

Lesson 1 - Introduction and algorithms

Logical Computational Thinking

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Material

Material

all the material will be available at

<https://github.com/trianam/courseLCT1516>

Book

[https:](https://www.dropbox.com/s/umx65z3m9bnm6xj/Metodologia_de_la_programacion__3ra_Edicion_-_Osvaldo_Cairo_Battistutti.pdf)

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Evaluation

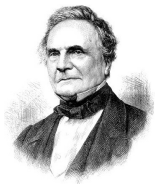
- ✓ You will be evaluated continuously along the lectures
 - exercises
 - questions
 - etc...
- ✓ and with exams
 - 2 partials (maybe 1)
 - 1 final (project)

History

- ✓ classical age and middle ages: **algorisms**

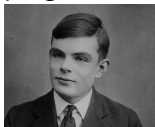


- ✓ 1833-1842: **Analytical engine** of Charles Babbage (Ada Byron)



History

- ✓ before and during WW2: first modern computers (single purpose, programmable), **Turing** studies



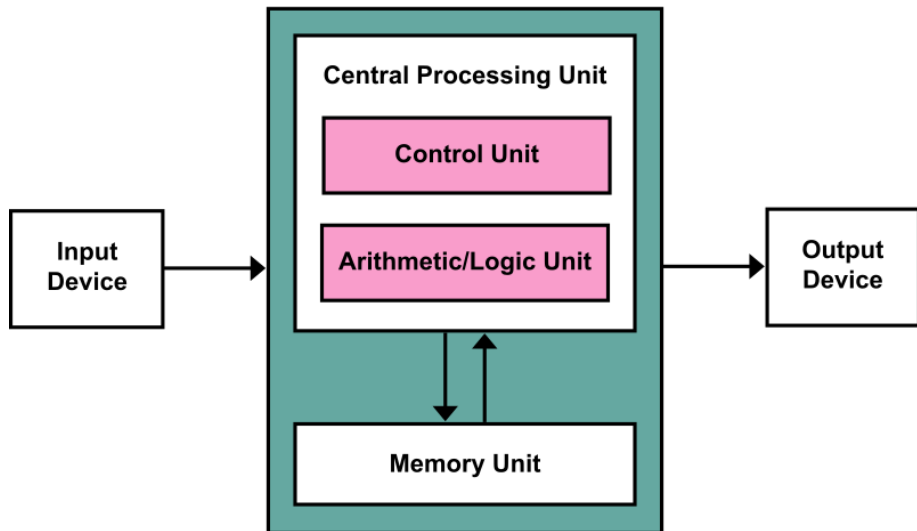
- ✓ 1946: **ENIAC** (general purpose)



- ✓ 1951: **EDVAC**, Von Neumann architecture



Computer architecture (Von Neumann)



Input/Output

Input devices

- ✓ Keyboard
- ✓ Mouse

Output devices

- ✓ Screen
- ✓ Printer

Input/output devices

- ✓ Hard disk
- ✓ Network card

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Algorithms

- ✓ a series of ordered **steps**
- ✓ with the goal of performing a **task**

Examples

- ✓ a recipe
- ✓ an algebraic procedure

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Program

- ✓ An implementation of an **algorithm** in a certain **programming language** (software)
- ✓ A program can be **executed** by a **machine** (hardware)
- ✓ Often a program need to be **compiled** before the execution (**transformed** in something understandable from the machine)

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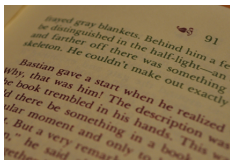
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Literary comparison

