**Problem Statement**

Perform **Burrows-Wheeler transform** or **block-sorting compression** on the below-mentioned sentence.

“Curneu MedTech Innovation is a health care technology firm based at Heidelberg, Germany. We work on a motive of building affordable and innovative healthcare solutions that address the clinical needs thereby bringing better lives for the needy.”

Neat Documentation is expected with from-scratch implementation with C++ and output characters.

**Program Coding:**

#include <stdio.h>

#include <stdlib.h>

#include <string.h>

// Structure to store data of a rotation

struct rotation {

int index;

char\* suffix;

};

// Compares the rotations and

// sorts the rotations alphabetically

int cmpfunc(const void\* x, const void\* y)

{

struct rotation\* rx = (struct rotation\*)x;

struct rotation\* ry = (struct rotation\*)y;

return strcmp(rx->suffix, ry->suffix);

}

// Takes text to be transformed and its length as

// arguments and returns the corresponding suffix array

int\* computeSuffixArray (char\* input\_text, int len\_text)

{

// Array of structures to store rotations and

// their indexes

struct rotation suff[len\_text];

// Structure is needed to maintain old indexes of

// rotations after sorting them

for (int i = 0; i < len\_text; i++) {

suff[i].index = i;

suff[i].suffix = (input\_text + i);

}

// Sorts rotations using comparison

// function defined above

qsort(suff, len\_text, sizeof(struct rotation),

cmpfunc);

// Stores the indexes of sorted rotations

int\* suffix\_arr

= (int\*)malloc(len\_text \* sizeof(int));

for (int i = 0; i < len\_text; i++)

suffix\_arr[i] = suff[i].index;

// Returns the computed suffix array

return suffix\_arr;

}

// Takes suffix array and its size

// as arguments and returns the

// Burrows - Wheeler Transform of given text

char\* findLastChar(char\* input\_text,

int\* suffix\_arr, int n)

{

// Iterates over the suffix array to find

// the last char of each cyclic rotation

char\* bwt\_arr = (char\*)malloc(n \* sizeof(char));

int i;

for (i = 0; i < n; i++) {

// Computes the last char which is given by

// input\_text[(suffix\_arr[i] + n - 1) % n]

int j = suffix\_arr[i] - 1;

if (j < 0)

j = j + n;

bwt\_arr[i] = input\_text[j];

}

bwt\_arr[i] = '\0';

// Returns the computed Burrows - Wheeler Transform

return bwt\_arr;

}

// Driver program to test functions above

int main()

{

char input\_text[] = "Curneu MedTech Innovation is a health care technology firm based at Heidelberg, Germany. We work on a motive of building affordable and innovative healthcare solutions that address the clinical needs thereby bringing better lives for the needy$";

int len\_text = strlen(input\_text);

// Computes the suffix array of our text

int\* suffix\_arr = computeSuffixArray(input\_text, len\_text);

// Adds to the output array the last char

// of each rotation

char\* bwt\_arr = findLastChar(input\_text, suffix\_arr, len\_text);

printf("Input text : %s\n", input\_text);

printf("Burrows - Wheeler Transform : %s\n",bwt\_arr);

return 0;

}

**OUTPUT:**

Input text : Curneu MedTech Innovation is a health care technology firm based at Heidelberg, Germany. We work on a motive of building affordable and innovative healthcare solutions that address the clinical needs thereby bringing better lives for the needy

Burrows-WheelerTransform: ,thu.sntgedmgyfheysaednraleekeessrsegyy d d cee mccb hvv l a eih ee eneraildeelhvhvrrWhhrTtsMeennHdthbGvrbnoa fnnrnocttttt tcneudgrl ttf ttlraeibc oaaorr ooa riiiiIihnnoa lns iiffwmnneooaaedeboieuiensda eaa tl l auaoeebClooiii dbgn

Process finished.