Tic Tac Toe Implementation using MiniMax Algorithm

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Mini-Max Algorithm:

Minimax algorithm is a recursive method used to determine the optimal move for a player, assuming that the opponent also plays optimally. The algorithm explores all possible moves and their subsequent outcomes to make decisions that maximize the AI's advantage while minimizing the opponent's chances of winning.

Design Logic:

player(board): Counts the number of X's and O's on the board to alternate turns

actions(board): Scans the board for empty cells and returns their indices

result(board, action): Creates a deep copy of the board and applies the move, ensuring the original board is not modified

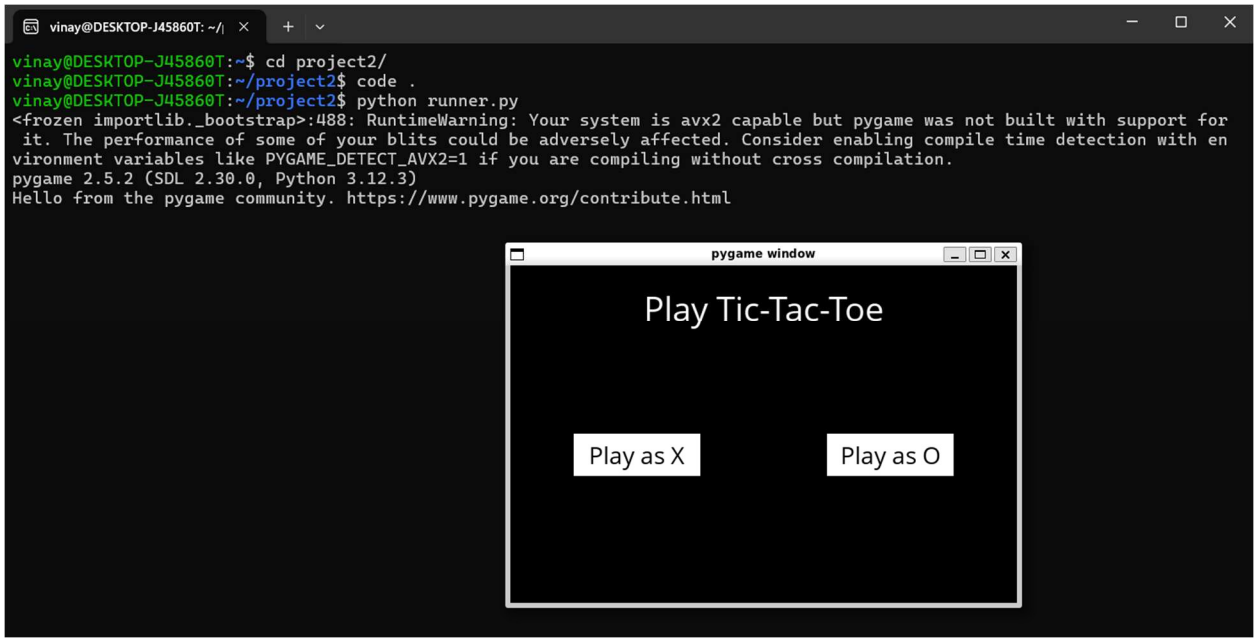
winner(board): Checks all rows, columns, and diagonals for three identical non-empty values

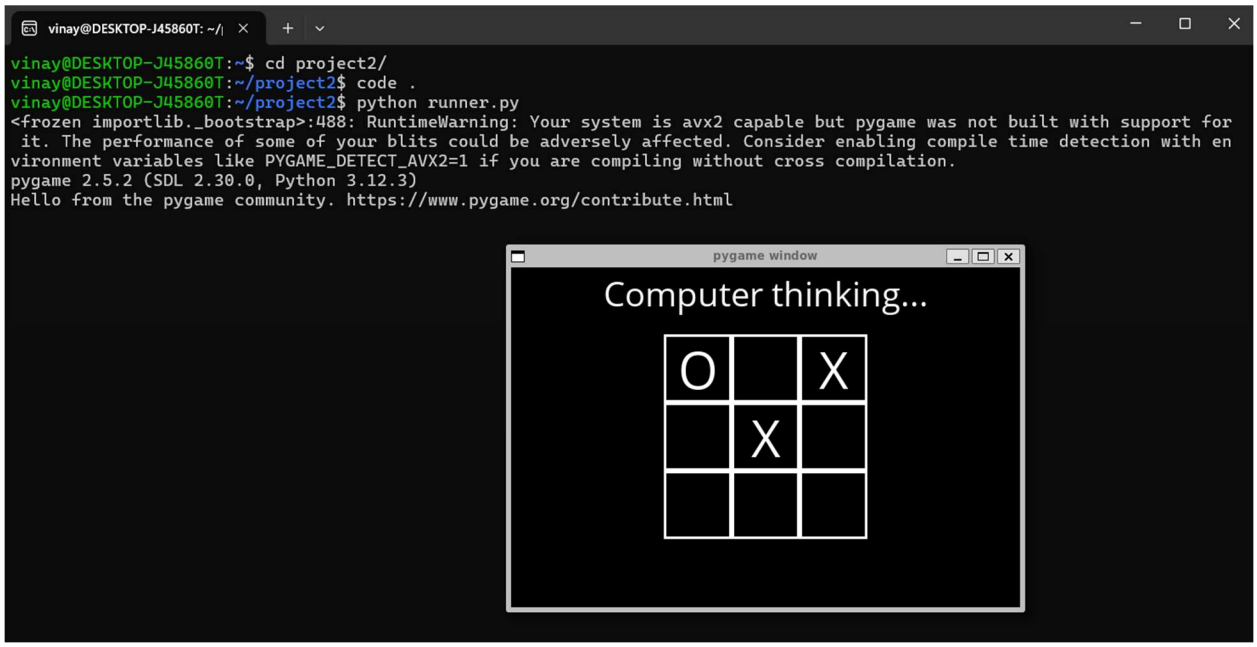
terminal(board): Returns True if the board is full or a winner exists

utility(board): Returns 1 if X wins, -1 if O wins, and 0 for a tie

minimax(board): Explores all possible moves for the current player, recursively calculates the utility of resulting states using helper functions max_value and min_value, and chooses the move with the highest utility for X or the lowest utility for O

Screenshots:





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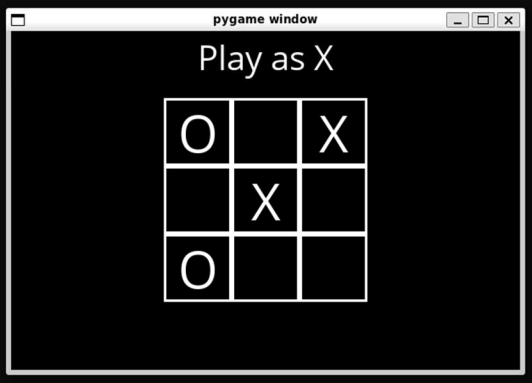
vinay@DESKTOP-J45860T: ~/
vinay@DESKTOP-J45860T:~$ cd project2/
vinay@DESKTOP-J45860T:~/project2$ code .
vinay@DESKTOP-J45860T:~/project2$ python runner.py
<frozen importlib._bootstrap>:488: RuntimeWarning: Your system is avx2 capable but pygame was not built with support for
 it. The performance of some of your blits could be adversely affected. Consider enabling compile time detection with en
vironment variables like PYGAME_DETECT_AVX2=1 if you are compiling without cross compilation.
pygame 2.5.2 (SDL 2.30.0, Python 3.12.3)
Hello from the pygame community. https://www.pygame.org/contribute.html
```

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