Experiment 11

Longest Common Subsequence

```
LCS-LENGTH(X, Y)
    m ← length[X]
    n ← length[Y]
  for i ← 1 to m
        do c[i,0] ← 0
  for j ← 0 to n
        do c[0,j] ← 0
    for i ← 1 to m
        do for j ← 1 to n
            do if xi = yj
                then c[i,j] ← c[i-1, j-1] + 1
                     b[i,j] ← "↖"
              else if c[i-1, j] ≥ c[i, j-1]
                then c[i,j] ← c[i-1, j]
                     b[i,j] ← "↑"
                else c[i,j] ← c[i, j-1]
                     b[i,j] ← "←"
  return c and b
```

where X & Y are sequence in input ie, $X = \langle x_1, x_2, \ldots x_m \rangle$
$Y = \langle y_1, y_2, \ldots y_n \rangle$

* Recursive Solution

Let us define $c[i,j]$ to be the length of an LCS of the sequence X_i and Y_j. If either $i=0$ or $j=0$, one of the sequence has length 0, so the LCS has length 0.

$$c[i,j] = \begin{cases} 0 & \text{if } i=0 \text{ or } j=0 \\ c[i-1,j-1]+1 & \text{if } i,j>0 \text{ and } x_i = y_j \\ \max(c[i,j-1], c[i-1,j]) & \text{if } i,j>0 \text{ and } x_i \neq y_j \end{cases}$$

Eg:- Sequence are <10010101> and <01011011>

		j	0	1	2	3	4	5	6	7	8	9
i		y_j	0	1	0	1	1	0	1	1	0	
0	x_i	0	0	0	0	0	0	0	0	0	0	
1	1	0	0	(1)	1	1	1	1	1	1	1	
2	0	0	1	1	(2)	2	2	2	2	2	2	
3	0	0	1	1	2	2	2	(3)	3	3	3	
4	1	0	1	2	2	3	3	3	(4)	4	4	
5	0	0	1	2	3	3	3	4	4	4	5	
6	1	0	1	2	3	4	4	4	5	(5)	5	
7	0	0	1	2	3	4	4	5	5	5	(6)	
8	1	0	1	2	3	4	5	5	6	6	6	

Length of LCS is 6. Some instances are (100110), (010101), (001101), (101101), (101010), (001010), (001011)