

**CS2402**  
**Spring 2009**  
**Lab 7**  
**Graphs**

Due Wednesday, April 21, 2009

**Instructions**

**Part I**

Write the following methods related to graphs:

- a) A method to read an undirected graph from a file (see example in appendix) and store it using an adjacency list or adjacency matrix representation, depending on the user request.
- b) Breadth-first search
- c) Depth-first search

Test your methods using several input files, including one derived from the U.S. adjacency graph included in the appendix. Your program should:

- a) Prompt the user to select:
  - The input file to read
  - Whether to store the graph using an adjacency list or an adjacency matrix representation
  - The search method to use
  - The start node
- b) Print the vertices in the order they are visited.

**Part II**

A Hamiltonian cycle is a path in a graph that visits each vertex exactly once and returns to the starting vertex. Determining if a graph has a Hamiltonian cycle is an NP-Complete problem, which means that it is unlikely that we'll find a polynomial time algorithm to solve it. Write a method to determine if a graph has a Hamiltonian cycle using a stack and backtracking to perform exhaustive search over all the edges in the graph.

## Appendix

Example graph file:

Vertices

Texas

New Mexico

Arizona

California

Edges

(Texas,New Mexico)

(New Mexico, Arizona)

(Arizon,California)

U.S.A. contiguous states

