

Introduction to complex Systems,Java,Mvn and Git

Valentina Siabatto

January 2020

1 Introduction

The objective of this laboratory is to create a program to calculate the mean and standard deviation of a set of n real numbers. This program is implemented using our own implementation of a linked list. The program reads the n real numbers from a file and returns the mean and standard deviation.

2 Implementation

2.1 Linked Lists

A linked list is a linear data structure where each element is a separate object. The elements of the list are stored in Nodes. The linked list elements are not stored at contiguous location; the elements are linked using pointers.

Every node can point to the next node, prior node, or both. In this implementation the nodes point to both. The linked list references the first node of the list (head) and the last node of the list (tail). Using this references is possible to reach every node of the list.

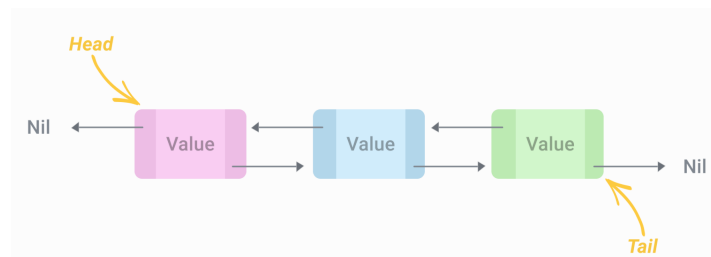


Figure 1: linked List

These are some of the operations that can perform a linked list:

- Appends an element to the end of this list.

- Appends an element at a position in the list.
- Removes all of the elements from this list.
- Removes an element at a position in the list.
- Consult the number of elements in the list.
- Replaces an element at position in the list with other element.

2.2 Mean and standard Deviation

- The mean is the average of a set of data. The average is the most common measure of location for a set of numbers.
- Standard deviation is a measure of the spread or dispersion of a set of data.

$$\sigma = \sqrt{\frac{\sum_{i=1}^n (x_i - x_{avg})^2}{n-1}} \quad x_{avg} = \frac{\sum_{i=1}^n x_i}{n}$$

where

- Σ is the symbol for summation
- i is an index to the n numbers
- x is the data in the set
- n is the number of items in the set

Figure 2: Mean and standard Deviation Formula

3 Test Cases

Two test cases were performed. These consisted of reading two text files with a set of n numbers shown in Figure 3. When calculating the mean and standard deviation the result should be the values shown in Figure 4. After executing the program, the values chosen are shown in Figure 5. The result values match with the correct values.

[1]

Column 1	Column 2
Estimate Proxy Size	Development Hours
160	15.0
591	69.9
114	6.5
229	22.4
230	28.4
270	65.9
128	19.4
1657	198.7
624	38.8
1503	138.2

Table 1

Figure 3: table 1

Test	Expected Value		Actual Value	
	Mean	Std. Dev	Mean	Std. Dev
Table 1: Column 1	550.6	572.03		
Table 1: Column 2	60.32	62.26		

Table 2

Figure 4: Mean and standard deviation

```

Mean Case 1: 550.6
Standard Deviation Case 1: 572.03

Mean Case 2: 60.32
Standard Deviation Case 2: 62.26

```

Figure 5: Mean and standard deviation result

References

- [1] Escuela Colombiana de Ingenieria. Introduction to complex systems, java, mvn, and git.