TECHNICAL UNIVERSITY OF TALLINN

Faculty of Engineering

Department of Computer Systems

IAX0583 Programming I

**Arrays**

Homework 2

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# Author’s declaration of originality

I hereby certify that I am the sole author of this thesis and that no part of this thesis has been published or submitted for publication. All works and major viewpoints of the other authors, data from other sources of literature and elsewhere used for writing this paper have been referenced.

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# 1. Assignment

The following is a description of my task:

Option 5

Write an algorithm and its jointly corresponding program by which:

1. the integer number of elements of the array A (1 < n < 20) and the real number elements of the array A are entered from the keyboard;

2. among the elements of array A, the one whose value differs minimally from the arithmetic mean of the elements of array A is selected;

3. the found element is displayed (displayed on the screen) with indexes.

The task requires the development of an algorithm and a program that perform specific operations on an array, as described below:

1. **Input Requirements:**
   * The user must input the number of elements in the array, denoted as n, where 1<n<20.
   * The user must also input n real number elements to populate the array A.
2. **Processing Requirements:**
   * The program must calculate the arithmetic mean of the elements of the array A.
   * The program must then identify the element in A whose value differs the least from this arithmetic mean.
3. **Output Requirements:**
   * The program must display the identified element along with its index in the array.
   * The output must be shown on the screen in a clear and concise manner.

# 2. Program description

## 2.1 UML-chart

A diagram of a flowchart

Description automatically generated

Figure 1: UML-chart input

A diagram of a flowchart

Description automatically generated

Figure 2: UML-chart process and output

## 2.2 Code in C

A white page with black text

Description automatically generated

Figure 3: Code part 1

A screenshot of a computer program

Description automatically generatedFigure 4: Code part 2

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Description automatically generated

Figure 5: Code part 3

## 2.3 Step-by-step description

The program begins by prompting the user to enter the number of elements for an array, ensuring the input is a valid integer between 2 and 19. It reads the input as a string, validates it, and converts it to an integer. Once a valid number is obtained, the program allocates an array of that size and prompts the user to input the array elements. After collecting the elements, it calculates the arithmetic mean of the array. The program then identifies the element closest to the mean by comparing the absolute differences between each element and the mean. It keeps track of the minimum difference and stores the corresponding element and its index. Finally, the program outputs the element closest to the mean along with its index in the array, displayed as a 1-based index. This process ensures the program provides accurate results even with varying input sizes and values.

# 4. Screenshots of output

1. A black screen with white text

Description automatically generated

Figure 6: Regular program operation

2.

A screenshot of a computer

Description automatically generated

Figure 7: Program operation with incorrect inputs