Tetris AI

The Playing Style Vector

Tetris AI is a project I started to teach myself how Ai works. The project is created from scratch and does not use any packages, plugins or anything of that nature.

The decision-making process of the AI is incapsulated in a vector of length 6. The vector is a point on a 6-dimensional unit ball and all elements are above zero. Each element of the vector represents how much the AI cares about a negative quality of a Tetris move. Bellow are the qualities of a move each vector indices points to.

1. The sum of all height in each column

2. How uneven the board is

3. The number of holes in the playing board

4. How deep the holes on the board are buried

5. The increase in score from the move

6. The maximum difference in height on the board

Ai Playing the Game

When deciding where to place a piece, the AI duplicates the board and tries placing the given piece in every possible orientation. This is 40 plays, (10 columns) * (4 rotations) = 40. Each move is scored based on how well the play aligns with the AI vector.

For example, if the hole depth index is a large number relative to the other indices on the vector, the AI is likely to make a move that does not create a hole on the board.
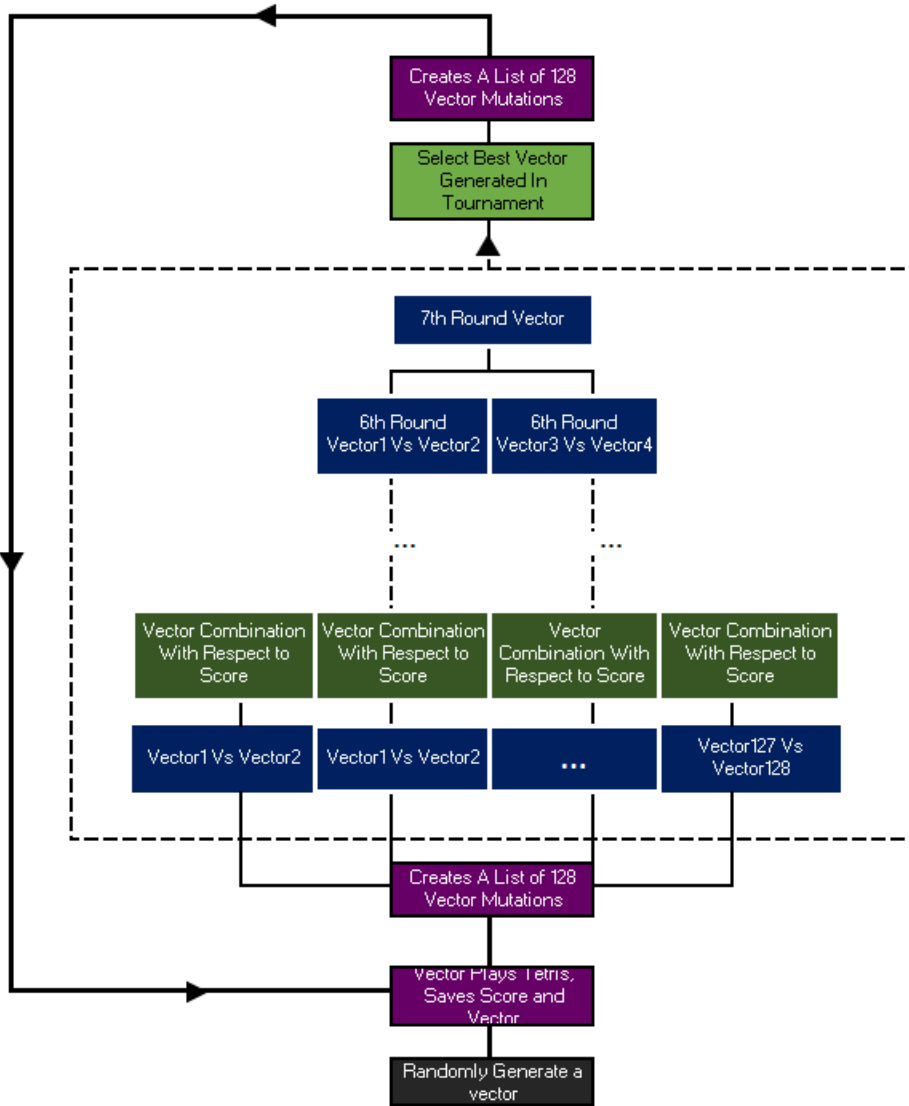
When the game is finished and the score is recorded, the AI will begin the back-propagation phase.

Back-Propagation

The Genome will mutate $(2^n - 1)$ amount of times. The amount the vector will mutate is inversely corelated with the games score (if the game did well the mutants will mutate less). Game mutation uses the following function: $(a)/ ((1 + score) ^b)$. Where (a) and (b) are both manually entered parameters

The mutants will enter a round robin tournament where they will face off against each other. At this point, the original unmutated vector will join the tournament. Each vector in the tournament round will play Tetris to determine their Tetris score. They will then "Bread with each other" meaning the 2 vectors will blend together with respect to their score. Thus, the new vector that has been "born" will have features that most resemble the vector with a higher score.

This process will continue n times until the tournament is completely played out. The vector that received the best score in the entire tournament will be the vector that represents the next generation.

Creates A List of 128
Vector Mutations

Select Best Vector
Generated In
Tournament

7th Round Vector

6th Round
Vector1 Vs Vector2

6th Round
Vector3 Vs Vector4

...

...

Vector Combination
With Respect to
Score

Vector Combination
With Respect to
Score

Vector
Combination With
Respect to Score

Vector Combination
With Respect to
Score

Vector1 Vs Vector2

Vector1 Vs Vector2

...

Vector127 Vs
Vector128

Creates A List of 128
Vector Mutations

Vector Plays Tetris,
Saves Score and
Vector

Randomly Generate a
vector

Where I got some Ideas

Yiyuan Lee,
April 14, 2013
https://codemyroad.wordpress.com/2013/04/14/tetris-ai-the-near-perfect-player/

Siraj Raval
May 24, 2017
https://www.youtube.com/watch?v=xLHCMMGuN0Q

I also found the Tetris game on GitHub, But I can no longer find it.