Burt Rosenberg

Problem Set 7

OUT: 18 NOVEMBER 1992
DUE: 30 NOVEMBER 1992

Reading Assignment

Read:

- Read Chapter 11, *Graphs.*
- Read Appendixes A, *Mathematical Induction,* and B, *Proof of Theorem 10–2.*

Goals

Practice programming with graphs. Implementation of a complicated algorithm, top-down design.

Assignment

Implement Dijkstra's shortest-path algorithm. The program accepts the commands,

- **Go** — prompts for the source vertex then runs the shortest-path algorithm.
- **List** — prints out the current graph.
- **Answer** — Prints out the answer to the shortest-path problem. For each vertex n give the length of the shortest-path from the source to n and the parent of n along the shortest path.
- **Quit** — exits the program.
- n m w, where n, m and w are positive integers. This means: make an edge of weight w between vertices n and m.

Example

```
>2 3 1
>3 1 1
>1 2 3
>List
Graph:
  Vertex  Vertex  Weight
     2       3       1
     3       1       1
     1       2       3
>Go
=>Enter source: 2
Computing Shortest-paths from 2 ...
Done.
>Answer
Shortest-Paths
   Vertex   Parent   Length
      1        3       2
      2        -       0
      3        2       1
>Quit
```

Extra Credit

For extra credit, implement the command *How?*, which prompts for a vertex n then gives the entire shortest path from the source to n. After the Answer command of the previous example, the How? command would give this output:

```
>How?
=>Enter vertex: 1
       2 -> 3 -> 1  : length=2
```