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Block Escape

AI First Project

Related work

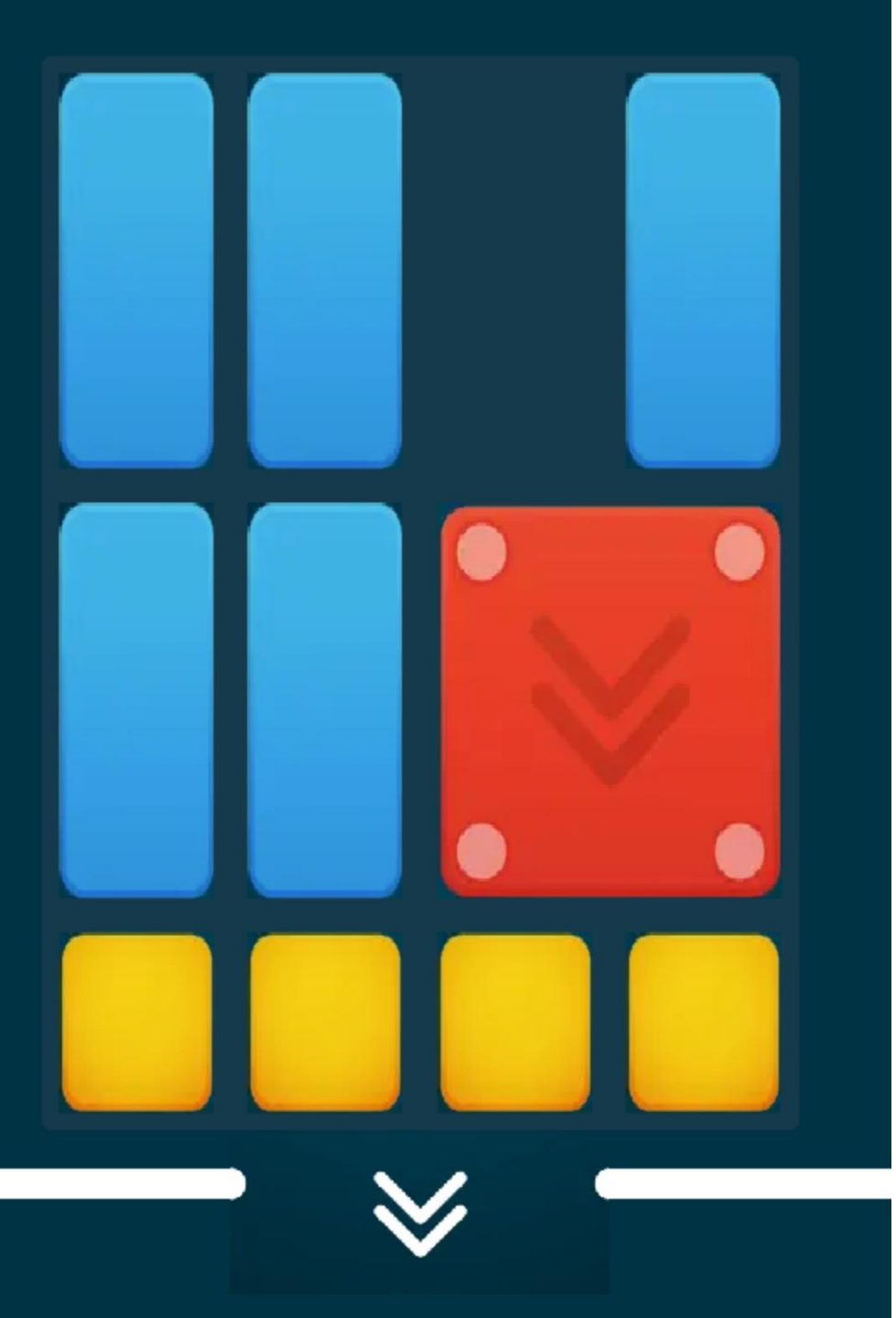
- Stuart Russell, Peter Norvig; Artificial intelligence. ISBN: 978-0-13-207148-2
- Richard S. Sutton; Reinforcement learning. ISBN: 978-0-262-03924-6
- Stuart Russel, Peter Norvig; Artificial Intelligence: A modern Approach.
- https://www.transum.org/Maths/Investigation/CarPark/

Specification of the work

- **Goal:** take the red piece to the exit, while navigating around obstacles on a limited grid.

- **Project Objectives:**
  - Implement search algorithms to efficiently calculate an efficient path to the exit.
  - Test and analyze various algorithms and heuristics to determine the best approach for the game.

- **Algorithms:** breadth-first search, depth-first search, iterative deepening, uniform cost, greedy search, A* algorithm and weighted A*



Formulation of the problem as a search problem

Goal: Move the red piece out of the board through a series of movements without getting blocked.

