COMP30024 Artificial Intelligence Project Part A Report

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All of the answers for full marks.

The game has been formulated as a search problem considering each board configuration as a state. Each legal white move in that board configuration is one of the actions that can be taken given that state. The goal test simply compares the current board configuration to an empty board. Our path cost is one per action. [ASK IN TUTE ABOUT A* PATH COST]

A* was chosen as the search algorithm because it is complete in this search space with finite nodes. Empirically, A* was found to be more efficient than other algorithms like iterative deepening. [ASK IN TUTE ABOUT A* TIME COMPLEXITY] The chosen heuristic calculates the manhattan distance between all black pieces to all white pieces. It sums up the smallest distance for each black piece.

$x_{1,i}$ = x coordinate of ith black piece $i \in 1, \ldots, n$
$y_{1,i}$ = y coordinate of ith black piece $i \in 1, \ldots, n$
$x_{2,j}$ = x coordinate of jth white piece $j \in 1, \ldots, m$
$y_{2,j}$ = y coordinate of jth white piece $j \in 1, \ldots, m$
Let S_i be the set of Manhattan distances from the ith black piece to all white pieces.
$S_i = \{|x_{2,j} - x_{1,i}| + |y_{2,j} - y_{1,i}| : j \in 1, \ldots, m\}$
$$h(node) = \sum_{i=1}^{n} \min(S_i)$$