

**CENG 462—Artificial Intelligence****HOMEWORK—I**

Due March 25, 2019 23:59

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Write a program that implements A\* and IDA\* algorithms that solve 8-puzzle. Note that 8-puzzle problem consists of a  $3 \times 3$  frame containing 8 numbered tiles and one empty or blank space represented by 0. Any tile horizontally or vertically adjacent to the blank can slide into the blank position. The goal is to find a shortest sequence of moves that transforms the initial state to the goal state. If a problem instance is not solvable, your program should return **fail**. The maximum depth of any eight-puzzle instance is 31 moves. Use the Manhattan distance heuristic function. It is computed by summing, for each tile except the blank, the distance of that tile in grid units from its goal position.

**Input**

Input file is named **input.txt**. It contains the initial state and the goal state (two  $3 \times 3$  matrices separated by a blank line).

Example Input file:

```
0 1 2
3 4 5
6 7 8
```

```
1 2 3
8 0 4
7 6 5
```

**Output** Output files are named **outputA.txt** and **outputIDA.txt**. Output files contain a sequence of states starting from the initial state and ending at the goal state if there is a solution. Otherwise, they should contain **fail**.

Example Output file:

```
0 1 2
3 4 5
6 7 8
```

```
1 0 2
3 4 5
6 7 8
```

```
.
.
.
```

1 2 3  
8 0 4  
7 6 5

### **Submission Policy**

- You are going to submit a single file called `hw1.py`.
- Your codes will be graded on inek machines. Make sure they run on these correctly.
- Late submissions will not be accepted.
- All work must be done individually and in compliance with course policy.