Program 2: Solve 8 puzzle problem.

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PROGRAM - 2 Solve 8 puzzle problem

Given a 3X3 board with 8 tiles (every tile has one number from 1 to 8) and one empty space. The objective is to place the numbers on tiles to match final configuration using the empty space. We can slide four adjacent (left, right, above and below) tiles into the empty space.

Program

```
class Node:
    def __init__(self, data, level, fval):
        self.data = data
        self.level = level
        self.fval = fval

    def generate_child(self):
        x, y = self.find(self.data, '_')
        val_list = [[x, y-1], [x, y+1], [x-1, y], [x+1, y]]
        children = []
        for i in val_list:
            child = self.shuffle(self.data, x, y, i[0], i[1])
            if child is not None:
                child_node = Node(child, self.level+1, 0)
                children.append(child_node)
```

```
        return children
    def shuffle(self, puz, x1, y1, x2, y2):
        if x2 >= 0 and x2 < len(self.data) and y2 >= 0
        and y2 < len(self.data):
            temp_puz = []
            temp_puz = self.copy(puz)
            temp = temp_puz[x2][y2]
            temp_puz[x2][y2] = temp_puz[x1][y1]
            temp_puz[x1][y1] = temp
            return temp_puz
            else:
                return None
        def copy(self, root):
            temp = []
            for i in root:
                t = []
                for j in i:
                    t.append(j)
                temp.append(t)
            return temp
        def find(self, puz, x):
            for i in range(0, len(self.data)):
                for j in range(0, len(self.data)):
                    if puz[i][j] == x:
                        return i, j
class Puzzle:
    def __init__(self, size):
        self.n = size
        self.open = []
        self.closed = []
    def accept(self):
        put = []
```

```
        for i in range (0, self.n):
            temp = input().split(" ")
            puz.append(temp)
        return puz

    def f(self, start, goal):
        return self.h(start.data, goal) + start.level

    def h(self, start, goal):
        temp = 0
        for i in range(0, self.n):
            for j in range(0, self.n):
                if start[i][j] != goal[i][j] and start[i][j] != '_':
                    temp += 1
        return temp
    def process(self):
        print("Enter the start state matrix \n")
        start = self.accept()
        print("Enter the goal state matrix \n")
        goal = self.accept()
        start = Node(start, 0, 0)
        start.fval = self.f(start, goal)
        self.open.append(start)
        print("\n\n")
        while True:
            cur = self.open[0]
            print("")
            print("  / \n")
            print(" /  \n")
            print("/ _ \n")
            for i in cur.data:
                for j in i:
```

```
            print(j, end = " ")
        print("")
    if (self.h(cur.data, goal) == 0):
        break
    for i in cur.generate_child():
        i.fval = self.f(i, goal)
        self.open.append(i)
    self.closed.append(cur)
    del self.open[0]
    self.open.sort(key = lambda x: x.fval,
    reverse = False)

puz = Puzzle(3)
puz.process()
```

Output: Start State matrix

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

Goal state matrix

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

```
2 _ 3
1 8 4
7 6 5
  |
  |
  V
_ 2 3
1 8 4
7 6 5
```


