

DAA EXP 4

Name	Atharva Bilonikar
UID no.	2021700011
Experiment No.	4

AIM: Algorithm:	Implement Longest Common Subsequence Problem
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LCS-LENGTH( $X, Y$ )
1   $m = X.length$ 
2   $n = Y.length$ 
3  let  $b[1..m, 1..n]$  and  $c[0..m, 0..n]$  be new tables
4  for  $i = 1$  to  $m$ 
5       $c[i, 0] = 0$ 
6  for  $j = 0$  to  $n$ 
7       $c[0, j] = 0$ 
8  for  $i = 1$  to  $m$ 
9      for  $j = 1$  to  $n$ 
10         if  $x_i == y_j$ 
11              $c[i, j] = c[i - 1, j - 1] + 1$ 
12              $b[i, j] = "\diagup"$ 
13         elseif  $c[i - 1, j] \geq c[i, j - 1]$ 
14              $c[i, j] = c[i - 1, j]$ 
15              $b[i, j] = "\uparrow"$ 
16         else  $c[i, j] = c[i, j - 1]$ 
17              $b[i, j] = "\leftarrow"$ 
18  return  $c$  and  $b$ 

```

Program 1

PROGRAM:

```

// The longest common subsequence in C

#include <stdio.h>
#include <string.h>

int i, j, m, n, LCS_table[20][20];
char S1[20] = "ACADB", S2[20] = "CBDA", b[20][20];

void lcsAlgo() {
    m = strlen(S1);
    n = strlen(S2);

    // Filling 0's in the matrix
    for (i = 0; i <= m; i++)
        LCS_table[i][0] = 0;
    for (i = 0; i <= n; i++)
        LCS_table[0][i] = 0;

    // Building the matrix in bottom-up way
    for (i = 1; i <= m; i++)
        for (j = 1; j <= n; j++) {
            if (S1[i - 1] == S2[j - 1]) {

```

```

        LCS_table[i][j] = LCS_table[i - 1][j - 1] + 1;
    } else if (LCS_table[i - 1][j] >= LCS_table[i][j -
1]) {
        LCS_table[i][j] = LCS_table[i - 1][j];
    } else {
        LCS_table[i][j] = LCS_table[i][j - 1];
    }
}

int index = LCS_table[m][n];
char lcsAlgo[index + 1];
lcsAlgo[index] = '\0';

int i = m, j = n;
while (i > 0 && j > 0) {
    if (S1[i - 1] == S2[j - 1]) {
        lcsAlgo[index - 1] = S1[i - 1];
        i--;
        j--;
        index--;
    }

    else if (LCS_table[i - 1][j] > LCS_table[i][j - 1])
        i--;
    else
        j--;
}

// Printing the sub sequences
printf("S1 : %s \nS2 : %s \n", S1, S2);
printf("LCS: %s", lcsAlgo);

for(int i=0;i<=m;i++){
    for(int j=0;j<=n;j++){
        printf("%d ",LCS_table[i][j] );
    }
    printf("\n");
}

