CS580 Introduction to Artificial Intelligence

## Assignment 1

Total Points: 100

Due Date: 10/2/2018

**Word Ladder Problem**

The Word Ladder Problem was invented by Lewis Carroll in 1878, the author of *Alice in Wonderland*. A ladder is a sequence of words that starts at the starting word, ends at the ending word, In a word ladder puzzle you have to change one word into another by altering a single letter at each step. Each word in the ladder must be a valid English word, and must have the same length. For example, to turn stone into money, one possible ladder is given on the left.

Many ladder puzzles have more than one possible solutions. Your program intends to find a shortest word ladder. A path from stone to money is

stone store shore chore choke choky cooky cooey coney money

For this problem, you must implement the programs to the **Word Ladder** problem using

1. **breadth-first** search (BFS)
2. **depth-first** search (DFS)
3. **informed** search (you need to come up with your own heuristic function and justify why it is a good heuristic).

The list of words is provided in file words.txt. Your program should take the input of two words of the same length and produce the solution. If no solution is found, print out “No solution is found.”

For each of the search routines, avoid returning to states that have already been visited on the current solution path i.e., there should be no repeated states in a solution.

**What to Hand in**

1. Well documented codes implementing breadth first search and depth first search. A README file should provide instructions on how to compile and execute the code.
2. Provide the sample solutions generated by your programs using BFS, DFS, informed search
3. Analysis of your program. Do BFS, DFS, and informed search provide the same solutions every time? Is the length of the path of BFS always shorter or the same than that of DFS in the same search? How about BFS and informed search? Compare the average computational time using BFS, DFS, and informed search for 100 random search (randomly select word pairs of the same length).

Please send the program and the analysis report to yalan001@odu.edu before the assignment due date. The dictionary of words can be found [here](http://www.cs.odu.edu/~yaohang/cs480/Assg/Words.txt).