



SOEN 6011 : SOFTWARE ENGINEERING
PROCESSES
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ETERNITY

PROBLEM - 3
Pseudocode & Algorithms

By Prathika Anup Suvarna (40156790)

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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

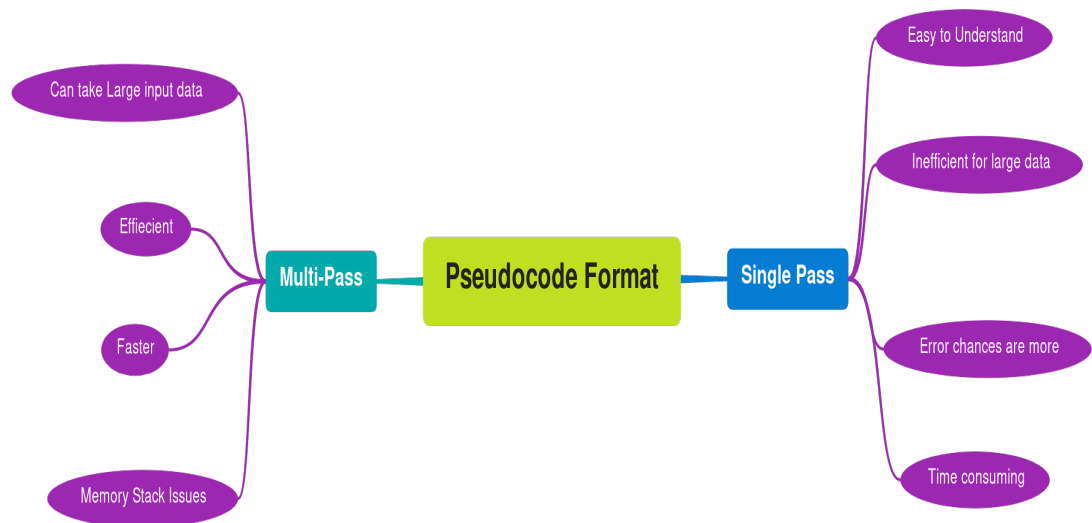
2.1 Advantages

- 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



Bibliography

- [1] Peter Kankowski
https://www.strchr.com/standard_deviation_in_one_pass?allcomments=1
- [2] Standard Deviations and Standard Errors,
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