Fall 2016 BIOSTAT 815 Problem Set #3

Submission Guide:

- Due is Wednesday November 2nd 11:59pm.
- You will need to submit the following items via Canvas and google doc
  1. A zip (or .tar.gz) file containing the C++ code and your report (pdf, doc, or docx format).
  2. The copy C++ code used should be available at google doc (under your umich.edu account) for grading.
  3. Make the google doc document editable by anyone (within University of Michigan) who has the link, and include the link in your report.

Problem 1. Word Ladder Path Constructor

Modify the word ladder program taught in the class to output all shortest word ladder paths from one word to another, instead of calculating shortest paths for all possible destinations.

Specifically, your program must satisfy the following criteria:

1. The program takes three input arguments (in addition to the program name itself) as (a) dictionary file, (b) source, and (c) destination. For example, to find shortest word ladders starting from `why` to `how` using Dolch site words (the word files are given in Canvas), it should be able to accomplished by

```
$ ./wordLadderHomework3 ./dolch.341.txt why how
```

2. The word ladder allows single character substitution, insertion, deletion as well as reversal of the word. (Same to the lecture notes)
3. Your program should output (a) minimal length of word ladder between the two words, (b) ***ALL*** word ladders between the two nodes with minimal length, and (c) total number of equivalent word ladders with the minimal length. An example run is as follows.

```
$ ./wordLadderHomework3 ./mit.10000.words.txt team work

Minimum word ladder length from team and work is 6
team tear  ear   far   for   fork  work
team tear  fear  far   for   fork  work
team tear  tar   far   for   fork  work
team tear  ear   par   park  pork  work
team tear  tar   par   park  pork  work
team tear  ear   par   por   pork  work
team tear  tar   par   por   pork  work
team tear  ear   war   ward  word  work
team tear  tar   war   ward  word  work
team tear  wear  war   ward  word  work
team tear  ear   war   warm  worm  work
team tear  tar   war   warm  worm  work
team tear  wear  war   warm  worm  work
team tea   ten   ton   won   worn  work
Total of 14 equivalent word ladders are found
```

4. If it is impossible to construct a word ladder between two words, report that "No word ladder can be found from [src] to [dst]".
5. Once all possible word ladders with minimum length is found, the program must stop searching additional word ladders and output all word ladders found. Failing to do so will result in deduction of points.
6. Make sure to test that your code compiles and runs in a UNIX environment, such as `scs.itd.umich.edu`.

Example input files will be available in the Canvas site.