Gospel Reading: Luke 9:1-6

And he called the twelve together and gave them power and authority over all demons and to cure diseases, and he sent them out to preach the kingdom of God and to heal. And he said to them, "Take nothing for your journey, no staff, nor bag, nor bread, nor money; and do not have two tunics. And whatever house you enter, stay there, and from there depart. And wherever they do not receive you, when you leave that town shake off the dust from your feet as a testimony against them." And they departed and went through the villages, preaching the gospel and healing everywhere.

Prayer

Lord Jesus, make me a channel of your grace and healing love that others may find life and freedom in you. Free me from all other attachments that I may joyfully pursue the things of your heavenly kingdom. May I witness to others the joy of the Gospel both in word and deed.

St. John Baptist de La Salle

Pray for us

Live Jesus in our Hearts

Forever

DESIGN AND ANALYSIS OF ALGORITHM

INTRODUCTION

Module Objectives

- define algorithm and its criteria.
- emphasize the importance of algorithms in our everyday lives and in computing science,
- discuss the need for analyzing algorithms.
- present methods to communicate algorithms.

Topic Learning Outcomes:

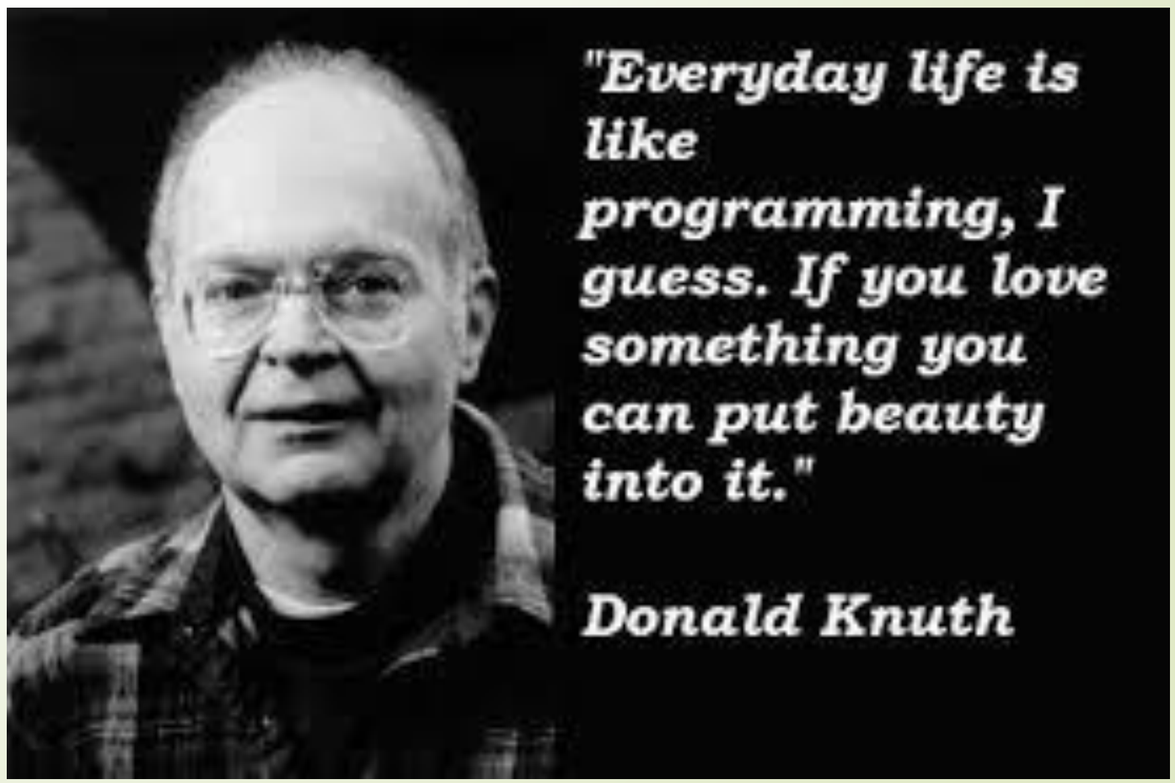
- Identify the criteria of an algorithm
- Understand the importance of algorithm analysis

Course Learning Outcomes:

- Enhance the knowledge of relevance of algorithm in computing science.

