CNS LAB

Name: Samrat Vishwas Jadhav
PRN: 2020BTECS00006

Assignment 3

Aim - Given the plain text, encrypt it using Playfair Encryption Algorithm

Playfair Encryption Algorithm

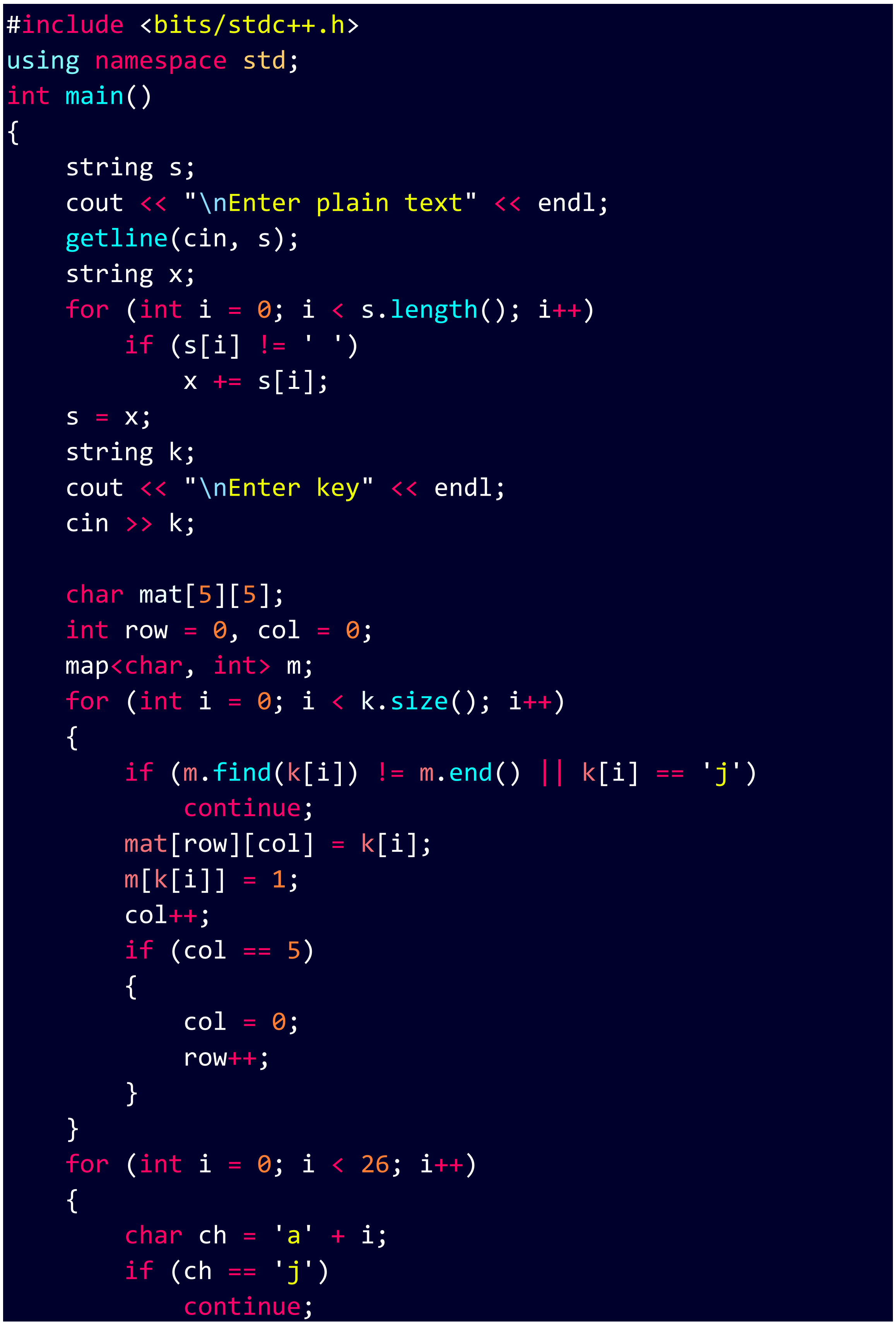
The key square is a 5×5 grid of alphabets that acts as the key for encrypting the plaintext. Each of the 25alphabets must be unique and one letter of the alphabet (usually J) is omitted from the table (as the table can hold only 25 alphabets). If the plaintext contains J, then it is replaced by I.

