



UNIVERSITY OF CALOOCAN CITY
COMPUTER ENGINEERING DEPARTMENT



Data Structure and Algorithm

Laboratory Activity No. 2

Algorithm Analysis and Flowchart

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I. Objectives

Introduction

Data structure is a systematic way of organizing and accessing data, and an algorithm is a step-by-step procedure for performing some task in a finite amount of time. These concepts are central to computing, but to be able to classify some data structures and algorithms as “good,” we must have precise ways of analyzing them.

This laboratory activity aims to implement the principles and techniques in:

- Writing a well-structured procedure in programming
- Writing algorithm that best suits to solve computing problems to improve the efficiency of computers
- Convert algorithms into flowcharting symbols

II. Methods

- A. Explain algorithm and flowchart
- B. Write algorithm to find the result of equation: $f(x) = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$ and draw its flowchart
- C. Write a short recursive Python function that finds the minimum and maximum values in a sequence without using any loops

III. Results

A. Explain algorithm and flowchart

- Algorithm: A sequence of well-defined steps or instructions designed to solve a problem or perform a specific task. Algorithms must be clear, finite, and effective.
- Flowchart: A graphical representation of an algorithm using standardized symbols to illustrate the flow of control and operations. Flowcharts make it easier to understand the logic and structure of a program.

B. Algorithm and Flowchart for the Equation

The given function is basically the absolute value function:

$$\begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$$

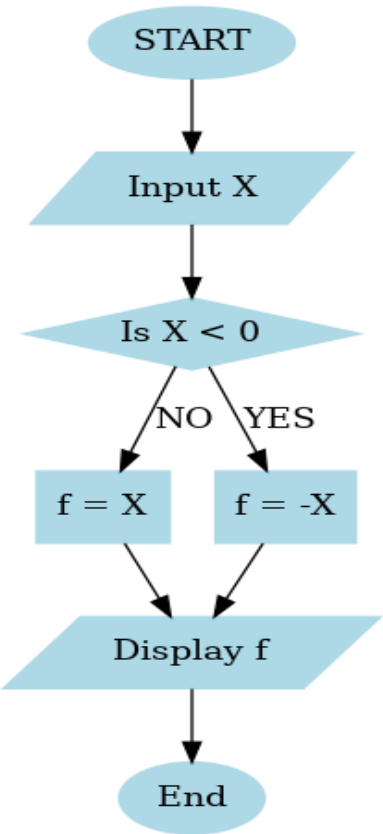
Algorithm:

1. Start
2. Input the value of x

- 3. If $x < 0$, then set $f = -x$
- 4. Else, set $f = x$
- 5. Show the result f
- 6. End

- **Oval** → Start / End
- **Parallelogram** → Input / Output
- **Diamond** → Decision (condition check)
- **Rectangle** → Process (computation/assignment)

The flowchart is shown in **Figure 1** below.



- C. Write a short recursive Python function that finds the minimum and maximum values in a sequence without using any loops

```
def find_min_max(seq, index=0):
    if index == len(seq) - 1:
        return seq[index], seq[index]

    current_min, current_max = find_min_max(seq, index + 1)

    return min(seq[index], current_min), max(seq[index], current_max)

numbers = [7, 2, 9, 4, 1, 5]
minimum, maximum = find_min_max(numbers)
print("Minimum:", minimum)
print("Maximum:", maximum)
```

Minimum: 1
Maximum: 9

CI. Conclusion

In this lab activity, I learn more about algorithm, flowchart, and recursion in Python. The flowchart show how the absolute value function works step by step, and the recursive code shows how to get the minimum and maximum value from a list without using loop. Doing this help me understand more how to solve problems in programming in different ways.

But to be honest, during our PLD it was really hard for me since making flowcharts was not really my task. I even struggled to find what website or app I can use to make flowcharts, so I just ended up using Canva. Also in OOP, we only been taught the basics so sometimes I don't really know how to apply it specially with recursion.

Even though it was hard, I still learn a lot. This activity gave me more practice in problem solving, and I realize that flowcharts and algorithms are not just for coding but also for explaining the logic in a simpler way.

References

[1] Co Arthur O.. "University of Caloocan City Computer Engineering Department Honor Code," UCC-CpE Departmental Policies, 2020.