

University of BATNA 2
Faculty of Mathematics and Computer Science
Department : Computer Science
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module course Support :

Algorithmic and Statics Data Structures

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Foreword

This course is intended for students of the first year common core Computer Science Engineer and students of the first year Bachelor in Mathematics and Computer Science, and all those who wish to learn algorithmic and learn static and/or dynamic data structures. The algorithms of this course are translated into C language.

Chapter 1 : Introduction

1. Definitions :

Computer science: is the science of automatic and rational processing of information. This processing is done by a machine called a computer.

Information: is an element of knowledge that can be represented using conventions to be manipulated (stored, processed or communicated) by a computer. It can be: text, sound, image, video, etc.

Computer : is a machine capable of processing information and is composed of two parts: Hardware (HARDWARE) and Software (SOFTWARE).

HARDWARE: is the physical or hardware part of the computer (keyboard, screen, processor, memory, motherboard, etc.).

SOFTWARE: is the program part in a computer (operating system, application program, etc.).

Operating System: It is a set of programs for computer management (memory management, file management, etc). It acts as an intermediary between the user and the machine.

2. Computer Components

A computer consists mainly of two components:

1-Central unit: This is the core functional element of any computer and is where most of the information processing takes place. It contains mainly:

- The motherboard,
- Memory: there are mainly 3 types of RAM, ROM and storage media. RAM is the central or RAM of the computer. The ROM is the memory that contains the computer boot program (BIOS). The storage media is used to store information (hard disk, CD-ROM, DVD, USB key, floppy disk, etc.).
- The processor (computer brain) is composed of the CPU (control unit: its role is to control the operation of the computer) and a UAL (arithmetic and logical unit: its role is to perform arithmetic and logical operations).

2- Peripherals: there are two types:

- **Input devices :** keyboard, mouse, scanner, ...
- **Output devices :** screen, printer, cabinet, etc.

3. Introduction to Algorithmic

3.1. Solving a Problem by Computer

3.1.1. Problem Definition:

- Definition 1: A problem is a theoretical or practical question that involves difficulties to be solved or whose solution remains uncertain.
- Definition 2: Question to be solved by rational or scientific methods.
- Definition 3: An issue that can be resolved from the elements given in the statement.

3.1.2. Steps for solving a problem by a computer

To solve a problem with a computer, you:

1. **Analyzes the problem:** by defining the data (inputs) and the results (outputs) of the problem and determining the procedure to follow (steps of resolution) which allows to obtain a solution to the problem.
2. **Formulates the algorithm:** this step is used to represent the resolution steps in the algorithmic language (pseudo-code).
3. **Translates the algorithm into a program:** the algorithm must translate into a program written in a programming language.
4. **Runs the program:** on the machine to obtain a solution.

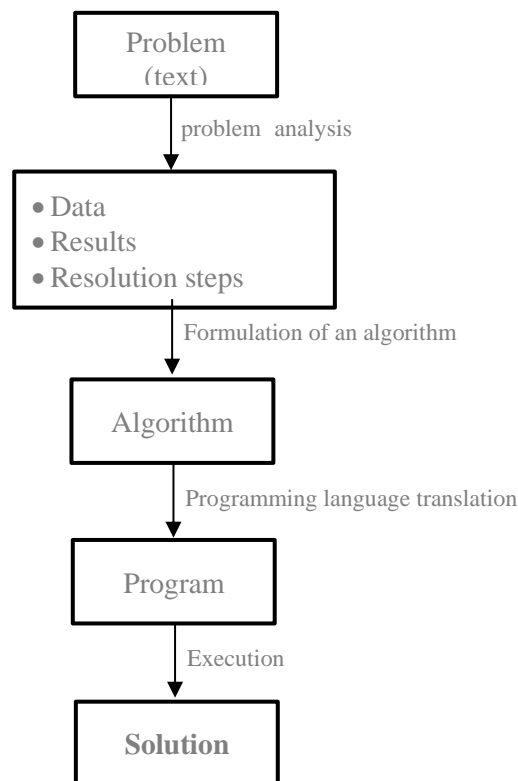


Figure N°1 : Steps for solving a problem by a computer

3.1.3. Presentation of problem-solving steps

Historically, there are two ways to represent the different stages of resolution:

1. **Organigram**: it is a graphical representation of different resolution stages with a set of symbols (squares, diamonds, etc.)

Note: this representation is almost abandoned today,

2. **Algorithm (The pseudo-code)**: is a text representation with a series of conventions similar to a programming language.

Note: This representation is widely used and more practical.

3.2. Algorithm and algorithmic concept

The word algorithm comes from the name of the famous Arab mathematician: Mohamed Ibn Moussa El Khawarizmi (780-850).

- **An algorithm**: is a sequence of ordered and finished instructions (operations, actions or treatments) to solve a given problem.
- **Algorithmics**: the discipline that studies algorithms and their applications in computer science

3.3. Programme and programming:

- **A program**: is a series of ordered and finished instructions that are executed to achieve a given objective (problem solving).
- **A computer program**: is a sequence of ordered and finite instructions that are executed by a computer in order to solve a given problem.
- **Programming**: refers to all activities that enable the writing, testing and maintenance of computer programs.

Note: A program is an algorithm written in a programming language.