.youtube.com/watch?v=sxTmJE4k0ho
Video for Pygame->
https://www.youtube.com/watch?v=jO6qQDNa2UY
More about Chinook->
https://webdocs.cs.ualberta.ca/~chinook/databases/
Minimax Algorithm->
https://www.youtube.com/watch?v=l-hh51ncgDI