DIGITAL ANALYSIS AND ALGORITHM

EXPERIMENT – 04

NAME :- MANTHAN AYALWAR

UID :- 2021700003

BATCH :- D1

Aim : Experiment using dynamic programming approach: finding longest common subsequence of two strings

Algorithm :

LCS-LENGTH(X, Y)

1. m = X.length

2. n = Y.length

3. let c[0 ..m, 0 .. n] and b[1...m, 1...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] = 0

13. elseif c [i — 1, j] > c[i, j — 1]

14. c[i, j] = c[i — 1, j]

15. b[i, j] = 1

16. else c[i, j] = c[i, j — 1]

17. b[i, j] = 2

18. return c and b

PRINT-LCS(b, X, i, j)

1. if i == 0 or j== 0

2. return

3. if b[i, j]== 0

4. PRINT-LCS(b, X, i —1, j — 1)

5. print x[i]

6. elseif b[i, j] == 1

7. PRINT-LCS(b, X, i -1, j)

8. else PRINT-LCS(b, X, i, j - 1)

Code :

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

void longestCommonSubsequence(char *str1, char *str2, char *lcs, int *lcs_len)
{
    *lcs_len = 0;
    int m = strlen(str1);
    int n = strlen(str2);
    int c[m + 1][n + 1];
    // initialising first row to 0
    for (int i = 0; i < n + 1; i++)
```

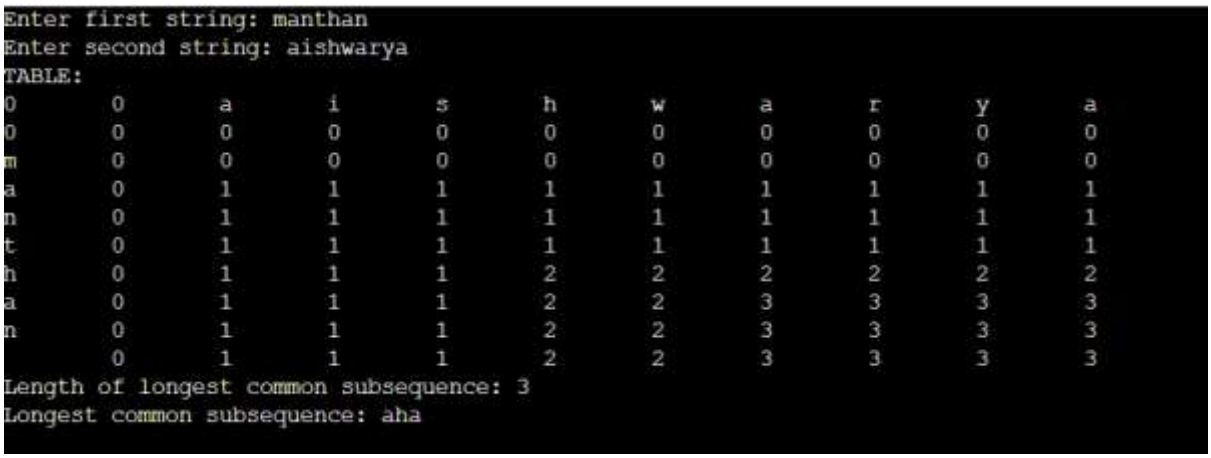
```
    c[0][i] = 0;
// initialising first column to 0
for (int i = 0; i < m + 1; i++)
    c[i][0] = 0;
for (int i = 1; i < m + 1; i++)
{
    for (int j = 1; j < n + 1; j++)
    {
        if (str1[i - 1] == str2[j - 1])
            c[i][j] = c[i - 1][j - 1] + 1;
        else
        {
            if (c[i - 1][j] > c[i][j - 1])
                c[i][j] = c[i - 1][j];
            else
                c[i][j] = c[i][j - 1];
        }
    }
}
printf("TABLE:\n");
printf("0\t0\t");
for (int i = 0; i < n; i++)
    printf("%c\t", str2[i]);
printf("\n");
for (int i = 0; i < m + 1; i++)
{
    if (i != 0)
        printf("%c\t", str1[i - 1]);
    else
        printf("0\t");
```

```
        for (int j = 0; j < n + 1; j++)
            printf("%d\t", c[i][j]);
        printf("\n");
    }
    *lcs_len = c[m][n];
    lcs[(*lcs_len)] = '\0';
    int u = m, v = n;
    int idx = (*lcs_len) - 1;
    while (idx >= 0)
    {
        if (str1[u - 1] == str2[v - 1])
        {
            lcs[idx--] = str1[u - 1];
            u--;
            v--;
        }
        else if (c[u][v] == c[u][v - 1])
            v--;
        else
            u--;
    }
}

int main()
{
    char a[100], b[100];
    printf("Enter first string: ");
    fgets(a, sizeof(a), stdin);
    int a_size = strlen(a);
    a[--a_size] = '\0';
```

```
    printf("Enter second string: ");
    fgets(b, sizeof(b), stdin);
    int b_size = strlen(b);
    b[--b_size] = '\0';
    char lcs[100];
    int lcs_len = 0;
    longestCommonSubsequence(a, b, lcs, &lcs_len);
    printf("Length of longest common subsequence: %d\n", lcs_len);
    printf("Longest common subsequence: %s\n", lcs);
}
```

Output :



Conclusion : From this experiment, I understand concept of longest common subsequent and also implement it in two random strings to find length of longest common subsequent and longest common subsequence.