Block-Tac-Toe: 5x5 Tic-Tac-Toe with Obstacles

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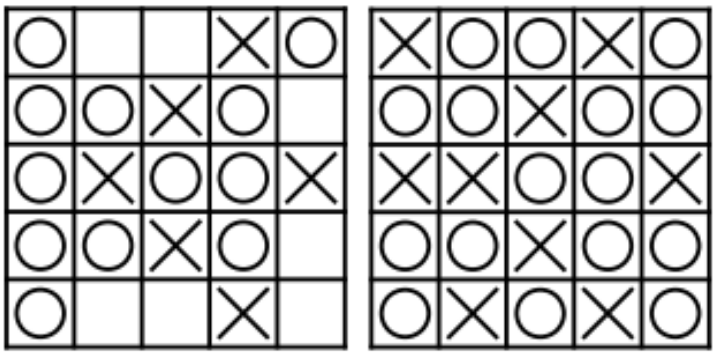
14/05/2025

Abstract

This project implements a 5x5 Tic-Tac-Toe game with obstacle pieces using object-oriented programming. It features a simple reinforcement learning agent trained to play the game. The application supports both human vs. human and human vs. AI game modes, providing a platform to explore AI behavior in a modified game environment.

1 Project Overview

This project presents an object-oriented programming (OOP) implementation of a modified 5x5 Tic-Tac-Toe game, we call it **Block-Tac-Toe** The game introduces an additional layer of complexity by including 'obstacle' pieces alongside the traditional 'X' and 'O' markers, with the winning condition being the first player to achieve three of their markers in a row horizontally, vertically, or diagonally. A core component of this project is the development and integration of a simple reinforcement learning (RL) agent designed to learn optimal strategies for playing this variant of the game. The application provides two distinct player modes: a classic two-player mode allowing human vs. human competition on the same device, and a human vs. AI mode where a human player can challenge the trained RL agent. This project serves to demonstrate the application of OOP principles in game development and explore the effectiveness of simple reinforcement learning techniques in creating an intelligent agent for a non-trivial game environment, offering an engaging platform for users to play and observe AI behavior.



2 Core part of Block-Tac-Toe

2.1 Classes

2.1.1 Cell

This represents the four possible contents of a square:

- EMPTY = 0, X = 1, O = 2, WALL = 3