HACETTEPE UNIVERSITY

DEPARTMENT OF COMPUTER ENGINEERING

BBM204 PROGRAMMING LAB.

ASSIGNMENT #4

Subject: Graph Theory
Submission: April 9, 2015
Deadline: April 23, 2015
Programming Language: Java
Advisor: Dr. Erkut Erdem, R.A. Handan Gürsoy

1 Introduction

In this experiment, you are expected to develop the shortest path between two words in a "word ladder". In addition, you are going to practice on graphs by using Java programming language.

The word ladder is a word game invented by Lewis Carroll,the famous Victorian mathematician and pioneer photographer.The goal is to transform a start word into a destination word by changing one letter at a time.

2 Experiment

Given two words, which one is a start word and the other is an end word, and a dictionary, in a word ladder you have to change one word into another by shifting only one character at a time. In addition, the new word which is shifted must be in the dictionary. For example, a word ladder between "stop" and "fast" is:

   stop - *s**o**op* - *l**oop* - *loo**t*** - *lo**s**t* - *l**a**st* - ***f**ast*

There are many solutions of the word ladder. One solution is to use graph. The graph is created by building relation among all words in dictionary. Nodes and edges represent words and the relationship, respectively. Notice that the graph is an undirected graph. Figure1 shows a small graph of some words that solve the STOP to FAST word ladder problem.
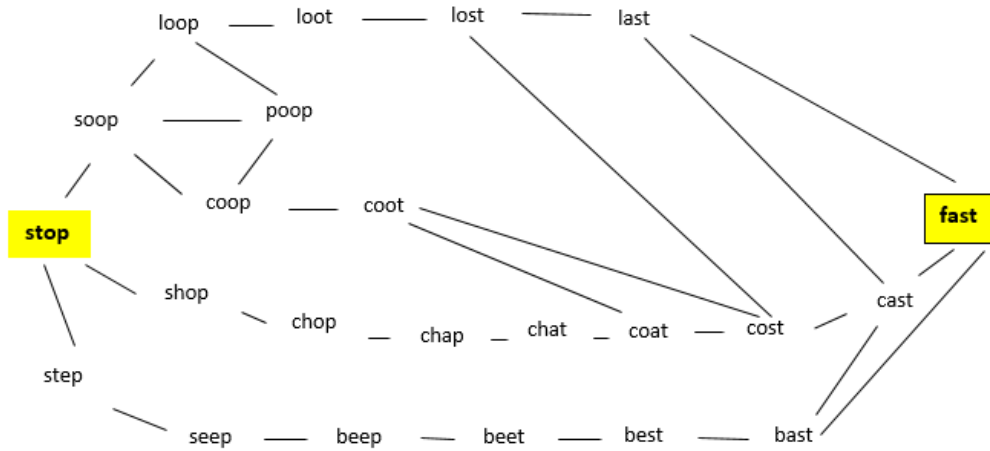
Figure 1: A Small Word Ladder Graph

Many word ladder have more than one possible solution. Your program must determine a shortest word ladder. Therefore, your program must use "breadth first search" algorithm for finding shortest ladder.

3 Implementation Details

3.1 Input

You must read the dictionary file from (`dictionary.txt`). Then, your program will accept starting and ending words from the input file called (`input.txt`). Finally, you build a word ladder between starting and ending words. Input file's format is as given below:

```
startword1 endword1
startword2 endword2
   .
   .
   .
startwordn endwordn
```

3.2 Output

When the input file (`input.txt`) are read and processed successfully, words list between start and end word must written to the output file (`output.txt`). Output file's format is as given below:

```
startword_1,word2_1,word3_1,..,endword_1
startword_2,word2_2,word3_2,..,endword2_2
```

If your inputs are not exist in the library, or the word ladder can not establish between given words, you must write to output file **"Failure"** as output.

4 What to Hand In

You are required to submit all your code files in the given format below:

\<studentid\>.zip
— − \<src\>
— − — –main.java
— − — − *.java

- `Main.java :  entry point of your application.`

Submit it to `http://www.dersler.cs.hacettepe.edu.tr`.

5 Notes

- `Give explanation lines in your code(necessary details).`

- `Your program will be executed as follows :`
  `<dictionary.txt> <input.txt> <output.txt>.`

- `The program must run on DEV (dev.cs.hacettepe.edu.tr).`

- `You must not use any graph library.`

- Save all your work until the experiment is graded.

- Your submission must be an original, individual work. Downloaded or modified source codes will be considered as cheating. Also the students who share their codes will be considered as the same.

- During this experiment session, to communicate with your advisor or with your friends, use BBM202-204 piazza group as far as possible. Ask your questions through this piazza group. Note also that when you use any communication channel like news groups, your messages must be a little polite. Your messages should have a minimum courtesy that you already have in advisor's office. If you need to see the advisor, respect the office hours. (Wednesday 09:00-10:30,Thursday 15:00-17:00,).

References

[1] http://interactivepython.org/KKhRZ/LpOMZ/courselib/static/pythonds/Graphs/graphbfs.html

[2] http://en.wikipedia.org/wiki/Word$_l$$adder$