



SOFE 2715U Data Structure Winter 2020

Due Date: By 11:59 pm on March 28, 2020
No late assignments will be accepted!

Assignment 2

Graph Algorithms

This assignment concerns graphs and traversals algorithms. For this assignment, you are to implement a simple representation of a graph, and the possibility to search the graph.

Detailed Instructions

1. Implement some representation of directed graphs. You are advised to use adjacency list representation.
2. Implement the possibility of doing a BFS traversal of your graph, starting at a user-specified vertex. The program should print the order in which the vertices are discovered.
3. Implement the possibility of doing a DFS traversal of your graph, starting at a user-specified vertex. The program should print the order in which the vertices are discovered.
4. Implement a path finding algorithm. That is, compute a directed path from vertex u to vertex v , or reporting such path does not exist

Hint: you can specialize the DFS algorithm to find a path between two given vertices u and v by calling $DFS(u)$ with u as the start vertex. You can use stack to keep track of the path between the start vertex and the current vertex.

Programming Requirement

1. The program accepts three arguments as follows:

myProgram <fileName> <action> <starting>

where

- myProgram is program's name
- <fileName> the name of the text file containing a description of a graph as defined below.
 - <action> is either DFS, BFS or PATH, telling the program to execute a DFS or a BFS, or a path finding algorithm respectively.
 - <starting> is a natural number telling the program which node to start the search from.

2. The input text file should have:

```
1 3
1 2
3 2
1 4
4 1
4 5
```

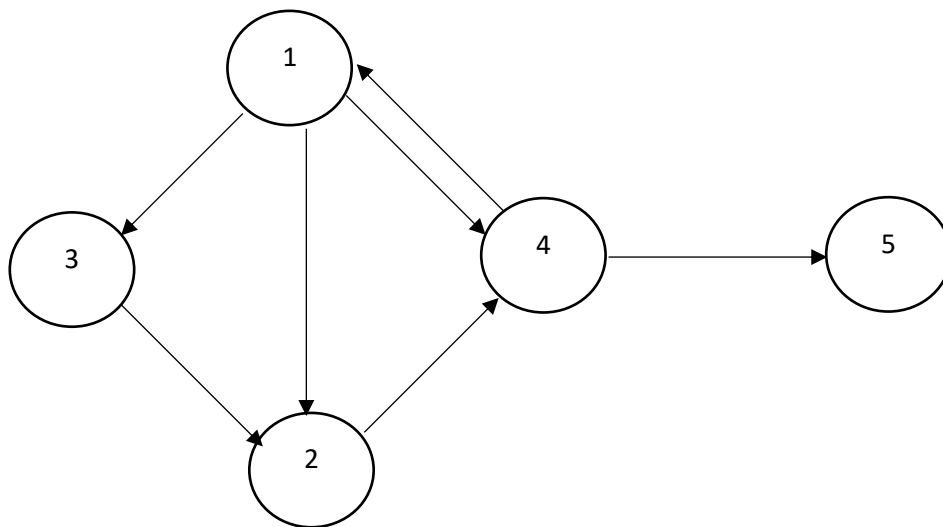


Figure 1

representing the graph $G(V,E)$ such that $V:\{1; 2; 3; 4;5\}$ and $E:\{ (1, 3); (1, 2); (3, 2); (3, 4); (1, 4) ; (4, 1);(4,5) \}$, shown in the Figure 1, a pair of numbers on each line describing the edges of the graph.

3. For DFS and BFS implementation, in the case that there are vertices not reachable from the starting vertex, you need to output all vertices by restarting from a white vertex.

4. Your program should be executable with different text files as an input and should not be limited to certain number of nodes and edges when representing graph.
5. You do not need to write a report for this assignment. However, you should enclose a plain text file that describes the commands to compile and run your program.

Deliverables

- Hand in your program and all additional required files:
 - A text file containing the commands to compile and run your program.
 - Your program source code (java files).