Finding target path in a maze environment using Monte Carlo Tree Search

PROJECT PROPOSAL

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Introduction

Monte Carlo Tree Search (MCTS) is an Artificial Intelligence (AI) search strategy. It's a probabilistic and heuristic-driven search method that blends traditional tree search implementations with reinforcement learning machine learning principles.

MCTS searches for possible moves and records the results in a search tree. As more searches are performed, the tree grows larger as well as its information.

In this project, we will attempt to record such moves and try to evaluate the best set of moves that will help us navigate through a maze environment.

Problem

All of us have played the maze game in our childhood. Such games are not only played for fun but help the human brain evolve. Human intelligence is more reliable and resilient compared to Artificial Intelligence, which is basically some lines of codes written by humans. It is easy for humans to play such games and evolve but when it comes to computers, the table turns. The question is, whether or not Artificial Intelligence can play and solve games/puzzles like the maze game.

Solution

Using MCTS we will attempt to build a visual representation of a completely simulated navigation of an AI bot through an n-dimensional maze with randomly generated obstacles. The main challenge of the proposed algorithm will be to dynamically evaluate the best paths for each simulation iteration. MCTS is a straightforward algorithm to use. It can work efficiently without any prior knowledge of the domain, save from the rules and end conditions, and can discover and learn from its own moves by playing random playouts. Any intermediate state of the MCTS can be preserved, and that state can be used in future use cases as needed.

We will be using Python, a versatile programming language which will allow us to represent the algorithm in a visually digestible manner.We will be using Python’s class based methods to maintain the states in the memory. Using packages like Tkinter we hope to bring the simulation to life.