State Representation: An object Puzzle with defined dimensions and a list of pieces.

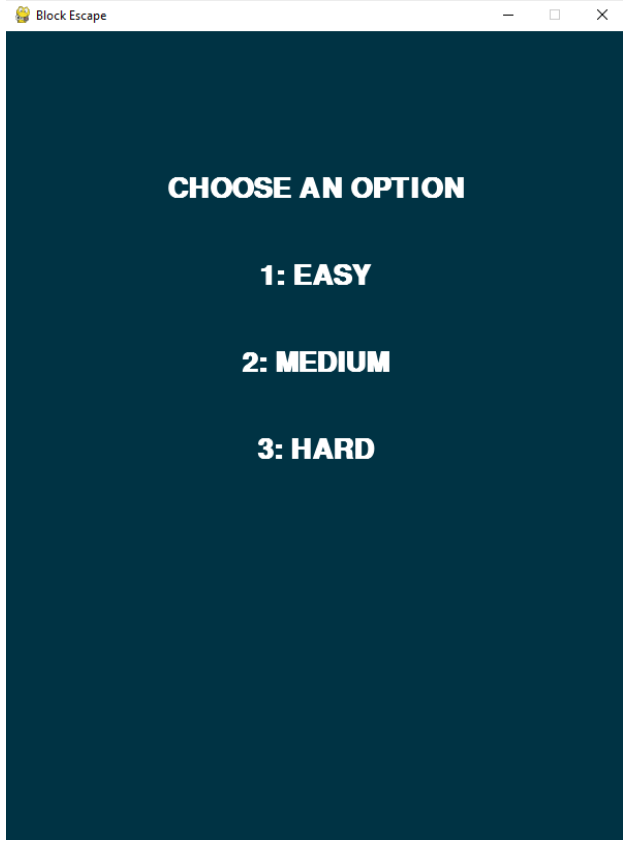
Initial State: A board filled with pieces and the red piece blocked.

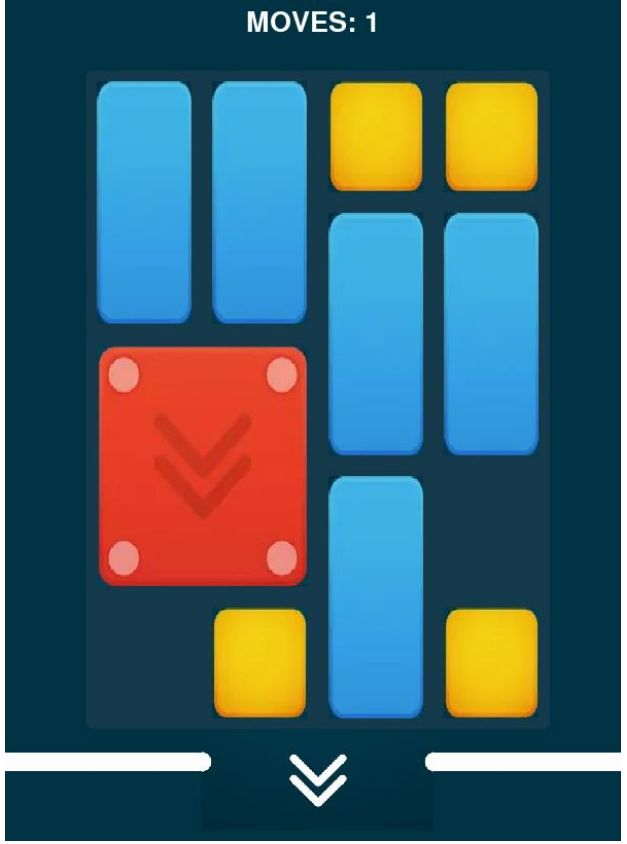
Operators: move: Move a piece to an empty space in the game board.

- Preconditions: Enough space adjacent to the current position and the coordinate is valid on the game board.
- Cost: 1 move.
- Effect: Update the position of the piece and end the game if the red piece reaches the exit.

Heuristics:

- H1: Distance from the red block to the exit.
- H2: Weighted sum of the number of obstacles between the red block and the exit.
- H3: The largest contiguous empty space near the red block.
- H4: Prioritize moves that keep the red block close to the edges of the game board.
- H5: Always ensure that the red block has at least one valid move option available.
- H6: Prioritize fitting pieces along the edges of the game board from largest to smallest.
- H7: Prioritize moving the largest pieces on the game board first.





Implementation work already carried out

- Menu that allows users to start or quit the game
- Difficulty level selection after starting the game
- Graphical User Interface (GUI) for piece movements
- Game over detection to determine when the game ends
- Total moves counter to keep track of the number of moves made