classmate
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1
1 2 3
- 8 4
7 6 5
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1 2 3
8 - 4
7 6 5

```
#8 puzzle problem
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    def generate_child(self):
        x, y = self.find(self.data, '_')
        val_list = [[x, y - 1], [x, y + 1], [x - 1, y], [x + 1, y]]
        children = []
        for i in val_list:
            child = self.shuffle(self.data, x, y, i[0], i[1])
            if child is not None:
                child_node = Node(child, self.level + 1, 0)
                children.append(child_node)
        return children

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        if x2 >= 0 and x2 < len(self.data) and y2 >= 0 and y2 < len(self.data):
            temp_puz = []
            temp_puz = self.copy(puz)
            temp = temp_puz[x2][y2]
            temp_puz[x2][y2] = temp_puz[x1][y1]
            temp_puz[x1][y1] = temp
            return temp_puz
        else:
            return None

    def copy(self, root):
```

```
        temp = []
        for i in root:
            t = []
            for j in i:
                t.append(j)
            temp.append(t)
        return temp

    def find(self, puz, x):
        for i in range(0, len(self.data)):
            for j in range(0, len(self.data)):
                if puz[i][j] == x:
                    return i, j



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        return puz

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        return self.h(start.data, goal) + start.level
```

```
def h(self, start, goal):
    temp = 0
    for i in range(0, self.n):
        for j in range(0, self.n):
            if start[i][j] != goal[i][j] and start[i][j] != '_':
                temp += 1
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def process(self):
    print("Enter the start state matrix \n")
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    goal = self.accept()

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    start.fval = self.f(start, goal)
    self.open.append(start)
    print("\n\n")
    while True:
        cur = self.open[0]
        print("")
        print("  | ")
        print("  | ")
        print(" \\\'/ \n")
        for i in cur.data:
            for j in i:
                print(j, end=" ")
            print("")
        if (self.h(cur.data, goal) == 0):
```

```
            break
        for i in cur.generate_child():
            i.fval = self.f(i, goal)
            self.open.append(i)
        self.closed.append(cur)
        del self.open[0]

        self.open.sort(key=lambda x: x.fval, reverse=False)


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```

outputs:

```
Enter the start state matrix


2 _ 3

1 8 4

7 6 5
Enter the goal state matrix


1 2 3

8 _ 4

7 6 5




   |
   |
  \'/

2 _ 3
1 8 4
7 6 5

   |
   |
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_ 2 3
1 8 4
7 6 5

   |
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```

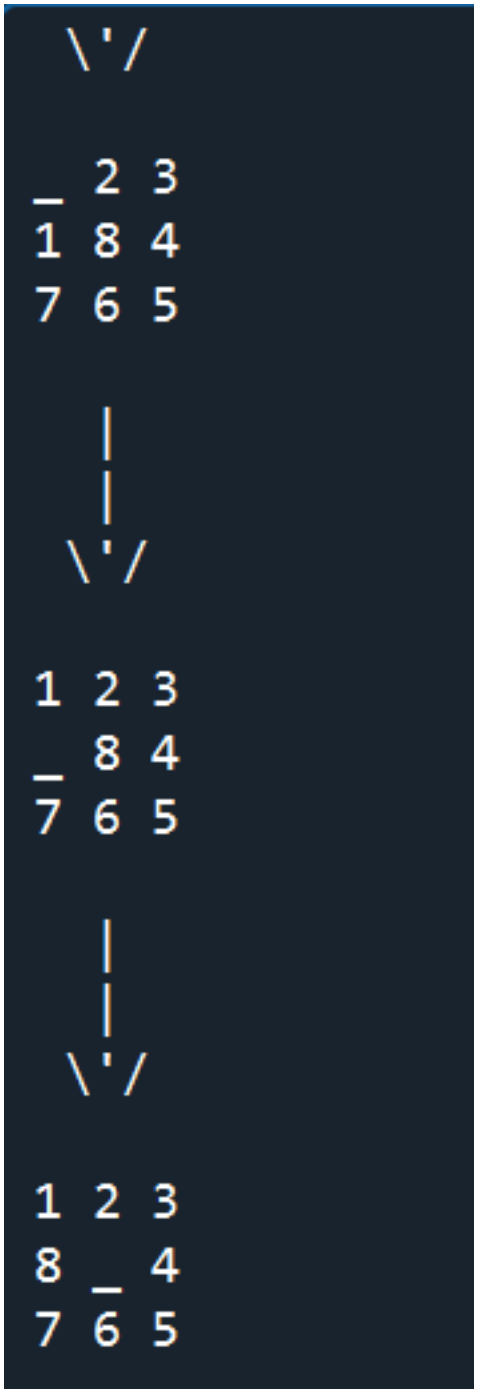
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