CS14 – Homework 4

Description:

In this assignment, you will implement a simple AI for the game of Risk. The user will specify a start territory and an end territory, and you will calculate the shortest path between these two territories.

Specifications:

Your program will begin by loading the risk board from the provided file. The file format is as follows. All territories are specified as the word "node" followed by the name of the territory, the number of pieces on the territory, and the color of those pieces. For example:

```
node "Western United States" 7 blue
node "Eastern United States" 1 yellow
node "Alaska" 2 yellow
node "Central America" 13 green
node "Alberta" 2 blue
node "Ontario" 2 blue
```

The connections between territories are specified as the word "edge" followed by the names of the two territories connected. For example:

```
edge "Western United States" "Easter United States"
edge "Alaska" "Alberta"
edge "Alberta" "Western United States"
edge "Alberta" "Ontario"
edge "Ontario" "Eastern United States"
edge "Western United States" "Central America"
edge "Eastern United States" "Central America"
```

You will need to build up a graph data structure containing all of these nodes and edges. Since edges do not have any properties, but nodes do, I recommend using an adjacency list like the one provided in class.

Next, your program should prompt the user for a start territory and an end territory. And your program should use Dijkstra's algorithm to calculate the shortest path between these two territories. An example output might be:

```
start territory: Central America
end territory: Alaska

shortest path:
Central America
Eastern United States
Ontario
Alberta
Alaska
```

Notice that the shortest path is not through Western United States because there are more pieces on Western United States than on Eastern United States. The path we chose actually goes through more countries, but there are fewer pieces. That is why it is shorter. Your program must be able to use these "weights" to get the right answer.

Extra credit:

In the real game of Risk, you are not allowed to conquer a country that you already own. For up to two points of extra credit, adjust your code so that the shortest path never goes through a territory that has the same color as the starting territory. If the starting and ending territories have the same color, you must output an error that no such path is possible.

Submission instructions: You should submit a single tarball containing a Makefile and your source code. Your submission should contain nothing else.

In the submission box on ilearn, you should specify whether you did the extra credit or not.

File headers: Every file you submit must begin with the following information.

```
// Course: CS 14 Spring 2013
//
// First name: <<INSERT>>
// Last name: <<INSERT>>
// Course username: <<INSERT>>
// Email address: <<INSERT>>
//
// Lecture section: <<INSERT>>
// Lab section: <<INSERT>>
// TA: <<INSERT>>
//
// Assignment: <<INSERT>>
//
// I hereby certify that the code in this file
// is ENTIRELY my own original work.
//=============================================================
```