CS211 Labs 3+4: Strings and Files, and a Crossword Solver

The goal of Labs 3 and 4 is to develop proficiency in programming with strings (i.e., `char` arrays), and files.

Since we'll be working with files, if you are using an on-line compiler you'll need to use one that allows one to upload several files. I've found `https://repl.it` to be adequate for this.

However, you are recommended to use an off-line IDE (such as code::blocks) if possible.

1 Strings, and arrays of strings

A *string* is a variable that stores text, such as a word, or line of text. In Week 4 we learned that, in C, these are stored in *char arrays*. If we need an array of strings, we code this as an *array of char arrays*, i.e., a two-dimensional array (see Week 5).

In C, such a 2D array is declared as, for example, `char ListOfWords[5][20]` giving a list of 5 strings, each at most 20 characters long. Download the file `ArrayOfStringsV0.c` from `http://www.maths.nuigalway.ie/~niall/CS211/lab3`. This gives a *very* simple example of use an array of strings.

2 Files

Download the file `Dictionary.txt` from `http://www.maths.nuigalway.ie/~niall/CS211/lab4` This file contains a list of just over 6,000 words, one per line.

Download the `04CountLinesWithfgetc.c` program from Week 5. Adapt it so that

(a) it opens `Dictionary.txt` for reading;

(b) it verifies that the file was successfully opened,

(c) as well as reporting the number of words in the file, it also reports the length of the longest word in the file. (Hint, that word is `incomprehensibilities` or `otorhinolaryngologist`).

The information that you get from this will be used to determine the array sizes in in the next part.

3 A crossword helper

Now write a program that prompts the user for a "crossword" clue. They should use "?" to represent an unknown letter. Examples:

- if they want a 6-letter word that starts with `b` and ends in `ry`, they would enter `b???ry`

- the word has five letters, and the second and fourth are `e` and `u` respectively, they enter `?e?u?`

It should be *case-insensitive*, so, for example, both `DE???` and `de???` match `Debug`.

To get started, download `CrossWordHelperV01.c` from
`http://www.maths.nuigalway.ie/~niall/CS211/lab3`
This version just checks if the word the user inputs is of the same length as one in its list.

You should extend this so that

(i) It initialises the 2D array `ListOfWords` so that it can store all the words in `Dictionary.txt`

(ii) It populates `ListOfWords` with the words in `Dictionary.txt`. If using `fgets` to read from the file ensure you handle the new-line character appropriately.

(iii) It compares the inputted word with each of these, and reports any match.

If you wish you may test your code against the file `MediumDictionary.txt` which has about 32,000 words, the longest of which is `antidisestablishmentarianism`, or even `BigDictionary.txt`, which has about 220,000 words.

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The deadline for this assignment is **5pm, Thursday 27 February**.

Submit your work by uploading the programs for Part 2 (for counting the number of words in the dictionary, and reporting the longest one), and Part 3 (Crossword Solver), to the *Labs:* `Lab 3+4` section of the Blackboard module. You can choose to include both these features in a single file, if you wish. Upload your code as "`.c`" sources files: **no other format is acceptable**.

The assignment will be graded using the rubric that is available from the Blackboard GradeCentre. Notice that 20% of the marks are given for attending the lab classes. Marks are also given for proper documentation and programming style.

Strive to make the code as self-documenting as possible, for example, by using sensible variable names. Documentation should explain the logic behind the code, and any assumptions being made. It does not need to explain basic features of the language: it should be aimed at someone who is very familiar with C, but not the problem you are solving, or your method of solution.

Include your name, ID number, and NUI Galway email address as comments in the file.