STMC coding team training

Lesson 0: Introduction

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To begin with...

What do you think of when talking about programming?

What is programming?

- A **computer program** is a collection of instructions that can be executed by a computer to perform a specific task [1].
- Tell computer what to do and how to response to input and produce outputs
- Similar to writing an article, you need to follow a few rules

writing	coding
grammar	syntax
content	logic/algorithm
organization	structure and indentation

Examples of computer programs

- Web browser
- Computer games
- Mobile applications
- Operation system (e.g. Windows, Linux, Unix, etc.)
- Productivity software (e.g. Word, PowerPoint, Excel, etc.)

Cool, but what is INSIDE a computer program?

- Computer programs consist of **machine code** that are made up of 0s and 1s
- It's groups of 0s and 1s that represent instructions directly executable by computer.
- Different operation systems (e.g. windows vs Mac) have dfferent set of instruction.

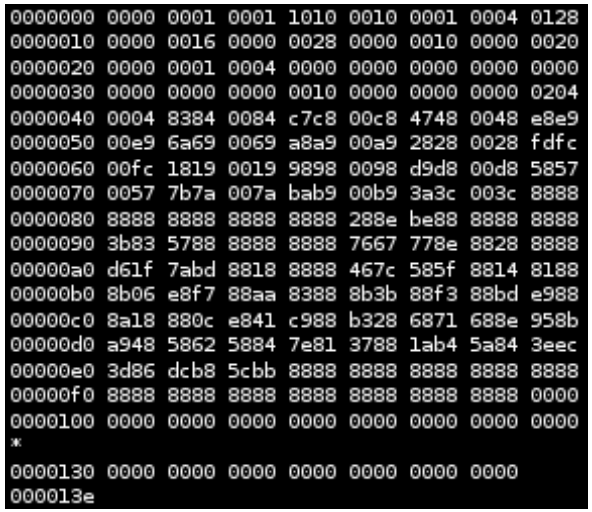

Figure 1: Machine code (Source: https://bit.ly/3sQendj)

But… We don’t speak machine code right?

- In order to communicate to machine more efficiently, people invented the **high level language**
- Examples: C/C++, Java, Python, Ruby, R, PHP, etc.
- It is composed of word and symbol that are used in daily life (e.g. if, while, y=x+c etc.)
- Code written in high level language are usually called **source code**

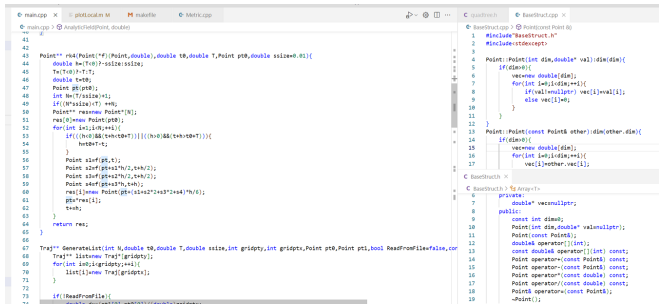

Figure 2: Source code in C++ (Source: me)

Compiler: Translate source code to machine code

- Like we don't speak machine code, machine don't know how to interpret source code.
- We need a "translator" to do the translation,from source code to machine code
- That's what a **compiler** do
- The compiled result is called an **executable**, which has the file extension of `.exe` in Windows

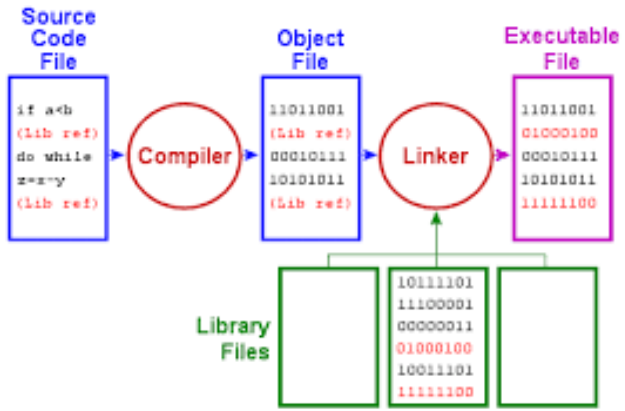

Figure 3: Compiling source code to executables (Source: https://bit.ly/3sQendj)

Some other solution

While machine code is machine dependent (since they have different instruction set), therefore we need to re-compile the source code everytime we change the machine we work on, below are some method to avoid this.

1. Two-step conversion

- Instead of directly translating the source code into machine code, we can first translate it into the instruction needed
- upon running the program, we then translate the instruction to the machine code needed
- Java works in this way (thats why you need to install Java on your computer before playing Minecraft)

Some other solution

2. Intepreter

- For some programming language (like Python), the high level instructions are compiled line-by-line during runtime
- The software that do that is called an **interpreter** instead of a compiler

Let’s move on to write our first program…

Reference I

[1] Wikipedia contributors. *Computer program — Wikipedia, The Free Encyclopedia*. [Online; accessed 27-August-2021]. 2021. URL: https://en.wikipedia.org/w/index.php?title=Computer_program&oldid=1040444998.