COLORADO MESA UNIVERSITY

Assignment 2

Graph Theory Algorithms

Task Description

Construct a data input file containing the representation of the graph pictured below a "DIGRAPH". The "DIGRAPH" vertices labels are the integer in each node circle. Arrows indicate edge directions. Edges without arrowheads are bidirectional and exist as two directed edges.

Your program is to accept a single command line argument when invoked being the data file name. Your program will then read the file contents into memory (using your designed dynamic memory-based data storage structure). It would be unwise to code your data structure based on the assumption that the graph size is limited to what is pictured below. The test/demo graph may be larger (have extra nodes).

Once the program reads the file data, close it, you may not read from it again. Your program will then prompt the user for three source vertices and destinations. Sample interaction:

Provide 3 sources: 7 19 26

Destination 1?: 32
Shortest Path 1 from vertex "Number":
Shortest Path 2 from vertex "Number":
Shortest Path 3 from vertex "Number":

Destination 2?: 22
Shortest Path 1 from vertex "Number":
Shortest Path 2 from vertex "Number":
Shortest Path 3 from vertex "Number":

Destination 3?: 3
Shortest Path 1 from vertex "Number":
Shortest Path 2 from vertex "Number":

Shortest Path 3 from vertex “Number”:

Program termination

Upon a negative value user input the program will terminate, to do so it must:

- Write a properly formatted log file of all interaction from invocation to termination
- For each Shortest path in the log it should also present running time of the calculation in nanoseconds
- De-allocate all dynamically allocated memory
- Record the overall runtime in seconds
- Record the date and time of the run
- Display a termination message on the screen

Code Implementation Constraints:

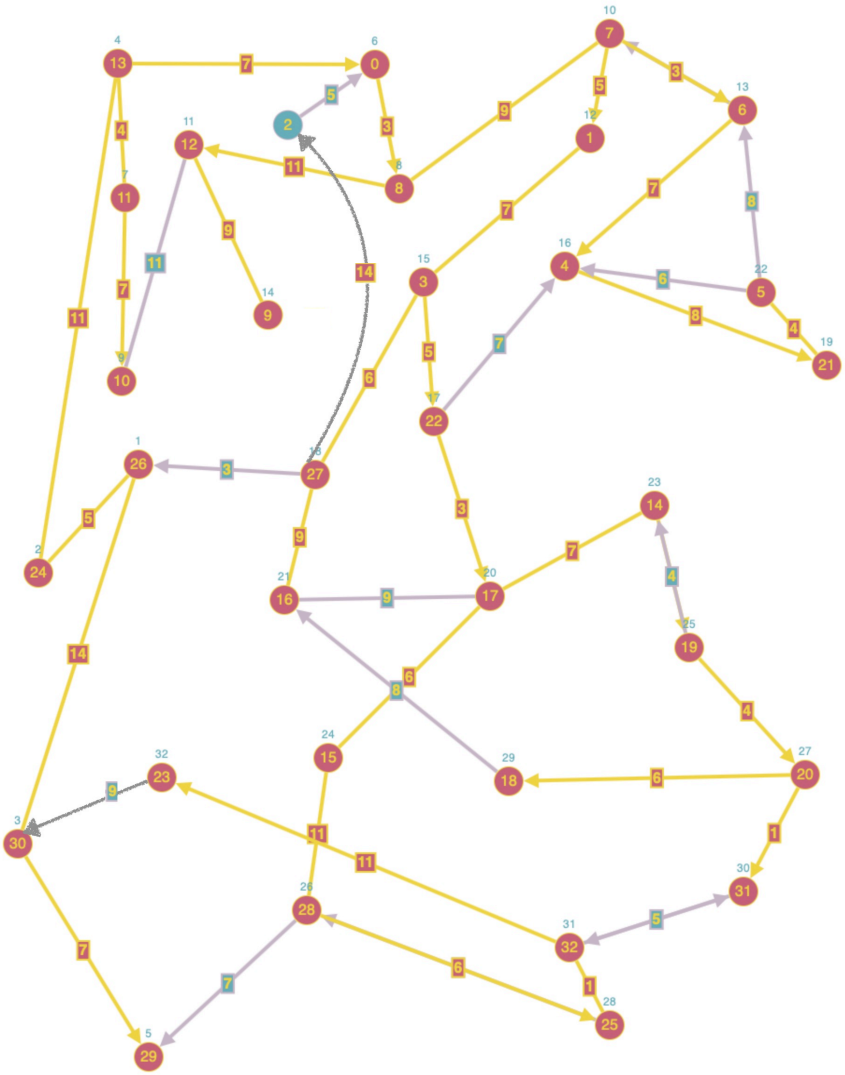
Assume all libraries are blacklisted, exceptions are listed below, you may use all or a subset of the exceptions list contents.

- fstream
- iomanip
- iostream
- cstdlib
- cassert
- cstring
- chrono and the chrono namespace

Please note that the exceptions list libraries contain some algorithms these are also blacklisted. Every action performed by your solution must a result of code you designed and implemented.

Task Submission

Submit your working code files, makefile, and a functional design document as a single compressed archive on D2L. Grading by group to teacher demo.



Prepared by Dr S. Antoun on October 2, 2024
santoun@uis.edu
Typeset with TEXShop.