

CPS 480 - 580 summer 2020: Artificial Intelligence.

Sai srikar rao kondu.

1016200320.

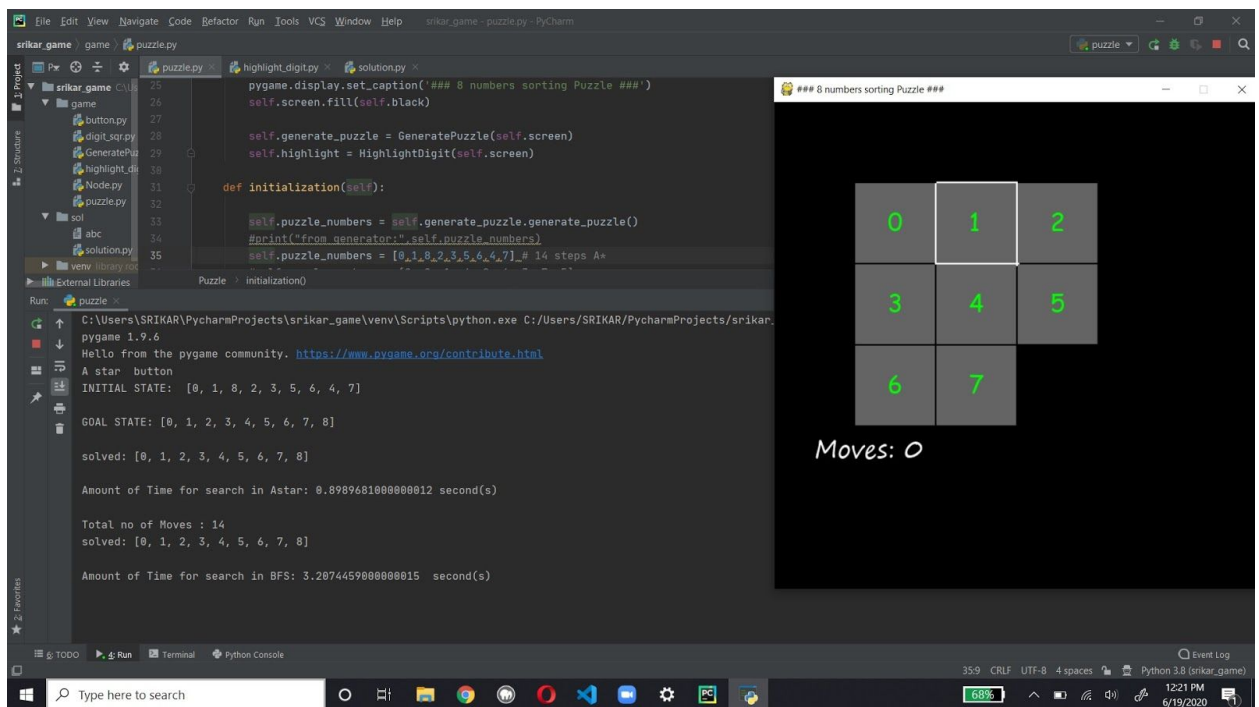
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Assignment : A star search puzzle solving.

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Comparison of Astar search and BFS :

1. Easy level puzzle.



The screenshot shows a PyCharm IDE with a project named 'srikar_game'. The file 'puzzle.py' is open, showing the following code:

```
25 pygame.display.set_caption('### 8 numbers sorting Puzzle ###')
26 self.screen.fill(self.black)
27
28 self.generate_puzzle = GeneratePuzzle(self.screen)
29 self.highlight = HighlightDigit(self.screen)
30
31 def initialization(self):
32
33     self.puzzle_numbers = self.generate_puzzle.generate_puzzle()
34     #print("from generator:", self.puzzle_numbers)
35     self.puzzle_numbers = [0, 1, 8, 2, 3, 5, 6, 4, 7] # 14 steps A*
```

The terminal output shows the following results:

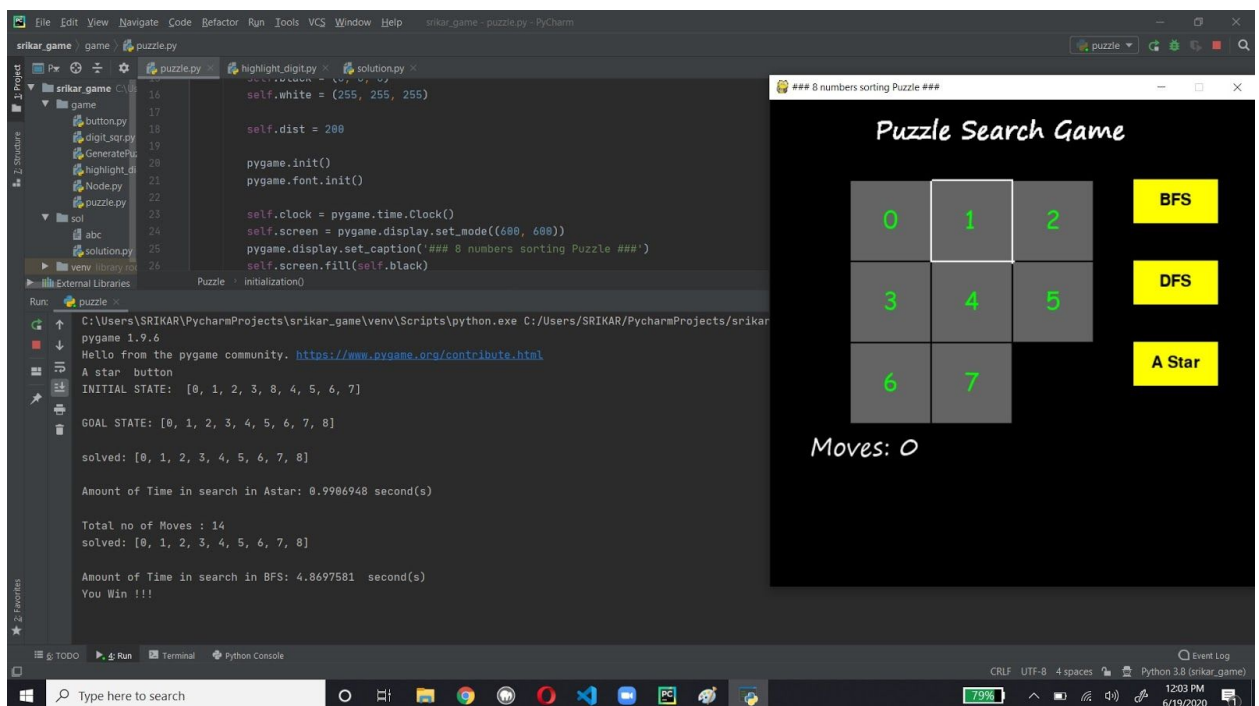
```
Run: puzzle
C:\Users\SRIKAR\PycharmProjects\srikar_game\venv\Scripts\python.exe C:/Users/SRIKAR/PycharmProjects/srikar...
pygame 1.9.6
Hello from the pygame community. https://www.pygame.org/contribute.html
A star button
INITIAL STATE: [0, 1, 8, 2, 3, 5, 6, 4, 7]
GOAL STATE: [0, 1, 2, 3, 4, 5, 6, 7, 8]
solved: [0, 1, 2, 3, 4, 5, 6, 7, 8]
Amount of Time for search in Astar: 0.89896810808080812 second(s)
Total no of Moves : 14
solved: [0, 1, 2, 3, 4, 5, 6, 7, 8]
Amount of Time for search in BFS: 3.2074459808080815 second(s)
```

The game window displays a 3x3 grid with the following numbers:

