UNIVERSITY OF CALOOCAN CITY
COMPUTER ENGINEERING DEPARTMENT

Data Structure and Algorithm

Laboratory Activity No. 2

Algorithm Analysis and Flowchart

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August 01, 2025

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

A. Explain algorithm and flowchart

An **algorithm** is a step-by-step procedure or formula for solving a specific problem or performing a task. It is written in a way that can be understood by humans and eventually translated into a computer program.

Characteristics of an Algorithm

- **Finiteness**: It must terminate after a finite number of steps.
- **Definiteness**: Each step must be clearly and unambiguously defined.
- **Input**: It should have zero or more inputs.
- **Output**: It must produce at least one output.
- **Effectiveness**: Every step must be basic enough to be carried out.

Flowchart is a graphical representation of an algorithm. It uses various symbols to denote different types of instructions and arrows to show the flow of control from one step to the next.

Common Flowchart Symbols are:

- **Rectangle -** Process step (e.g., calculations or assignments)
- **Paralelogram** - Input/Output operations
- **Diamond** - Decision-making (e.g., Yes/No questions)
- **Oval** - Start/End

III. Results

B. Write algorithm to find the result of equation: f (x) = and draw its flowchart

Algorithm:

1. Start
2. Read Value of x
3. Check if x < 0
4. If YES, set f = -x
5. If NO, set f= x
6. Display value of f
7. End

Flowchart:

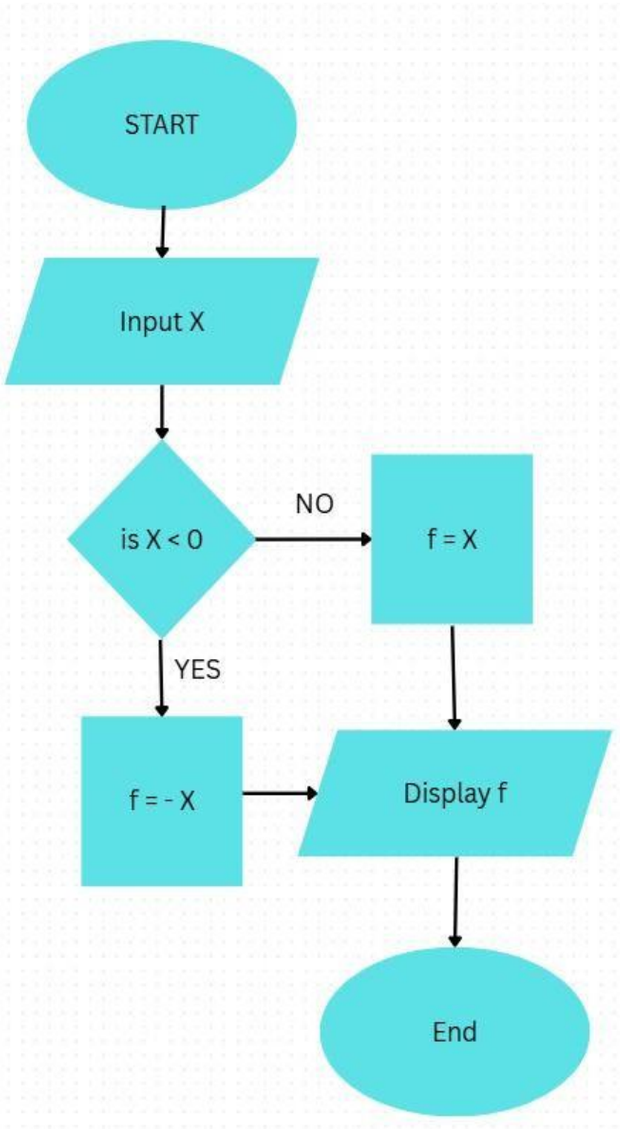
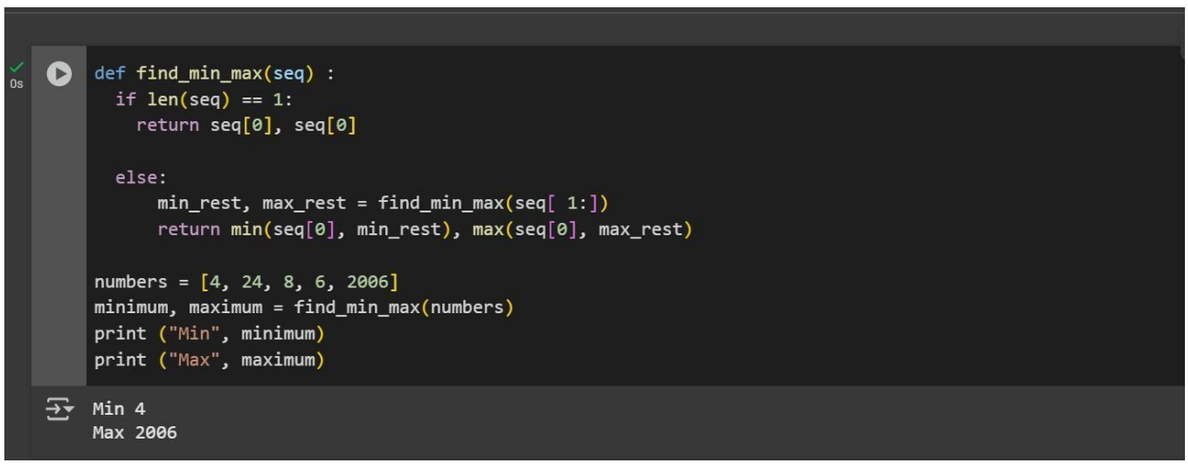


