**Data Structure and Algorithm Practicals**

14. Implementation of Dynamic Programming- LCS

//by Situ Zhengmei

function LCS(str1, str2){

var rows = str1.split("")

rows.unshift("")

var cols = str2.split("")

cols.unshift("")

var m = rows.length

var n = cols.length

var dp = []

for(var i = 0; i < m; i++){

dp[i] = []

for(var j = 0; j < n; j++){

if(i === 0 || j === 0){

dp[i][j] = 0

continue

}

if(rows[i] === cols[j]){

dp[i][j] = dp[i-1][j-1] + 1 //Diagonal +1

}else{

dp[i][j] = Math.max( dp[i-1][j], dp[i][j-1]) //To the left, take the largest from the top

}

}

console.log(dp[i].join(""))//debugging

}

return dp[i-1][j-1]

}

//by Situ Zhengmei

function LCS(str1, str2){

var m = str1.length

var n = str2.length

var dp = [new Array(n+1).fill(0)] //The first line is all 0

for(var i = 1; i <= m; i++){ //A total of m+1 lines

dp[i] = [0] //The first column is all 0

for(var j = 1; j <= n; j++){//A total of n+1 columns

if(str1[i-1] === str2[j-1]){

//Note here, the first character of str1 is in the second column, so you have to subtract 1, and str2 is the same

dp[i][j] = dp[i-1][j-1] + 1 //Diagonal +1

} else {

dp[i][j] = Math.max( dp[i-1][j], dp[i][j-1])

}

}

}

return dp[m][n];

}

//by Situ Zhengmei, print an LCS

function printLCS(dp, str1, str2, i, j){

if (i == 0 || j == 0){

return "";

}

if( str1[i-1] == str2[j-1] ){

return printLCS(dp, str1, str2, i-1, j-1) + str1[i-1];

}else{

if (dp[i][j-1] > dp[i-1][j]){

return printLCS(dp, str1, str2, i, j-1);

}else{

return printLCS(dp, str1, str2, i-1, j);

}

}

}

//by Situ Zhengmei, convert the target string into regular, verify whether it is the LCS of the previous two strings

function validateLCS(el, str1, str2){

var re = new RegExp( el.split("").join(".\*") )

console.log(el, re.test(str1),re.test(str2))

return re.test(str1) && re.test(str2)

}

function LCS(str1, str2){

var m = str1.length

var n = str2.length

//.... Omit, add it yourself

// var s = printLCS(dp, str1, str2, m, n)

validateLCS(s, str1, str2)

return dp[m][n]

}

var c1 = LCS( "ABCBDAB","BDCABA");

console.log(c1) //4 BCBA?BCAB?BDAB

var c2 = LCS("13456778" , "357486782" );

console.log(c2) //5 34678

var c3 = LCS("ACCGGTCGAGTGCGCGGAAGCCGGCCGAA" ,"GTCGTTCGGAATGCCGTTGCTCTGTAAA" );

console.log(c3) //20 GTCGTCGGAAGCCGGCCGAA