

Problem 1.1: Syzygies

This is an simplification of a word puzzle created by the English polymath Lewis Carroll where the player is given a start word (e.g. WHITE) and a goal word (e.g. GREEN). One must construct a chain of words, where, for adjacent words in the chain, either the first two letters of one word are last two letters of the next word, or vice-versa. An example is below:

```
          WHI  TE
              TE  AMWORK
          EN  UMER  TE
GRE  EN
```

A list of words¹ is available as a `.txt` and a `.mat` file on Moodle. Using these words, implement, in a language of your choice, a search algorithm of your choice to connect the following words, using the **shortest chain possible** (which may not be unique):

- PEN → PAPER
- ACORN → OAK
- AUTUMN → WINTER
- EARTHQUAKE → TSUNAMI
- STARSHIP → ENTERPRISE

This problem is to be solved individually. Please email a zipped folder to `aaron.pereira@tum.de` under the subject header “Syzygies”:

1. the answers to the above questions,
2. your source code (so that I can check for uniqueness),
3. an executable file/MATLAB script I can run from command line on MacOSX or Windows, with the start and end words as inputs and the shortest chain of words connecting them as output,
4. a `readme.txt` file telling me how to run the executable, which directory to place the word list (if necessary), etc.

A pass will be awarded only if:

- I receive correct answers to the questions above,
- your executable also delivers the shortest solution for two word pairs of my choice,
- your executable finds the solution to any of the word pairs mentioned above, in less than 1 hour on my computer (Macbook Pro, 2.8GHz i7 processor 16GB RAM) or equivalent Windows PC.
- the code of the search algorithm is your own work (although you can use open-source code such as `github.com/tinevez/matlab-tree` to support your work, as long as you reference it). I will **not** grade your source code.

Submission will close on **Sunday 27th November at 23:59**. If your executable does not work for technical reasons, I will contact you – please respond within 48 hours, or I cannot consider your solution. **A hint:** the list contains over 100,000 words! To save time when finding the children of nodes, you can pre-compute lists of words that begin/end with pairs of letters, then look them up.

¹adapted from `www-01.sil.org/linguistics/wordlists/english/`, accessed 14.10.2015