

Language Confusion

Programming Languages - Overview and Discussion

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Discussion based - means...

- I am not an expert
- The slides are prepared as a basis for discussion
- Please ask and/or add your knowledge

Motivation

- Which are the important programming languages out there?
- Where are they used?
- What is a programming language - and what not?
- What are the differences?
- And what are good learning resources?

Reasons to choose

- Is used in the project or community I want to contribute to
- There is a course for it
- Easy to learn and use
- Is used a lot
- Has special functionality in e.g. web development, data science, etc.
- Code runs fast
- Security
- ...

Background: What is a programming language?

see for example here the graphic about high level and low level languages:
<http://carlcheo.com/what-is-programming-what-do-programmers-do>

Hello World Example in (some) Assembly Language

```
format ELF executable
entry _start

_start:
mov eax, 4
  mov ebx, 1
  mov ecx, msg
  mov edx, msg_len
int 80h

mov ebx, 0
mov eax, 1
int 80h

msg db 'Hello, world!', 0xA
msg_len = $-msg
```

Hello World Example in C and Rust

In C:

```
#include <stdio.h>

int main()
{
    printf("Hello, world!\n");
    return 0;
}
```

in Rust:

```
fn main() {
    println!("Hello, world!");
}
```

Compiled and interpreted languages

- Compiled languages: C, C++, Go
- Interpreted languages: e.g. Python, PHP, Ruby, R, JavaScript
- Virtual Machine: Java, C#

Not programming languages

- HTML
- CSS

They are called markup languages

Some Rankings

TIOBE Index

- 1 Java
- 2 C
- 3 C++
- 4 Python
- 5 C#
- 6 JavaScript
- 7 Visual Basic .NET
- 8 R
- 9 PHP
- 10 Matlab

GitHub

- 1 JavaScript
- 2 Python
- 3 Java
- 4 Ruby
- 5 Go
- 6 PHP
- 7 C++
- 8 C
- 9 TypeScript
- 10 C#

And historically important ones

In Tendency:

- Fortran
- Pascal
- Basic
- Perl
-

Where do those languages come from?

- Independent: C, C++, Javascript (ISO/IEC Standardized)
- Python Software Foundation: Python
- PHP group: PHP
- Mozilla: Rust

- Oracle (Sun): Java
- Microsoft: C#, TypeScript, VB.NET, F#,
- Apple: Objective-C, Swift
- Google: Go, Kotlin

And where are they used?

- Web, front-end: (HTML, CSS), Javascript
- Web, back-end: PHP, Java, Javascript, Ruby, Python,...
- Apps:
 - Android: (Javascript), Java, C or C++
 - iOS: (Javascript), Swift or ObjectiveC (older)
- Data science: Python, R, Matlab
- Numerical modeling: Fortran, Julia, Python, Matlab, R
- Desktop software: C, C++, C#, Java, Python
- Linux systems: C, C++, Python, Java, Bash
-

Easy to use vs code runs fast?

- Easy to difficult: Ruby < Python < C < C++ ?
- For speed, in tendency
 - Fast: C, C++
 - Medium: Python,
 - Slower: Java, Ruby, ?
- But speed depends a lot on how the code is written

Object orientation

"Some of the characteristics that object-oriented programming languages tend to share are objects[...]"

- Not object oriented: C
- Almost all others can be programmed object-oriented
Java, C++, C#, Python, PHP, Ruby, Objective-C, Swift, R, ...

Security

- Not so secure: C, C++ (no mandatory garbage collector)
- Rust was designed as a safer alternative to C and C++

Learning resources

- <https://www.codecademy.com/> for HTML & CSS, Python JavaScript, Java, SQL, Bash/Shell, Ruby (not all free?)
- <https://www.freecodecamp.org/> for HTML & CSS, JavaScript, Databases, git, DevTools, Node.js, and Angular.js
- <https://www.codewars.com/> 20+x languages
- <https://www.coursera.org/> and edx.org
- <https://eu.udacity.com/courses/all> (some free courses??)
- <https://www.codeschool.com/free> jQuery, angular.js, Ruby, Rails, ASP.NET, git, Objective-C, SQL, R

Some more notes

- `https://en.wikipedia.org/wiki/List_of_programming_languages`
- `https://en.wikibooks.org/wiki/Computer_Programming/Hello_world`
- `http://www.99-bottles-of-beer.net/`
- `https://en.wikipedia.org/wiki/Comparison_of_programming_languages`
- `http://carlcheo.com/what-is-programming-what-do-programmers-do`

Anything else you want to share or know?

- HTML, CSS and a little bit of JavaScript - Web-Programming for Beginners -today 5pm, Lecture Room 12
- We were shortly talking about functional programming, which is a different programming paradigm and where other programming languages are used (but not so wide spread, e.g. Haskell)