Department of education and science of Ukraine

National technical university of Ukraine

«Kyiv polytechnic institute the name of Igor Sikorsky»

Faculty of informatics and computing engineering

Department of the computing engineering

Laboratory work №4

Discipline: «The algorithms theory»

Topic: «Pyramids»

EXECUTED:

The first-year student

of FICT group IP-95

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The Student book number- 9505

CHECKED:

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The Computer Engineering Department

PhD, SR

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**TASK**

**Goal:**

determining the sequence of medians for a given input array.

**Task variant: 5**

In this paper, we need to solve the following problem of determining the sequence of medians for a given input array. Recall that the median for an array is an element that occupies the middle position in the sorted array. Thus, if the number of elements in an array is odd, then the median is one and its index in the sorted array is defined as [n / 2] (where n is the size of the input array). If the number of elements in an array is even, then the median will be two and their indices are determined by the formulas [n / 2] and [n / 2] + 1. The problem is formulated as follows. Suppose that the input array A = [x1, ..., xN] is given.

Suppose that the elements of an array arrive at the input of the program sequentially: at each moment in time a new element xi is considered. It is necessary for each i (from 1 to N) to determine the median of the subarray A '= [x1, ..., xi], that is, the median for the array of elements received by the program at this point in time. It is necessary to solve this problem using the structure of the pyramid data and so that each median is determined by the time O (log (i)).

**SOFTWARE CODE**

**'use strict';**

**// Impl. of tasks algorithm**

**const task = arr => {**

**// Array of founded medians**

**const medians = [];**

**// Simulate sequential receipt of array elements in the program**

**for(let i = 0; i < arr.length; i++){**

**// If the number of elements received in the program is even**

**if((i+1) % 2 === 0) {**

**medians.push(arr[(i+1)/2]);**

**medians.push(arr[((i+1)/2)+1]);**

**} else { // If odd**

**medians.push(arr[i/2]);**

**}**

**}**

**// Return sequential medians**

**return medians;**

**}**

**const arr1 = [ 11, 13, 28, 99, 34, 51, 36, 52, 63, 24, 25, 23, 38 ].sort();**

**console.log('input: ', arr1);**

**console.log('output: ', task(arr1));**

**RESULTS OF THE PROGRAM WORK**

The input: 

Output: 

**CONCLUSIONS**

Familiarized with the topic of laboratory work.

Have acquired relevant work skills.

An appropriate test program has been developed.

The results of the successful work of the test program above confirm the correctness of the chosen decisions, the ultimate goal of the work has been achieved.