DEVELOPMENT OF AN AUTONOMOUS AGENT FOR TETRIS

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LEI, Inteligência Artificial
2021/2022

The Algorithm

The algorithm consists of a greedy tree search with pruning.

It can be split into two main sections:

- Calculate the optimal move
  - Generate all possible moves
  - Validate move (assign the move a score)
  - Prune the worst branches
- Generate the instructions for a move

The Heuristics

To assign a score to a move, four parameters are evaluated:

- Area Occupied - height of each column
- Lines Cleared
- Holes
- Bumpiness - height difference between consecutive columns

```
def validate_move(gamestate, lines, high_points):

    a = -0.510066   # area
    b = 0.760666    # lines
    c = -0.35663    # holes
    d = -0.184483   # bumpiness

    bumpiness = 0
    area = _height - high_points[-1]
    for i in range(len(high_points)-1):
        bumpiness += abs(high_points[i] - high_points[i+1])
        area += _height - high_points[i]

    holes = (area - (len(gamestate) - (len(_bottom)-2)))
    points = a*area + b*lines + c*holes + d*bumpiness
    return points
```

Move Calculation

- Determine the first column that will intersect the piece and the point of intersection.
- After getting the pivot point, generate the coordinates of the piece.

```
def calculate_move(highpoints, piece, column, floor_piece):

    pivot = [0, _height+1]
    coords = []
    # Get the first column that intersects the piece
    for fp in floor_piece:
        if highpoints[column + fp[0] - 1] - fp[1] < pivot[1]:
            pivot = [fp[0], highpoints[column + fp[0] - 1] - fp[1]]
            coords = [fp[0], highpoints[column + fp[0] - 1]]

    # Calculate the piece location based on y of the column
    offset = max([y[1] for y in piece if y[0] == pivot[0]])
    move = [[p[0] + column, coords[1] - 1 + p[1] - offset] for p in piece ]
    return move, coords[1]
```

Bibliography

Values for Heuristics from:

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

Special Thanks to:

- Diogo Monteiro, Lucius Vinicius, Afonso Campos
- Rodrigo Lima, Diana Siso, João Borges