0	1	2
3	4	5
6	7	

Moves: 0

2. Medium level puzzle



The screenshot shows a PyCharm IDE with a project named 'srikar_game'. The file 'puzzle.py' is open, showing the following code:

```
16 self.white = (255, 255, 255)
17
18 self.dist = 200
19
20 pygame.init()
21 pygame.font.init()
22
23 self.clock = pygame.time.Clock()
24 self.screen = pygame.display.set_mode((600, 600))
25 pygame.display.set_caption('### 8 numbers sorting Puzzle ###')
26 self.screen.fill(self.black)
```

The terminal output shows the following results:

```
Run: puzzle
C:\Users\SRIKAR\PycharmProjects\srikar_game\venv\Scripts\python.exe C:/Users/SRIKAR/PycharmProjects/srikar...
pygame 1.9.6
Hello from the pygame community. https://www.pygame.org/contribute.html
A star button
INITIAL STATE: [0, 1, 2, 3, 8, 4, 5, 6, 7]
GOAL STATE: [0, 1, 2, 3, 4, 5, 6, 7, 8]
solved: [0, 1, 2, 3, 4, 5, 6, 7, 8]
Amount of Time in search in Astar: 0.9986948 second(s)
Total no of Moves : 14
solved: [0, 1, 2, 3, 4, 5, 6, 7, 8]
Amount of Time in search in BFS: 4.8697581 second(s)
You Win !!!
```

The game window displays a 3x3 grid with the following numbers:

0	1	2
3	4	5
6	7	

Moves: 0

Buttons for BFS, DFS, and A Star are visible on the right side of the game window.

3. Hard level puzzle.

The image shows a PyCharm IDE with a Python script for an 8-number sorting puzzle. The script is titled `puzzle.py` and is part of a project named `srikar_game`. The script defines a `Puzzle` class with methods for initialization, puzzle generation, drawing, and solving. The `initialization` method sets the puzzle numbers to `[1, 2, 3, 0, 5, 4, 6, 7, 8]` for the hard level. The `draw_puzzle` method draws the puzzle on the screen. The `solve` method uses the A* search algorithm to solve the puzzle. The `run` method displays the initial state, goal state, and the solution path.

```
def initialization(self):
    self.puzzle_numbers = self.generate_puzzle.generate_puzzle()
    #print("from generator:", self.puzzle_numbers)
    #self.puzzle_numbers = [8, 1, 8, 2, 3, 5, 6, 4, 7] # 14 steps A*
    #self.puzzle_numbers = [2, 8, 1, 4, 8, 6, 3, 7, 5]
    #self.puzzle_numbers = [8, 1, 2, 3, 8, 4, 5, 6, 7] #med
    self.puzzle_numbers = [1, 2, 3, 0, 5, 4, 6, 7, 8] #hard

    self.generate_puzzle.draw_puzzle(self.puzzle_numbers)
    solve_button = Button(self.screen, (255, 255, 153), 450, 100, 100, 50, "BFS")
    # ...
```

The game window, titled "8 numbers sorting Puzzle", displays the puzzle state as a 3x3 grid of numbers. The numbers are 0, 1, 2 in the top row; 3, 4, 5 in the middle row; and 6, 7, and an empty space in the bottom row. To the right of the grid are three buttons: "BFS", "DFS", and "A Star". Below the grid, it says "Moves: 0".

The console output shows the following information:

```
pygame 1.9.6
Hello from the pygame community. https://www.pygame.org/contribute.html
A star button
INITIAL STATE: [1, 2, 3, 0, 5, 4, 6, 7, 8]
GOAL STATE: [0, 1, 2, 3, 4, 5, 6, 7, 8]
solved: [0, 1, 2, 3, 4, 5, 6, 7, 8]
Amount of Time for search in Astar: 3.4189521999999988 second(s)
Total no of Moves : 16
solved: [0, 1, 2, 3, 4, 5, 6, 7, 8]
Amount of Time for search in BFS: 43.1128989 second(s)
You Win !!!
```