Lab1ArepMvnGit

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1 Introduction

The goal of this lab was to write a program to calculate the mean and standard deviation of a set of n real numbers.

We also had to implement our own LinkedList to store these numbers. This LinkedList had to be generic, it had to be able to store any kind of java object.

2 LinkedList

The linked list created is a list that can contain any type of value, since it is a generic implementation. These values are stored in nodes, these nodes will have the value that should be stored in that position.

In the implementation of the list we only store two nodes, head and tail that correspond to the first and last element of the list. Each node will have a reference to the previous node and to the next one, in this way we will be able to reach any node from the head or tail node.

This implementation resembles the doubly linked list because it contains an extra pointer, typically called the previous pointer, along with the next pointer.

Figure 1: Doubly Linked List (DLL)

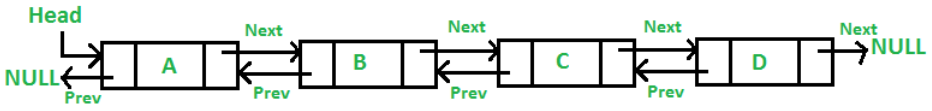

Image taken from GeeksforGeeks

2.1 These LinkedList can do operations like

- Add an item at the end.
- Add an item in any position.
- Get any element from the linkedList.
- Get any node from the linkedList.
- Get the head node.
- Get the tail node.

- Know the number of items on the linkedList.
- Replace any item.
- Remove any element.
- Iterate on the linkedList.

3 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. The average locates the center of the data.

Figure 2: Formula for calculating the mean

$$x_{avg} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Standard deviation is a measure of the spread or dispersion of a set of data. The more widely the values are spread out, the larger the standard deviation.

Figure 3: Formula for standard deviation σ

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

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**

4 Test Cases

After finishing the implementation of the linked list and all that it entails we went on to do some testing. In the lab statement we have two examples of which we have the results.

We have two sets of data from which we must find the mean and standard deviation, and we have the correct values to compare with those in our program.

5 Results

We can see that the values obtained and those expected are the same, we can affirm that both the calculation of the mean and the calculation of the standard deviation are being done correctly.

Figure 4: Groups Of Data

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

Figure 5: Expected Resutls

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		

Figure 6: Results

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Mean Test Case 1: 550.60
Mean Test Case 2: 60.32
Standard Deviation Test Case 1: 572.03
Standard Deviation Test Case 2: 62.26
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