“Computer science is the study of algorithms“

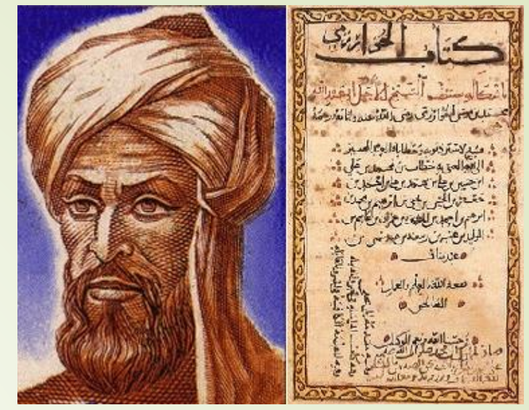
Donald E. Knuth



ALGORITHM DEFINITION

- Algorithm is a finite sequence of instructions that can be performed in a finite length of time in order to solve a problem(s).
- Algorithm is a procedure or formula for solving a problem, based on conducting a sequence of specified actions.
- Algorithm is a recipe for solving a problem.

History



- The word “algorithm” is derived from the name of Muhammad ibn Musa al-Khwarizmi.
- The word “algorism” was used for the rules for performing arithmetic using decimal notation
- The word “algorism” evolved into the word algorithm by the eighteenth century

Criteria of an Algorithm

Every Algorithm must satisfy the following criteria:

1) Input
2) Output
3) Definiteness
4) Finiteness
5) Effectiveness

Algorithm Example 1:

Write an algorithm to add two numbers entered by user. (NOTE: using English statements)

Step 1: Declare variables num1, num2 and sum.
Step 2: Read values num1 and num2.
Step 3: Add num1 and num2 and assign the result to sum.

sum←num1+num2

Step 4: Display sum

Algorithm Example 2:

Write an algorithm for finding the largest value in a finite sequence of integers. (NOTE: pseudocode)

```
procedure max(a_1, a_2, ...., a_n: integers)
    max := a_1
    for i := 2 to n
        if max < a_i then max := a_i
    return max{max is the largest element}
```

Ways to write Algorithms

- Algorithms can be specified in different ways, either in English statements or in pseudocode.
- Pseudocode provides an intermediate step between an English language description of an algorithm and an implementation of this algorithm in a programming language.

Why is pseudocode preferred over programming language?

1. A formal programming language is designed to communicate an algorithm to a computer;

2. We want a notation that is not overloaded by too many low-level details which can distract us from the high-level ideas that we want to communicate.

3. A high-level analysis of an algorithm is facilitated by its concise specifications in pseudocode.

Problem 1:

Show that Algorithm Example 1 has all the criteria listed.

1) Input -- num1, num2
2) Output -- sum
3) Definiteness – the steps are defined precisely
4) Finiteness – there are only 4 steps
5) Effectiveness – the formula sum = num1 + num2 is for adding 2 numbers

Why analyze an algorithm?

- An algorithm that requires gigabyte of memory and a year of running time is not useful.
- The design of algorithms does not only involve effectiveness but also its efficiency with respect to storage space and running time.
- Deciding what algorithm to be use is important to determine how much memory space and execution time an algorithm would require.

Why analyze an algorithm?

Analyzing **an algorithm** means predicting the resources that the algorithm requires.

Computer Resources - memory, communication bandwidth, or computer hardware are of primary concern, but most often it is **computational time** that we want to measure.

"The most important resource to analyze is generally the running time."

Algorithm Design

***Designing* an algorithm** takes into consideration the resources (generally the running time) that the algorithm requires.

Several design techniques:

1. *Divide and conquer techniques*
2. *Dynamic programming (advanced)*
3. *Greedy algorithms (advanced)*

Other Sample Algorithms

1. Linear Search
2. Binary Seacrh
3. Bubble Sort
4. Insertion Sort

Enabling Assessment:

Write a pseudocode to compute the factorial of an inputted number n. Try to trace n= 5. Show your solution and display the result. (10 pts.)

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https://whatis.techtarget.com/definition/algorithm

Thank you for your active participation ☺

CLOSING PRAYER

One La Salle Prayer

Let me be the change I want to see
To do with strength and wisdom
All that needs to be done…
And become the hope that I can be.

Set me free from my fears and hesitations
Grant me courage and humility
Fill me with spirit to face the challenge
And start the change I long to see.

Today I start the change I want to see.
Even if I'm not the light
I can be the spark
In faith, service, and communion.
Let us start the change we want to see.
The change that begins in me.

Live Jesus in our hearts forever!