The initial alphabets in the key square are the unique alphabets of the key in the order in which theyappear followed by the remaining letters of the alphabet in order.

The plaintext is split into pairs of two letters (digraphs). If there is an odd number of letters, a Z is added to the last letter. Pair cannot be made with same letter. Break the letter in single and add a bogus letter to the previous letter. If both the letters are in the same column: Take the letter below each one. If both the letters are in the same row: Take the letter to the right of each one. If neither of the above rules is true: Form a rectangle with the two letters and take the letters on the horizontal opposite corner of the rectangle.

Code:

```
#include <iostream>
```

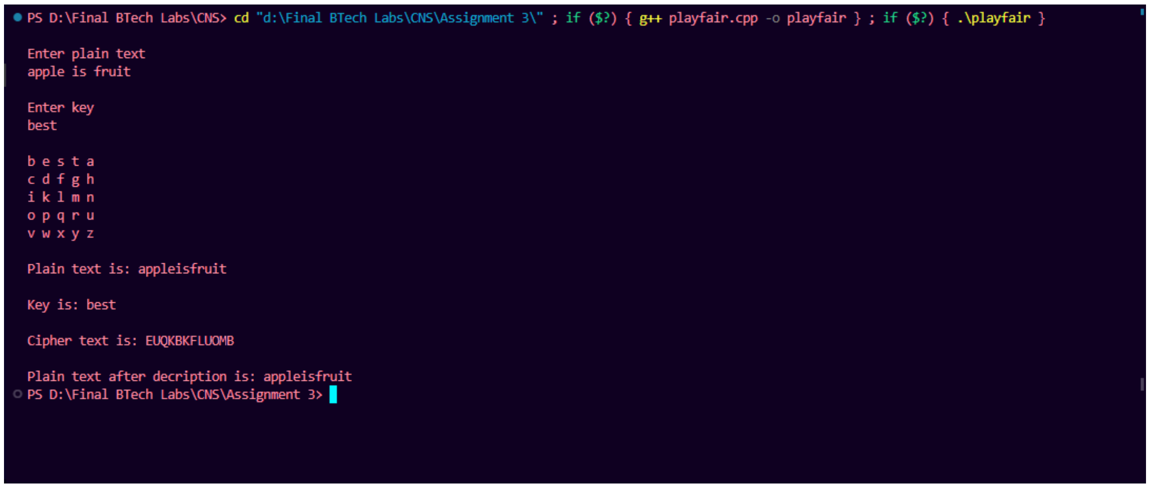


```
#include <bits/stdc++.h>
using namespace std;
int main()
{
    string s;
    cout << "\nEnter plain text" << endl;
    getline(cin, s);
    string x;
    for (int i = 0; i < s.length(); i++)
        if (s[i] != ' ')
            x += s[i];
    s = x;
    string k;
    cout << "\nEnter key" << endl;
    cin >> k;

    char mat[5][5];
    int row = 0, col = 0;
    map<char, int> m;
    for (int i = 0; i < k.size(); i++)
    {
        if (m.find(k[i]) != m.end() || k[i] == 'j')
            continue;
        mat[row][col] = k[i];
        m[k[i]] = 1;
        col++;
        if (col == 5)
        {
            col = 0;
            row++;
        }
    }
    for (int i = 0; i < 26; i++)
    {
        char ch = 'a' + i;
        if (ch == 'j')
            continue;
        if (m.find(ch) != m.end())
            continue;
        m[ch] = 1;
        mat[row][col] = ch;
        col++;
        if (col == 5)
        {
            col = 0;
            row++;
        }
    }
    map<char, pair<int, int>> loc;
    cout << endl;
    for (int i = 0; i < 5; i++)
    {
        for (int j = 0; j < 5; j++)
        {
            cout << mat[i][j] << " ";
            loc[mat[i][j]] = {i, j};
        }
        cout << endl;
    }
    x = "";
    string pos = "";
    for (int i = 0; i < s.length(); i++)
    {
        if (i == (s.length() - 1))
        {
            x += s[i];
            x += 'x';
            pos += '*';
            pos += '#';
        }
        else
        {
            x += s[i];
            pos += '*';
            if (s[i] == s[i + 1])
            {
                x += 'x';
                pos += '#';
            }