Figure 1: Screenshot of the flowchart of the program

This flowchart represents a simple program that calculates the absolute value of a number entered by the user. The process begins with a start point, followed by a step where the user is prompted to input a value for X. Once the input is received, the program evaluates whether the value of X is less than zero. If X is indeed less than zero, the program assigns f the value of -X, effectively converting the negative number to a positive one. If X is greater than or equal to zero, the program simply assigns f the same value as X. After determining the appropriate value of f, the program proceeds to display this result. Finally, the process ends. In essence, this flowchart outlines the logic for determining and displaying the absolute value of a number using a straightforward decision-making structure.



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

  else:
      min_rest, max_rest = find_min_max(seq[ 1:])
      return min(seq[0], min_rest), max(seq[0], max_rest)

numbers = [4, 24, 8, 6, 2006]
minimum, maximum = find_min_max(numbers)
print ("Min", minimum)
print ("Max", maximum)
```

```
Min 4
Max 2006
```

Figure 2: Source code and Output

This Python code defines a recursive function find_min_max(seq) that finds both the minimum and maximum values in a list of numbers. The function works by checking if the length of the input list seq is 1. If so, it returns that single element as both the minimum and maximum, since it is the only value to compare. If the list contains more than one element, the function recursively calls itself on the sublist seq[1:] (i.e., all elements except the first). It then compares the first element seq[0] to the minimum and maximum of the rest of the list, using the built-in min() and max() functions to determine the overall minimum and maximum values. These are returned as a tuple. The list numbers = [4, 24, 8, 6, 2006] is passed to the function, and the resulting minimum and maximum values are stored in the variables minimum and maximum. Finally, the program prints these values with appropriate labels. In this example, the minimum value is 4 and the maximum value is 2006, as displayed in the output.

IV. Conclusion

At first, I was struggling to write flowcharts during our PLD course as I am still adjusting to the new environment around me. But through this laboratory activity, I gained a deeper understanding of how algorithms and flowcharts assist in solving problems in a step-by-step manner. Writing procedures and converting them into flowcharts helped clarify the logic and made it easier to follow each step. I found the section on recursive functions particularly interesting, as it demonstrated how certain problems can be solved without using loops. Overall, this lab enhanced my problem-solving skills in programming and emphasized the importance of proper planning before writing actual code

References

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