

Print all interleavings of given two strings

Given two strings str1 and str2, write a function that prints all interleavings of the given two strings. You may assume that all characters in both strings are different

Example:

Input: str1 = "AB", str2 = "CD"

Output:

ABCD
ACBD
ACDB
CABD
CADB
CDAB

Input: str1 = "AB", str2 = "C"

Output:

ABC
ACB
CAB

An interleaved string of given two strings preserves the order of characters in individual strings. For example, in all the interleavings of above first example, 'A' comes before 'B' and 'C' comes before 'D'.

Let the length of str1 be m and the length of str2 be n. Let us assume that all characters in str1 and str2 are different. Let count(m, n) be the count of all interleaved strings in such strings. The

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value of count(m, n) can be written as following.

```
count(m, n) = count(m-1, n) + count(m, n-1)
count(1, 0) = 1 and count(0, 1) = 1
```

To print all interleavings, we can first fix the first character of str1[0..m-1] in output string, and recursively call for str1[1..m-1] and str2[0..n-1]. And then we can fix the first character of str2[0..n-1] and recursively call for str1[0..m-1] and str2[1..n-1]. Thanks to [akash01](#) for providing following C implementation.

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

// The main function that recursively prints all interleavings. The v
// iStr is used to store all interleavings (or output strings) one by
// i is used to pass next available place in iStr
void printIlsRecur (char *str1, char *str2, char *iStr, int m, int n,
{
    // Base case: If all characters of str1 and str2 have been include
    // output string, then print the output string
    if ( m==0 && n ==0 )
    {
        printf("%s\n", iStr) ;
    }

    // If some characters of str1 are left to be included, then includ
    // first character from the remaining characters and recur for res
    if ( m != 0 )
    {
        iStr[i] = str1[0];
        printIlsRecur (str1 + 1, str2, iStr, m-1, n, i+1);
    }

    // If some characters of str2 are left to be included, then includ
    // first character from the remaining characters and recur for res
    if ( n != 0 )
    {
        iStr[i] = str2[0];
        printIlsRecur (str1, str2+1, iStr, m, n-1, i+1);
    }
}

// Allocates memory for output string and uses printIlsRecur()
// for printing all interleavings
```

```

void printIls (char *str1, char *str2, int m, int n)
{
    // allocate memory for the output string
    char *iStr= (char*)malloc((m+n+1)*sizeof(char));

    // Set the terminator for the output string
    iStr[m+n] = '\\0';

    // print all interleavings using printIlsRecur()
    printIlsRecur (str1, str2, iStr, m, n, 0);

    // free memory to avoid memory leak
    free(iStr);
}

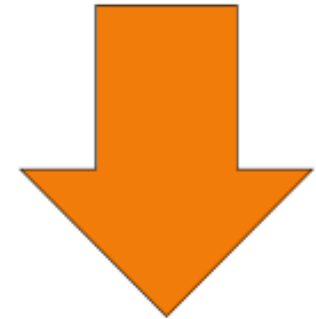
// Driver program to test above functions
int main()
{
    char *str1 = "AB";
    char *str2 = "CD";
    printIls (str1, str2, strlen(str1), strlen(str2));
    return 0;
}

```

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