AI Project Report

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1 Abstract

This study attempts to use artificial intelligence in order to play Tetris. The success of the AI, in a game that theoretically could go on forever, was measured in terms of number of rows destroyed. A 7-bag modern approach to Tetris was used to generate the pieces. The AI algorithm used was a breadth-first search algorithm that [WRITE MORE]

2 Introduction

2.1 Tetris as a Non-trivial Game

Tetris is a game created in 1984 that involves tile matching "blocks" consisting of different orientations of consecutive cells. These blocks are referred to as tetrominoes, or shapes composed of four squares (cells) connected orthogonally. The tetrominoes are dropped, one at a time, on a 10 x 20 grid space and players are expected to tile match pieces together. Once a row of ten cells are filled with the squares composing the tetrominoes, those squares are deleted and squares above said row move down. Players lose by creating filling so many rows that the new blocks have no place to generate and the game is over; this is referred to as a block out. The objective of the game, since it can theoretically go on infinitely, is to get the highest score, which is typically calculated by how many rows were destroyed. The game poses a complex problem for artificial intelligence (even for a single-player game) as there are many possible combinations of pieces and many places and orientations that a new piece can be placed. An algorithm needs to be fast enough to perceive the best move for a given piece in a given state space.

2.2 7-Bag - A Modern Approach

Older versions of Tetris generated the next piece randomly. In this study, we use a modern approach to tetromino piece generation called the 7-bag approach. The 7-bag approach essentially generates pieces by creating a set of each of the pieces and then randomly takes a piece to generate until the set is empty, the process starts over. This ensures that the same piece will generate again in, at maximum, 13 moves.

2.3 Background

This paper was strongly influenced by the work of Max Bergmark on his Bachelors Thesis "Tetris: A Heuristic Study". Bergmark's AI calculates the number of holes on a given game and defines holes heuristically three ways: 1

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3 Approach

3.1 Representation

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3.2 Algorithms