UNIVERSITÉ Concordia UNIVERSITY

SOEN 6011 : SOFTWARE ENGINEERING PROCESSES

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ETERNITY

PROBLEM - 3

Pseudocode & Algorithms

https://github.com/PrathikaSuvarna/ScientificCalculator

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Contents

1 Algorithms

1.1 Description

To calculate the standard deviation for an array of numbers, there are two algorithms. In Algorithm 1, the standard deviation is usually calculated in two passes. In the first pass, we will find the mean and in the second pass, we will calculate the standard deviation of the numbers from the calculated mean. But we can do the same thing in one pass. So, Algorithm 2 do the same thing in one pass. It just rewrites the formula in a different way to calculate the mean and standard deviation in a single pass.

1.2 Decision on Psuedo-Code format

There are two algorithms for which the psuedo code is provided below:-

Algorithm 1 Multi Pass Algorithm for calculating Standard Deviation

```
function StandardDeviation(numArray[])
    $Sum \leftarrow 0.0$
    $Mean \leftarrow 0.0$
    $SD1 \leftarrow 0.0$
    $iLength \leftarrow numArray.count()$
    for $i = 0$ to $iLength$ do
        Sum = Sum + numArray[i]
    $Mean = Sum/iLength$
    for $i = 0$ to $iLength$ do
        diff = numArray[i]-Mean
        SD1 =SD1 + (diff*diff)
    return SquareRoot(SD1 /iLength)

function SquareRoot(input)
    $error \leftarrow 0.00001$
    $errorPrecision \leftarrow 1$
    $dup \leftarrow input$
    $iLength \leftarrow numArray.count()$
    while $errorPrecision > error$ do
        $input = (input + dup/input)/2$
        $errorPrecision = input - dup/input$
    return input
```

Algorithm 2 Single Pass Algorithm for calculating Standard Deviation

```
function StandardDeviation(numArray[])
    $Sum \leftarrow 0.0$
    $Mean \leftarrow 0.0$
    $SD1 \leftarrow 0.0$
    $iLength \leftarrow numArray.count()$
    for $i = 0$ to $iLength$ do
        Sum = Sum + numArray[i]
        SqSum = SqSum + (numArray[i]*numArray[i])
    $Mean = Sum/iLength$
    $Variance = SqSum/n - Mean * Mean$
    return SquareRoot(SD1 /iLength)

function SquareRoot(input)
    $error \leftarrow 0.00001$
    $errorPrecision \leftarrow 1$
    $dup \leftarrow input$
    $iLength \leftarrow numArray.count()$
    while $errorPrecision > error$ do
        $input = (input + dup/input)/2$
        $errorPrecision = input - dup/input$
    return input
```

2 Multi-Pass VS Single Pass Algorithm

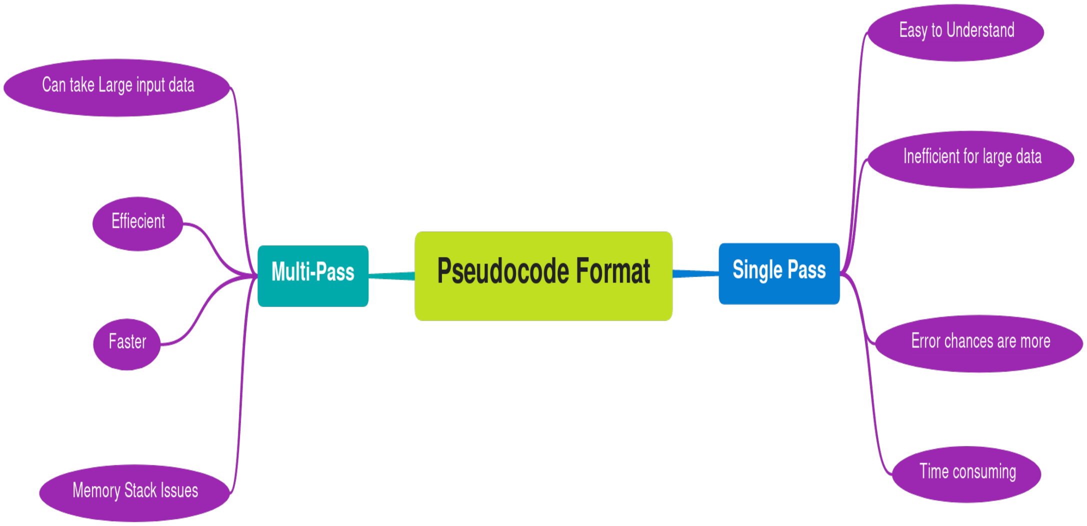
2.1 Advantages

- Multipass Algorithm
  - It is most efficient algorithm to use.
  - This algorithm is fast and can take collection of input data in the form of a file.
- Singlepass Algorithm:-
  - It is easy to understand.
  - The algorithm is taking up less time as there is only one iteration.

2.2 Disadvantages

- Multipass Algorithm
  - It will be difficult to develop in any other language.
  - Memory stack will get full as it is using recursion and not iteration.
- Singlepass Algorithm:-
  - It gives inaccurate result when the array contains large numbers.
  - If there are more input data then this algorithm takes more time.

3 Mindmap



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