

The Word Ladder Problem



To begin our study of graph algorithms let's consider the following puzzle called a word ladder. Transform the word "FOOL" into the word "SAGE". In a word ladder puzzle you must make the change occur gradually by changing one letter at a time. At each step you must transform one word into another word, you are not allowed to transform a word into a non-word. The word ladder puzzle was invented in 1878 by Lewis Carroll, the author of *Alice in Wonderland*. The following sequence of words shows one possible solution to the problem posed above.

FOOL
POOL
POLL
POLE
PALE
SALE
SAGE

There are many variations of the word ladder puzzle. For example, you might be given a particular number of steps in which to accomplish the transformation, or you might need to use a particular word. In this section, we are interested in figuring out the smallest number of transformations needed to turn the starting word into the ending word.

Not surprisingly, since this module is on graphs, we can solve this problem using a graph algorithm. Here is an outline of where we are going:

- Represent the relationships between the words as a graph.
- Use the graph algorithm known as breadth first search to find an efficient path from the starting word to the ending word.

Source: [Problem Solving and Algorithms in Python](http://interactivepython.org/runestone/static/pythonds/index.html#) [\(http://interactivepython.org/runestone/static/pythonds/index.html#\)](http://interactivepython.org/runestone/static/pythonds/index.html#) from Bradley Miller on www.interactivepython.org [\(http://interactivepython.org/runestone/static/pythonds/index.html#\)](http://interactivepython.org/runestone/static/pythonds/index.html#).