Algorithm: the history



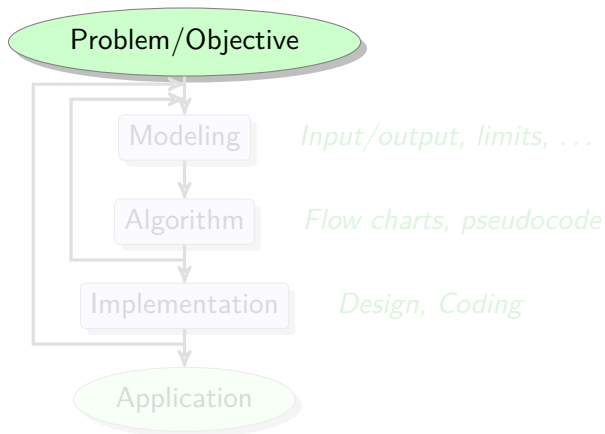
Program: the text



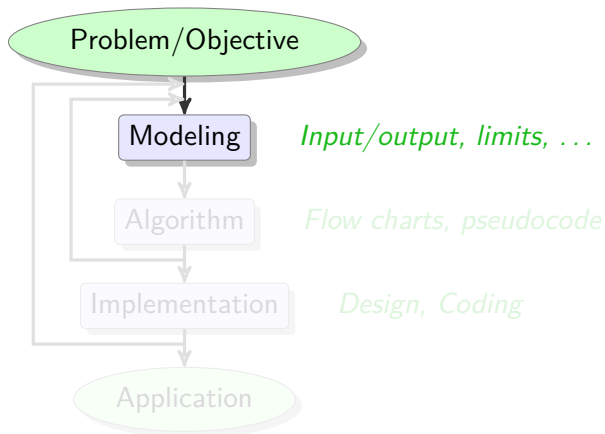
Hardware: the book



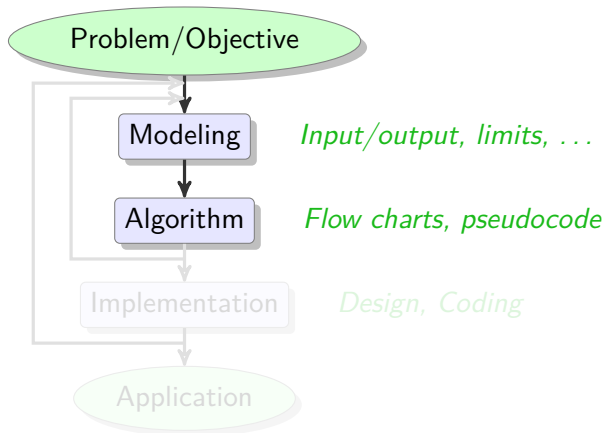
How to develop a program



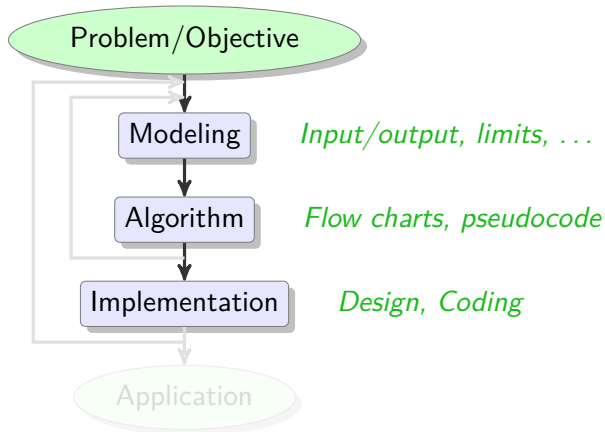
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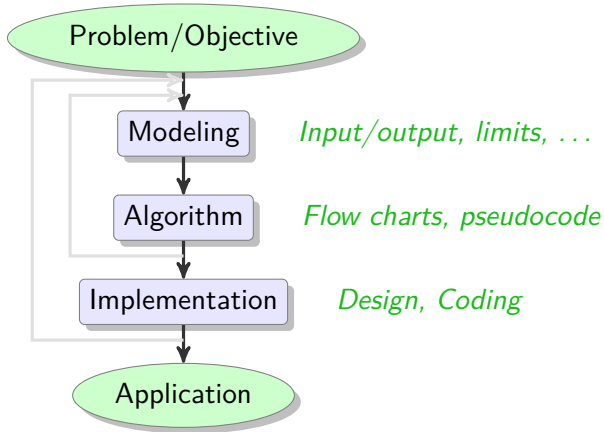
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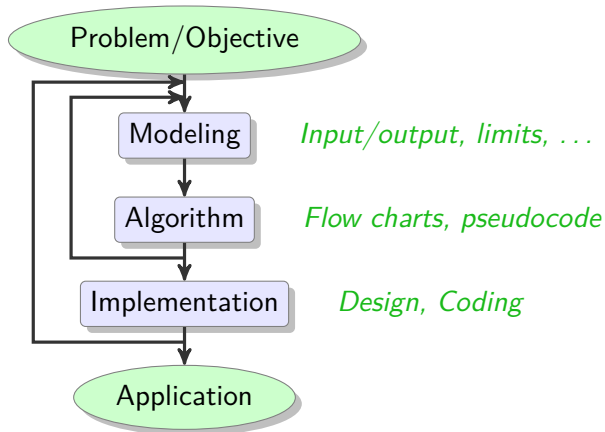
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How to develop a program



How to develop a program



Model

1. **Analyze** the problem or the required objective
2. **Contextualize** in an algorithmic way
3. **Identify** the key concept/mechanisms, how to divide the problem in subproblems

Algorithm

Concept

Use techniques to “put down” ideas on how to resolve the problem.

