Lab Assignment 2

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Write a program that implements the Caesar cipher encryption and decryption. Additionally, include a function to perform frequency analysis on an encrypted text. Your program should allow the user to input a plaintext message, specify a shift value for encryption, display the encrypted text, perform decryption, and finally, conduct frequency analysis on the encrypted text. Explain how the frequency analysis could help in breaking the Caesar cipher.

ENCRYPTION

```
#include <iostream>
#include <algorithm>
#include <string>
using namespace std;

string encrypt(string s, int k){
    string a = "";
    int ch;
    for(int i = 0; i < s.length(); i++){
        if(s[i] != ' '){
            s[i] = toupper(s[i]);
        }
    }
    for(int i = 0; i < s.length(); i++){
        if(s[i] == ' '){
            a += ' ';
        }
        else{
            ch = s[i];
            a += (char)((((ch-65) + k) % 26)+65);
        }
    }
    return a;
}

int main(){
    int k = 3;
    string s;
    cout << "Enter the plain text: ";
    getline(cin, s);
    // cout << "\nEnter the key value: ";

    string enc = encrypt(s, k);
    cout << "Encrypted Text - " << enc;
    return 0;
}
```

```
~/D/C/V/I/Lab cd "/Users/garvitshah
ege/VI/ISC/Lab/Assign2/"e
Enter the plain text: Good Morning
Encrypted Text - JRRG PRUQLQJ
```

DECRYPTION

```cpp
#include <iostream>
#include <string>
#include <vector>
#include <algorithm>

// Function to decrypt Caesar cipher using frequency analysis
std::string decryptCaesarCipher(const std::string& ciphertext) {
    // Define the English alphabet
    const std::string alphabet = "abcdefghijklmnopqrstuvwxyz";

    // Initialize a vector to store the frequency of each letter
    std::vector<int> frequency(26, 0);

    // Count the frequency of each letter in the ciphertext
    for (char ch : ciphertext) {
        if (std::isalpha(ch)) {
            int index = std::tolower(ch) - 'a';
            frequency[index]++;
        }
    }

    // Find the most frequent letter in the ciphertext
    auto max_iter = std::max_element(frequency.begin(),
frequency.end());
    int max_index = std::distance(frequency.begin(), max_iter);
    int shift = (max_index + 26 - ('e' - 'a')) % 26; // Calculate
the shift

    // Decrypt the ciphertext using the calculated shift
    std::string plaintext;
    for (char ch : ciphertext) {
        if (std::isalpha(ch)) {
            char decrypted_char = (std::isupper(ch) ? 'A' : 'a') +
(ch - (std::isupper(ch) ? 'A' : 'a') - shift + 26) % 26;
            plaintext.push_back(decrypted_char);
        } else {
            plaintext.push_back(ch); // Preserve non-alphabetic
characters
        }
    }

    return plaintext;
}

int main() {
    std::string ciphertext;
    std::cout << "Enter the ciphertext: ";
    std::getline(std::cin, ciphertext);
```

```
    std::string plaintext = decryptCaesarCipher(ciphertext);

    std::cout << "Decrypted text: " << plaintext << std::endl;

    return 0;
}
```

```
~/D/C/V/I/Lab cd "/Users/garvitshah/Desktop/College/VI/ISC/Lab/Assign2/" && g++ -std=c++17 tempCodeRunnerFile.cpp -o tempCodeRunnerFile
&& "/Users/garvitshah/Desktop/College/VI/ISC/Lab/Assign2/"tempCodeRunnerFile
Enter the plain text: Write a program that implements the Caesar cipher encryption anddecryption. Additionally, include a function to perfor
m frequency analysison an encrypted text. Your program should allow the user to input a plaintextmessage, specify a shift value for encrypti
on, display the encrypted text,perform decryption, and finally, conduct frequency analysis on the encryptedtext. Explain how the frequency a
nalysis could help in breaking the Caesarcipher.
Encrypted Text - ZULWH D SURJUDP WKDW LPSOHPHQWV WKH FDHVDU FLSKHU HQFUBSWLRQ DQGGHFUBSWLRQ DGGLWLRQDOOB/ LQFOXGH D IXQFWLRQ WR SHUIRUP IUH
TXHQFB DQDOBVLRQ DQ HQFUBSWHG WHAW1 BRXU SURJUDP VKRXOG DOORZ WKH XVHU WR LQSXW D SODLQWHAWPHVVDJH/ VSHFLB D VKLIW YDOXH IRU HQFUBSWLRQ/ G
LVSODB WKH HQFUBSWHG WHAW/SHUIRUP GHFUBSWLRQ/ DQG ILQDOOB/ FRQGXFW WKH HQFUBSWHGWHAW1 HASODLQ KRZ WKH IUHTXHQFB D
LV FRXOG KHOS LQ EUHDNLQJ WKH FDHVDUFLSKHU1
~/D/C/V/I/L/Assign2 cd "/Users/garvitshah/Desktop/College/VI/ISC/Lab/Assign2/" && g++ -std=c++17 d.cpp -o d && "/Users/garvitshah/Deskto
p/College/VI/ISC/Lab/Assign2/"d
Enter the ciphertext: ZULWH D SURJUDP WKDW LPSOHPHQWV WKH FDHVDU FLSKHU HQFUBSWLRQ DQGGHFUBSWLRQ1 DGGLWLRQDOOB/ LQFOXGH D IXQFWLRQ WR SHUIRU
P IUHTXHQFB DQDOBVLRQ DQ HQFUBSWHG WHAW1 BRXU SURJUDP VKRXOG DOORZ WKH XVHU WR LQSXW D SODLQWHAWPHVVDJH/ VSHFLB D VKLIW YDOXH IRU HQFUBSWL
RQ/ GLVSODB WKH HQFUBSWHG WHAW/SHUIRUP GHFUBSWLRQ/ DQG ILQDOOB/ FRQGXFW IUHTXHQFB DQDOBVLV RQ WKH HQFUBSWHGWHAW1 HASODLQ KRZ WKH IUHTXHQFB D
QDOBVLV FRXOG KHOS LQ EUHDNLQJ WKH FDHVDUFLSKHU1
Decrypted text: WRITE A PROGRAM THAT IMPLEMENTS THE CAESAR CIPHER ENCRYPTION ANDDECRYPTION1 ADDITIONALLY/ INCLUDE A FUNCTION TO PERFORM FREQ
UENCY ANALYSISON AN ENCRYPTED TEXT1 YOUR PROGRAM SHOULD ALLOW THE USER TO INPUT A PLAINTEXTMESSAGE/ SPECIFY A SHIFT VALUE FOR ENCRYPTION/ DI
SPLAY THE ENCRYPTED TEXT/PERFORM DECRYPTION/ AND FINALLY/ CONDUCT FREQUENCY ANALYSIS ON THE ENCRYPTEDTEXT1 EXPLAIN HOW THE FREQUENCY ANALYSI
S COULD HELP IN BREAKING THE CAESARCIPHER1
~/D/C/V/I/L/Assign2 ■                                                                                                    06:48:16
```