}

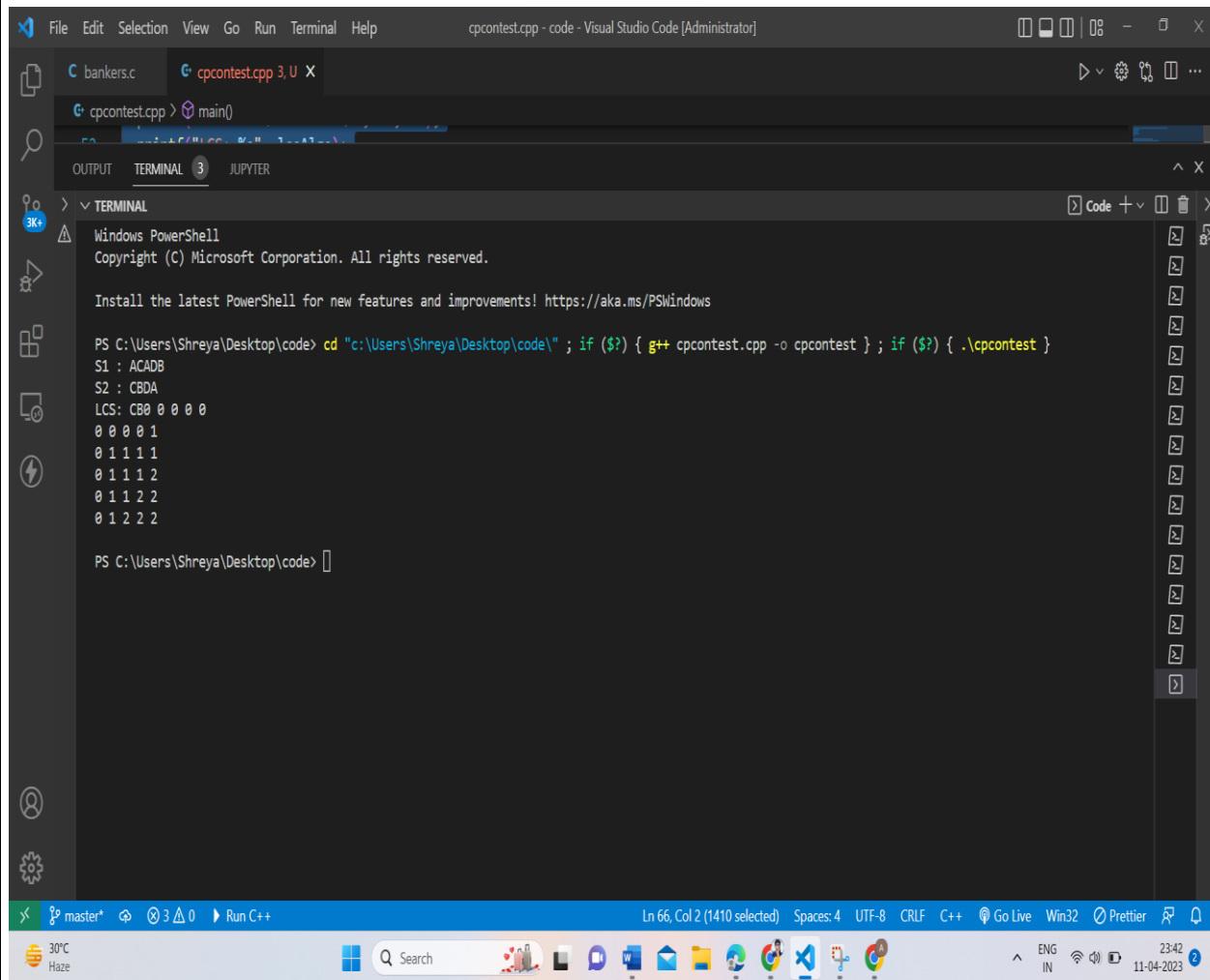
int main() {
    lcsAlgo();
}

```

```
printf("\n");  
}
```

```
PS C:\Users\Shreya\Desktop\code\ml>  
PS C:\Users\Shreya\Desktop\code\ml> gcc protemplate.c  
PS C:\Users\Shreya\Desktop\code\ml> ./protemplate  
S1 : abaaba  
S2 : babbab  
LCS: baba  
PS C:\Users\Shreya\Desktop\code\ml>
```

RESULT:



```
File Edit Selection View Go Run Terminal Help cpcontest.cpp - code - Visual Studio Code [Administrator]  
C bankers.c cpcontest.cpp 3, U X  
cpcontest.cpp > main()  
OUTPUT TERMINAL JUPYTER  
TERMINAL  
Windows PowerShell  
Copyright (C) Microsoft Corporation. All rights reserved.  
  
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows  
  
PS C:\Users\Shreya\Desktop\code> cd "C:\Users\Shreya\Desktop\code\" ; if ($?) { g++ cpcontest.cpp -o cpcontest } ; if ($?) { .\cpcontest }  
S1 : ACADB  
S2 : CBDA  
LCS: CBDA  
0 0 0 0 0  
0 0 0 0 1  
0 1 1 1 1  
0 1 1 1 2  
0 1 1 2 2  
0 1 2 2 2  
  
PS C:\Users\Shreya\Desktop\code>
```

CONCLUSION:	In this experiment, I learnt about dynamic programming and how
	to memoize a solution efficiently,