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Artificial Intelligence with Python

Lab test - 1

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8 Puzzle Problem

A* Algorithm

A* algorithm is an informed search algorithm / Heuristic algorithm. In informed algorithm, problem specific knowledge is ~~kno~~ known and used by search strategy to solve problem.

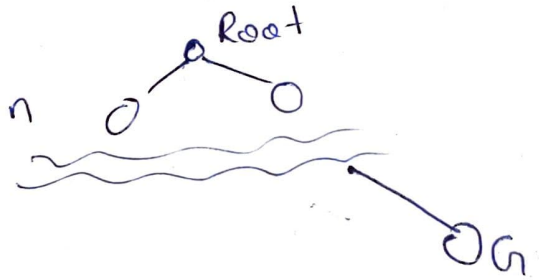
In A* algorithm, we use

$f(n) = g(n) + h(n)$

$g(n)$ = ~~Ac~~ctual cost to reach node n

$h(n)$ = Estimated / heuristic cost to reach goal node from node n

$f(n)$ = Total estimated cost to reach goal node



A* algorithm is admissible, that is, it do not overestimate the path cost, so it leads to optimal solution

We will have two classes

Node
- Defining a node structure
- Methods to generate child nodes

Puzzle
- Class actually implementing the puzzle
- Methods to calculate heuristic value and total f(n)

```
class Node:
    def __init__(self, data, level, fval): # initializing the node

    def generateChild(self):
        # Getting blank space position
        # Then swapping to get children of current node
```

```
class Puzzle:

    def __init__(self, size):
        self.n = size
        self.open = []          # Initializing two lists
        self.close = []

    def fval(self, start, goal): # Getting the f(n)
        return g(start) + h(start)

    def start_problem(self):
        # Get start state and goal state
        # Traverse through initial state(root) till find the goal state.
```

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- Start with root node
- place it in open list

If it's not the goal state, generate the child (if child is not in closed list)
calculate f(n) for each child
child with least f(n) is selected and continued further

- Place the explored node in closed

So, repeat process till you get the goal state