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Graph Solver Project Report

We were assigned problem number 11, which is find s where is_path(s, A, B) and color(s, Color, t) and t>C. A, B, C, and Color are user inputs, and t is number of edges that has the color k. For our solver, we're finding all sets of edges that has a path from A to B, and the paths must satisfy the condition t>C.

In main.py, it asks for a csv file in the command argument, and then, asks user inputs. The input nodes must exist in the graph to output a path. Once the program obtains all the inputs, it creates a graph from network module that contains all nodes between every edge, their edge weight, and their edge color. Then, it is passed to find_paths(), which will output all possible paths into a output.txt file.

In find_paths(), it is a recursive function that starts with node A, and, using networkx's neighbor(), it will find every node that is connected to A. When it finds B, it will check is_path() and color() and determine whether the path will be outputted to output.txt. Any dead end or paths that don't satisfy the conditions will not be outputted. Figure 1 shows when the user's inputs are A=1, B=6, C=1, k=green, and output.txt. Figure 2 shows the graph.csv file which the program runs from.

```
path_0:
1, 2
2, 7
7, 3
3, 4
4, 6
path_1:
1, 2
2, 7
7, 6
path_2:
1, 3
3, 7
7, 6

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

Microsoft Windows [Version 10.0.18362.476]
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C:\Users\hayde\Documents\GitHub\EECS118\GraphProblemSolver>python main.py graph.csv
Input A:
1
Input B:
6
Input C:
1
Input Color:
green
1 6 1 green
color() is True
is_path() is True
color() is True
is_path() is True
color() is True
is_path() is True
```

Figure 1

```
1,2,0.5,green
1,3,0.9,green
1,4,1.0,black
2,7,0.7,green
7,3,0.5,green
3,4,0.1,blue
4,6,0.2,white
7,6,0.6,white
```

Figure 2

Above is one of the test cases, where the program found three paths that satisfied the conditions. Rest of the test cases are shown below:

Test case 2 using the same graph from Figure2:

```
Input A:
4
Input B:
1
Input C:
2
Input Color:
black
4 1 2 black
```

From the inputs, the program didn't output anything because there isn't a path that satisfy t>C, where t=1 and C=2.

Test case 3 using the same graph from Figure 2:

```
1   path_0:
2   7, 6
3   6, 4
4   4, 1
5
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL

```
C:\Users\hayde\Documents\GitHub\EECS118\GraphProblemSolver>python main.py graph.csv
Input A:
7
Input B:
1
Input C:
0
Input Color:
white
7 1 0 white
color() is True
is_path() is True
```

From the inputs, there exist only one path that satisfies the condition from node 7 to 1.

```
0,7,5,green
1,17,5,green
2,3,5,green
2,6,5,green
2,18,5,green
2,19,5,green
4,16,5,green
5,14,5,green
5,16,5,green
5,12,5,green
7,10,5,green
7,13,5,green
7,14,5,green
8,15,7,green
8,12,7,green
9,11,7,green
11,19,7,green
12,17,7,green
17,19,7,green
```

Figure 3

Test case 4 using graph from Figure 3:

```
C:\Users\hayde\Documents\GitHub\EECS118\GraphProblemSolver>python main.py g3.csv
Input A:
2
Input B:
17
Input C:
5
Input Color:
green
2 17 5 green
```

The program didn't output anything because there no such path.

Test case 5 using graph from Figure 3:

```
1   path_0:
2   17, 12
3   12, 5
4   5, 16
5
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL

C:\Users\hayde\Documents\GitHub\EECS118\GraphProblemSolver>python main.py g3.csv
Input A:
17
Input B:
16
Input C:
2
Input Color:
green
17 16 2 green
color() is True
is_path() is True
```

The program found a path that satisfies the conditions.