            else
            {
                x += s[i + 1];
                i++;
                pos += '*';
            }
        }
        cout << "In " << i << "iteration X is  " <<
x<<endl;
        cout << "In " << i << "iteration pos is  " <<
pos<<endl;
        cout<<endl;
    }
    s = x;
    cout << "\nPlain text is: " << s << endl;
    cout << "\nKey is: " << k << endl;
    for (int i = 0; i < s.length(); i += 2)
    {
        char ft = s[i];
        int ftR = loc[ft].first;
        int ftC = loc[ft].second;
        char sd = s[i + 1];
        int sdR = loc[sd].first;
        int sdC = loc[sd].second;
        if (ftR == sdR)
        {
            s[i] = (mat[ftR][(ftC + 1) % 5]);
            s[i + 1] = (mat[ftR][(sdC + 1) % 5]);
            continue;
        }
        if (ftC == sdC)
        {
            s[i] = (mat[(ftR + 1) % 5][ftC]);
            s[i + 1] = (mat[(sdR + 1) % 5][sdC]);
            continue;
        }
        s[i] = mat[ftR][sdC];
        s[i + 1] = mat[sdR][ftC];
    }
    string cip = s;
    transform(cip.begin(), cip.end(), cip.begin(),
::toupper);
    cout << "\nCipher text is: " << cip;
    for (int i = 0; i < s.length(); i += 2)
    {
        char ft = s[i];
        int ftR = loc[ft].first;
        int ftC = loc[ft].second;
        char sd = s[i + 1];
        int sdR = loc[sd].first;
        int sdC = loc[sd].second;
        if (ftR == sdR)
        {
            s[i] = (mat[ftR][(ftC - 1 + 5) % 5]);
            s[i + 1] = (mat[ftR][(sdC - 1 + 5) % 5]);
            continue;
        }
        if (ftC == sdC)
        {
            s[i] = (mat[(ftR - 1 + 5) % 5][ftC]);
            s[i + 1] = (mat[(sdR - 1 + 5) % 5][sdC]);
            continue;
        }
        s[i] = mat[ftR][sdC];
        s[i + 1] = mat[sdR][ftC];
    }
    string ans = "";
    for (int i = 0; i < s.length(); i++)
    {
        if (pos[i] == '*')
            ans += s[i];
    }
    s = ans;
    cout << "\n\nPlain text after decription is: " << s;

    return 0;
}
```

Output:



```
● PS D:\Final BTech Labs\CNS> cd "d:\Final BTech Labs\CNS\Assignment 3\" ; if ($?) { g++ playfair.cpp -o playfair } ; if ($?) { .\playfair }

  Enter plain text
  apple is fruit

  Enter key
  best

  b e s t a
  c d f g h
  i k l m n
  o p q r u
  v w x y z

  Plain text is: appleisfruit

  Key is: best

  Cipher text is: EUQKBKFLUOMB

  Plain text after decription is: appleisfruit
○ PS D:\Final BTech Labs\CNS\Assignment 3>
```