Gebze Technical University Computer Engineering

CSE222/Homework 4 Report

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Part one : Definition of the problem and requirements

a)Definition of the problem:

Four questions are asked and those are supposed to be solved.

a)Requirements:

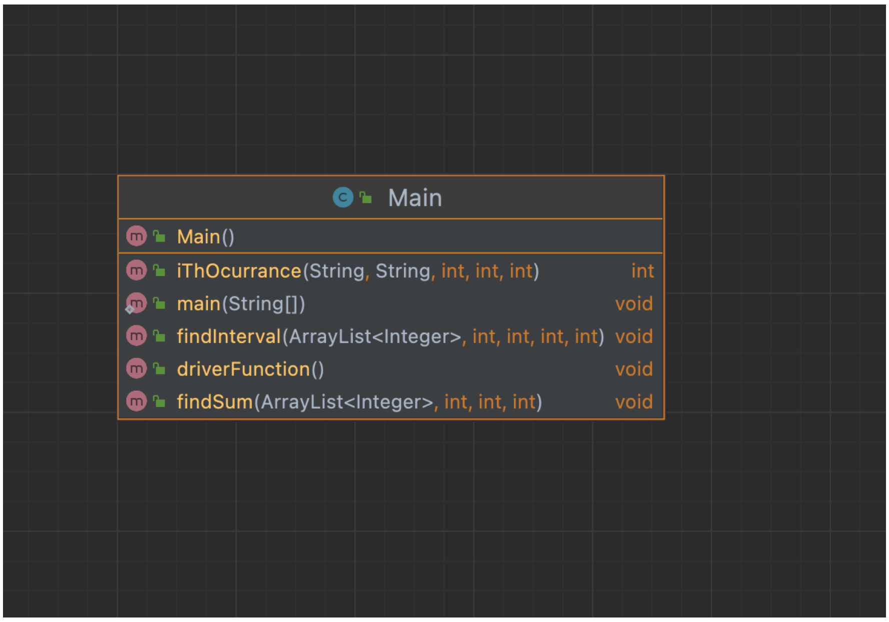
->A recursive function that finds index of the i’th occurrance of a string in a bigger string

->A recursive function that finds indexes of the interval within the sorted array.

->A recursive function that searches unsorted array and finds all possible pairs those are their sum equals to given number.

->A recursive function is given and this function is supposed to be explained.

Part two : Class Diagrams



Main

Main()

iThOcurrance(String, String, int, int, int) int

main(String[]) void

findInterval(ArrayList<Integer>, int, int, int, int) void

driverFunction() void

findSum(ArrayList<Integer>, int, int, int) void

Part three : Problem solution approach

→iThOcurrance() functions starts from the 0th index and checks every substring of the main string,if it equals to target string,it increases number of ocurrance,if it finds substring in main string,function returns that index,else function continues until the end of the main string and returns -1.

Complexity = O(n).Because it can search the array until the end and might not find or might find at 0th index.

→findInterval() functions gets left and right bounds and first,function starts from 0th index and it increases index till finding left bound.After finding left bound,same operation gets done for right bound from the most-right of the array,throws error if given bounds are out of array's bounds.

Complexity = O(n).Because it might search for both boundries until the end or left boundry might be equal to first element or right boundry might be equal tol ast element of the array.

→findSum() function starts from the most left and selects all numbers to the end of the array.When a number is choosen,it gets added with every number with the numbers at right.If sum of this pair equals to asked sum,indexes gets printed to the console.

Complexity = Theta(n^2).Because for every element of the array,it iterates on the array from the right position of choosen element.

→Question 4 analyzdeb below…

```
foo (integer1, integer2)
  if (integer1 < 10) or (integer2 < 10)
    return integer1 * integer2
  n = max(number_of_digits(integer1), number_of_digits(integer2))
```

```
    half = int(n/2)


    int1, int2 = split_integer (integer1, half)

    int3, int4 = split_integer (integer2, half)

    sub0 = foo (int2, int4)

    sub1 = foo ((int2 + int1), (int4 + int3))

    sub2 = foo (int1, int3)

    return (sub2*10^(2*half))+((sub1-sub2-sub0)*10^(half))+(sub0)
```

-->Function takes two integers as parameter

-->It finds length of the longest integer

-->it keeps digit at the longest integer's middle

-->it splits first and second integers at the position kept by "half" and;

