Assignment - AIR 1

* PROBLEM STATEMENT: Solve 8-puzzle problem using A* algorithm. Assume any initial configuration & define goal configuration clearly.

* OBJECTIVES: - Understand A* algorithm.
- Understand searching algorithms for 8 puzzles problem.

* OUTCOME: Solve 8 puzzle problem using A* algorithm.

* SOFTWARE AND HARDWARE REQUIREMENTS: 64 bit CPU, 4 GB RAM, UNIX/ LINUX based OS, python 3, Any IDE.

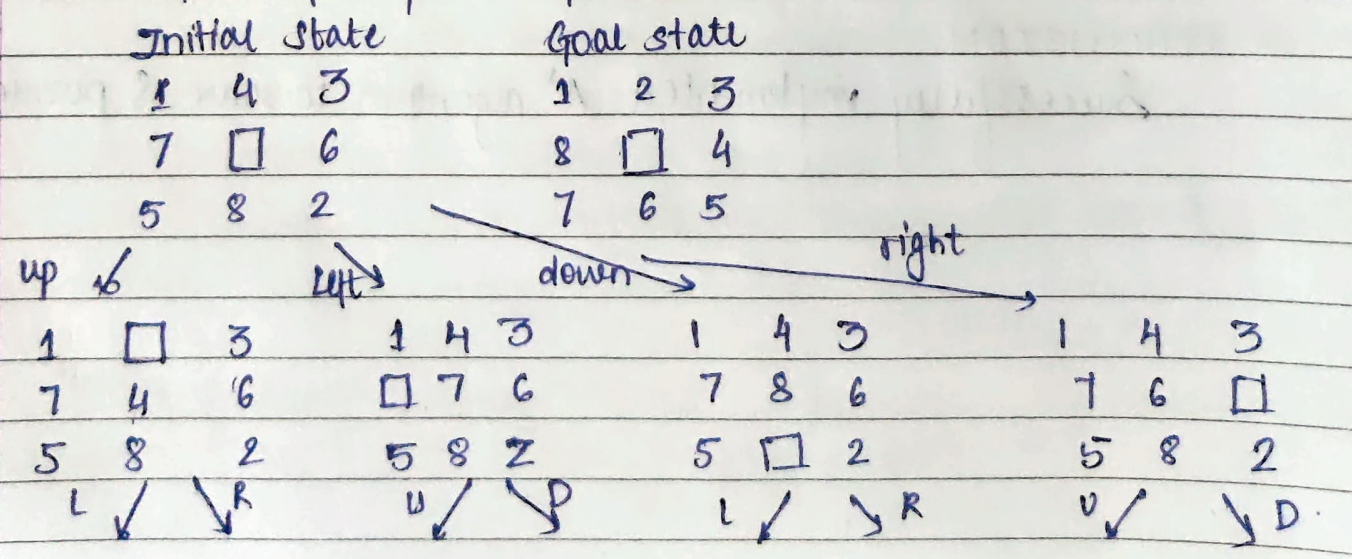
* THEORY:

• 8 puzzle problem: N-puzzle or sliding puzzle is a popular puzzle that consists of N tiles where N can be 8, 15, 24 and so on.

• We are considering the case N=8. the puzzle is divided into sqrt(N+1) rows and sqrt(N+1) columns. So 8-puzzle will have 3 rows & columns.

• The puzzle consists of 8 tiles & one empty space where the tiles can be moved. Start and goal configurations are provided. The goal can be achieved by moving the tiles one by one in empty space.

• State space of 8 puzzle problem.



- In this way 'children' states of current state can be derived, because the empty space can only be moved in 4 directions, which is further restricted by the position.

- A* Algorithm:

The A* algorithm integrates characteristics of uniform cost search & heuristic based search to find optimally efficient. The key feature of A* is that it keeps track of open each visited node which helps in ignoring the already visited nodes, as well as a list of nodes yet to be explored. From this list it chooses most optimal node.

So, we use the 2 lists namely open list & closed list: open list contains all the nodes that are being generated & are not existing in closed. As each node is explored, it is added to closed list & its neighbours are added to open. Each node has a 'pointer' to its parent so that at any given point path to parent can be retraced.

The metric used to determine optimal-ness of a node is f-score.

f-score = h-score + g-score.
how far goal node is → no. of nodes traversed from start to current node.

The h-score is Manhattan distance = abs(x1-x2) + abs(y1-y2)

* CONCLUSION:

Successfully implemented A* algorithm to solve 8 puzzle problem.