1. Flow charts
2. Pseudocode

Implementation

Transform the algorithm in code

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Flow charts

Definition

Symbols with different meanings and descriptions, **combined** with the logic of the flow along the time

An oval shape, commonly used to represent the start or end of a flowchart process.

Start/End

Start and end of the flow chart

A parallelogram shape, typically used to denote input or output operations in a flowchart.

Description

Input, reading

A rectangular shape, often used for processing or calculation steps in a flowchart.

Description

Output, writing

A rectangular shape, often used for processing or calculation steps in a flowchart.

Description

Assignment, operation

A diamond or rhombus shape, used to represent decision points or conditional logic in a flowchart.

Condition

Selection, split the flow

Data types

Data type

is the mean how the data is stored and manipulated

1. **Simple** represent single values
 - boolean
 - integer number
 - floating point number (real number approximation)
 - alphanumeric character
2. **Structured** composed of multiple values
 - string of characters
 - array of values
 - ...

All the data types have specific **limits** (depending of the programming language)

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Variables and costants

Name → Content

Variable

- ✓ A name associated with a data type
- ✓ Use a certain amount of memory (specific to the data type)
- ✓ The content **can** be modified

Constant

- ✓ A name associated with a data type
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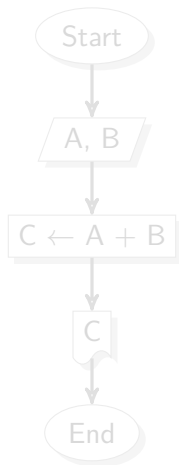
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Example 1

Problem

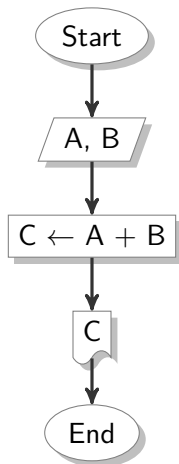
Given two integer A and B , calculate the sum $A+B$ and return it



Example 1

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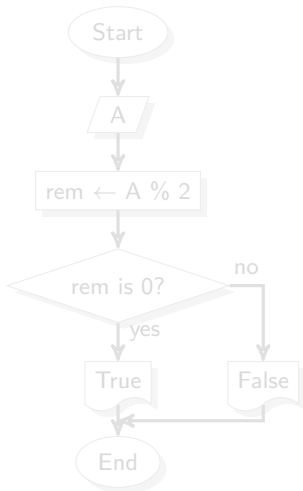
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Example 2

Problem

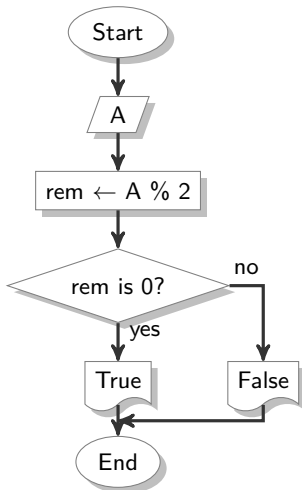
Given an integer A , evaluate it's evenness value, and return **true** if A is even, and **false** if is odd



Example 2

Problem

Given an integer A , evaluate its evenness value, and return **true** if A is even, and **false** if is odd



Exercise 1

Problem

Given the reals A , B , and C (A is $\neq 0$), calculate the solutions x_1 and x_2 of the equation $Ax^2 + Bx + C = 0$ and return them. If the equation doesn't has solutions (real solutions), return $x_1 = 0$ and $x_2 = 0$.

Remember:

1. $\Delta = B^2 - 4AC$

2. if $\Delta \geq 0$ the solutions are:

$$x_1 = \frac{-B + \sqrt{\Delta}}{2A}$$

$$x_2 = \frac{-B - \sqrt{\Delta}}{2A}$$

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We have a parking with a limited number of 50 places. We also have two sensors that notify the passage of a car, one in the entrance and one in the exit. We want to put a semaphore in the entrance that is red when the parking is full and green when it isn't.

1. Make a proper model, identify the different parts of the application
2. Make a flow chart for each part

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