-->int1 equals to left part of first integer

-->int2 equals to right part of first integer

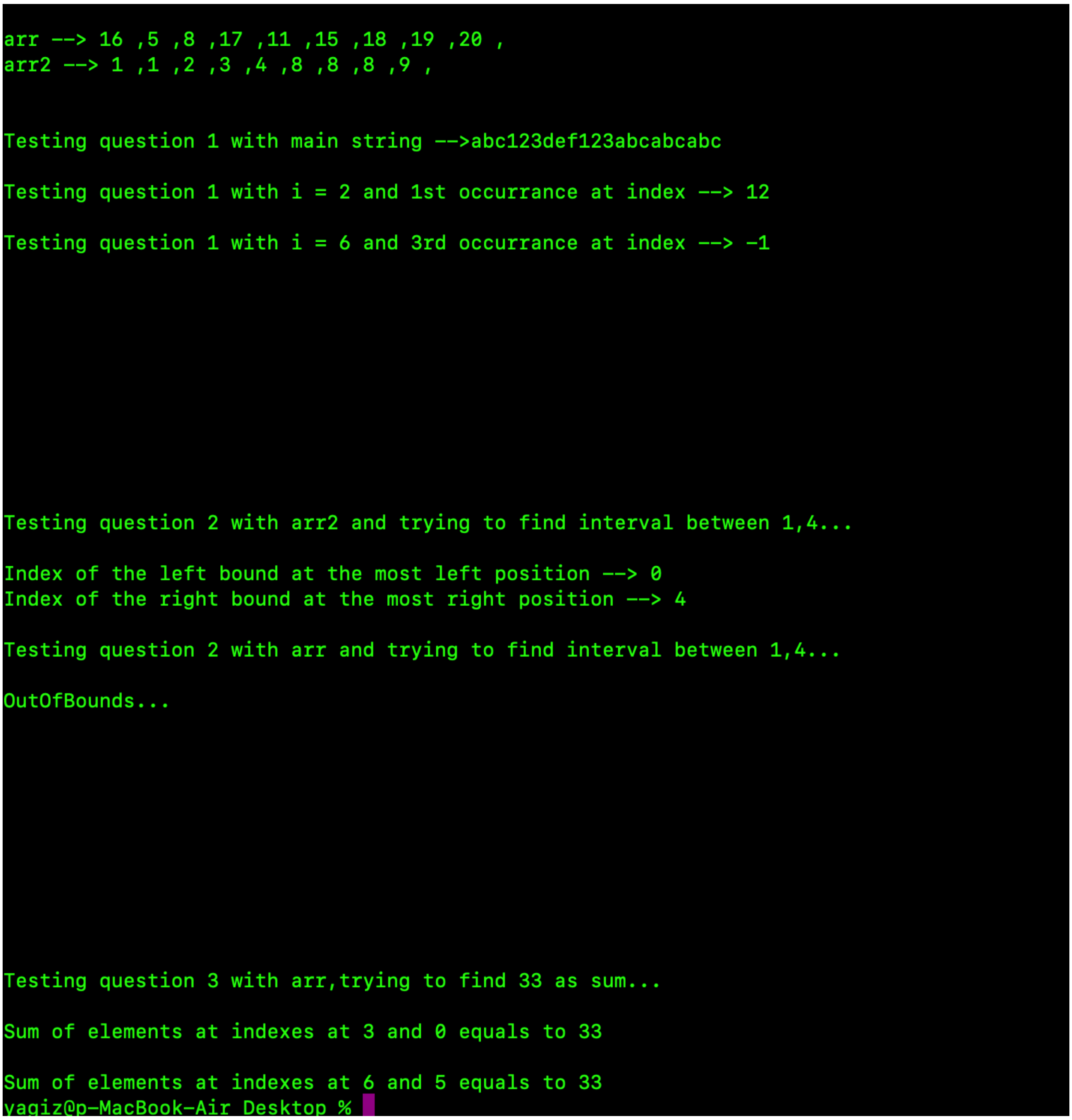
-->int3 equals to left part of second integer

-->int4 equals to right part of second integer

sub0,sub1 and sub2 variables are assigned by foo() function and this operation continues recursively until one of the parameters can't be divided to half

result of the operation which is obtained with the final values of sub0,sub1 and sub2 is returned at the final.Runtime complexity of this function is theta(logn) because at every call,numbers gets splitted to the half and lenght of the number decreases exponentially.

Part four : Test Cases



```
arr --> 16 ,5 ,8 ,17 ,11 ,15 ,18 ,19 ,20 ,
arr2 --> 1 ,1 ,2 ,3 ,4 ,8 ,8 ,8 ,9 ,


Testing question 1 with main string -->abc123def123abcabcabc

Testing question 1 with i = 2 and 1st occurrance at index --> 12

Testing question 1 with i = 6 and 3rd occurrance at index --> -1









Testing question 2 with arr2 and trying to find interval between 1,4...

Index of the left bound at the most left position --> 0
Index of the right bound at the most right position --> 4

Testing question 2 with arr and trying to find interval between 1,4...

OutOfBounds...









Testing question 3 with arr,trying to find 33 as sum...

Sum of elements at indexes at 3 and 0 equals to 33

Sum of elements at indexes at 6 and 5 equals to 33
yagiz@p-MacBook-Air Desktop %
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