Vg101: Introduction to Computer and Programming

Spring 2021

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Task 4 C Programming: Spy and Code Book

1. Background and Starting Point

Encryption algorithms define data transformations that cannot be easily reversed by unauthorized users. It is a good way of keeping data private and secure. There are many different encryption algorithms developed and used wide area of applications. Basically, encryption is to apply certain algorithm to transform plain text (readable) to some message unreadable. Decryption works in the opposite way. Typical and widely-used encryption algorithms include Secure Hash Algorithm, RSA algorithm, DES algorithms, etc..

For task 4, instead of looking into complicated encryption algorithms, we are going to invent your own “code book” (encryption program). By using your “code book”, only you can write and read your top-secret files. It might be a useful and crucial skill for being a good “spy”.

We are taking advantage of something called “pangram”.
(A pangram, or holoalphabetic sentence, is a sentence that contains every letter of the alphabet at least once.) quoted from wikipedia
There are a few famous pangrams:

1) The quick brown fox jumps over the lazy dog.
2) Jackdaws love my big sphinx of quartz.
3) Pack my box with five dozen liquor jugs.
4) The quick onyx goblin jumps over the lazy dwarf.
5) How razorback-jumping frogs can level six piqued gymnasts!
6) Cozy lummox gives smart squid who asks for job pen.
7) .....

2. Problem to be solved

Think of creating a 2D matrix/array containing a number of pangrams. That is to say, for every letter, we can use 2 integer numbers to represent it. The matrix/array can just become your “code book”!

Certainly, we still need to consider some other issues:

a) For every letter, there exist multiple mappings in your “code book”. Randomly

using the mappings can reduce the risk of being decrypted by your “enemy”. For example, letter ‘a’ can be encoded as ‘0202’ (the 2nd char in pangram 2) or ‘0206’ (the 6th char in pangram 2), or ‘0302’ (the 2nd char in pangram 3), and so on.

b) For upper cases and lower cases. Use an extra random single-digit number to distinguish if the letter is in upper case or lower case. The rule is a little bit complex. If the sum of all the digits is even, it is in lower case. otherwise it is in upper case. For example, ‘a’ can be mapped as ‘80202’, and the code ‘50202’ will represent the letter ‘A’.

c) Think about space and newline, etc. You also need to handle digits (0-9) and the symbols (!@#~$%^&*.,), if necessary.

Detailed requirements:

a) Think about how to organize your code. Decide what functions should be created and how they should be designed and implemented.

b) Save your “code book” in a file, so that it will be possible to change your “code book” later.

c) In console, user can choose to encrypt or decrypt a file.

d) For encryption, use a text file with plain text as your input file. One of the poems written by William Shakespeare (as below) can be your top-secrete. Try to encrypt it, and overwrite the input file with your encrypted text.

e) For decryption, your program reads the encrypted text, decrypt it and display the original text in your console.

Silvia by William Shakespeare(1564-1616)

WHO is Silvia? What is she?
That all our swains commend her?
Holy, fair, and wise is she;
The heaven such grace did lend her,
That she might admired be.
Is she kind as she is fair?
For beauty lives with kindness:
Love doth to her eyes repair,
To help him of his blindness;
And, being help'd, inhabits there.
Then to Silvia let us sing,
That Silvia is excelling;
She excels each mortal thing
Upon the dull earth dwelling:
To her let us garlands bring.

3. Assessment

a) On-site demo and explanation will be required; (20)

b) Code should be well commented and correctly named;(20)
c) Functionalities implemented;(60)

4. Submission

Demo: on the 6th week of our lab session. (Friday afternoon, Week 14)
Code: should be submitted before the demo. (deadline)
Naming conventions:
[studentID]_[name].c or [studentID]_[name].zip (if you want to hand in multiple files)
e.g. 202012345_张三丰.c or 202012345_张三丰.zip

If you use any external library, please explain it in your comments.

DO NOT submit your project files.

Expecting to receive an All-In-One zip file for each class.