University of Toronto

CSCB70S—Data Structures and Techniques, Spring 1998

Assignment 2: Graph Representation

Due: Friday February 27 at 4:00 pm.
Worth: 12%.

The problem

The purpose of this assignment is to teach you how to represent a graph in C. It will also help you to get comfortable with pointers, dynamic allocation and modules in C. You have to maintain information of roads connecting cities. From time to time, roads are closed or opened, and we would like to have a program to insert and remove edges in the graph of cities. In addition, we may receive inquiries about shortest connection between two cities given the particular situation of the roads at the time of the inquiry, and about printing the information in the graph.
You'll be provided with a 'skeleton program' and will have to write code for the bodies of several functions. Make a directory in your account:

```
% cd
% mkdir hwk2
% cd hwk2
```

and copy the skeleton file into it from:

```
http://www.cs.toronto.edu/~daniel/teaching/B70/main.c
```

Then copy the following files from the same webpage:

```
graph.c       graph.h       remove.c   remove.h   insert.c   insert.h
shortpath.c   shortpath.h   print.c    print.h    testfile   Makefile
```

Compile and test the skeleton program:

```
% make
...
% a2 < testfile
```

Note that the results make no sense. That is because the code for the different functions still have to be written in the program. We just did some dummy assignments in order to test the output; your task is to provide the correct code for the functions.

Programming

Read and understand the complete program. Implement the functions: `findShortestPath`, `insertEdge`, `removeEdge`, and `printRoadMap`. You do not need to add code outside those functions, but you may do so if you wish and if you document your additions. In any case, YOU CANNOT CHANGE THE INPUT/OUTPUT. Do not change the I/O statements or you'll lose marks. Give good comments in your code, including a comment above each of the functions.

Testing

Test your program with the test `testfile` provided on the Web page. In addition, test your program with another test file that you create. Choose tests that make a thorough checking of your program. Capture the screen output by executing

```
% a2 < mytests > mytests-output
```

How to hand in your assignment

Hand in the following:

- a hardcopy of the program files that you modified;
- a hardcopy of your 'mytests'; and
- a hardcopy of 'mytests-output'; write in pen on the hardcopy, beside each test, a brief explanation of why the test is relevant.

Put this into an ENVELOPE. Tape the cover page (provided below) to the envelope. Write the following on the outside of the envelope:

- your account name;
- your name (with surname underlined);
- your tutorial section; and
- your student number.

The tutor will compile and run your program. Make sure that the following commands work before submitting your program.

```
% cd ~/hwk2
% make clean
% make
% a2 < testfile
% a2 < mytests
```

Your programs must also be submitted electronically by the deadline. Name your own test file 'mytests' and execute exactly these commands:

```
% cd
% cd hwk2
% make clean
% submit -N a2 cscb70s *
```

You may, if you wish, also submit a README file that the tutor will read. You will lose marks if you don't follow these submission instructions exactly.

COVER SHEET FOR ASSIGNMENT 2

Account name:

Surname:

Given Name(s):

Student Number:

Tutorial:

I declare that this assignment is my own work and is submitted in accordance with the University of Toronto Code of Behavior on Academic Matters, the Code of Student Conduct, and the guidelines for avoiding plagiarism described in the course syllabus.

I discussed this assignment with the following people:

Signature

GRADING

Program		
insertEdge	____________	/ 5
removeEdge	____________	/ 5
createGraph	____________	/ 5
printRoadMap	____________	/ 5
findShortestPath	____________	/ 5
Programming style	____________	/ 5
Tutor's compilation and tests	____________	/ 10
Thoroughness of your own tests	____________	/ 10
Total	____________	/ 50