CC314-18 THEORY OF PROGRAMING LANGUAGES

ASSIGNMENT 3

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1. **Programming language advancements**

In 2018-2023's period of time, programming languages is already in its high-level language era. Popularity of Object-oriented programming and Machine Learning languages is prominent. One is Python which had its popularity during 2018 because of its features being flexible and scalable, has good security, versatile, robust, and easy to integrate. Because of this, it is widely used in web development, machine learning, data analysis, and so much more. Later on, this became 2019's most popular programming language.

Not only Python, but another language that also has constant development is Java. Looking at its latest release, the Java JDK 19 which was released in September 2022. This offers structured concurrency, record patterns, a preview of a foreign function and memory API, and support for the open-source Linux/RISC-V instruction set architecture.

Another thing that amazed the masses was the release of ChatGPT 4 back in March 2023. ChatGPT 4 is a large language model created using Python programming. Besides its casual like conversation, like in its predecessor, users can also use image inputs. ChatGPT also gave programmers convenience in writing code and through machine learning, it was trained to teach suggest and help analyze code by programmers.

2. **5 generations of language**

1GL – First Generation Language

This is the low-level language era which is Machine Language. In here, a programmer only uses bits, or 1s and 0s, to build code which makes programs translation free making it faster to be executed as these is the native language of a computer.

2GL – Second Generation Language

In this generation, Assembly Language takes place which still, also fall under low-level language. Additionally, this generation introduces the concept of using mnemonics or symbolic names rather than pure binary. Therefore, making it easier to build code and be less prone to errors.

3GL – Third Generation Language

This generation is categorized as the High-level Language, and it also introduced procedural language. This surpassed the limitations of the previous generations by being able to concentrate mainly on the logic of the program. This also introduced English-like syntax enabling developing programs to be less prone to errors, can easily be maintained and, has faster development process than its predecessors. However, it requires compilers and interpreters to execute the program resulting in a slower execution.

4GL – Fourth Generation Language

Just like the 3rd Generation language, this generation is considered to be human-friendly to understand. However, this generation shifted from procedural to non-procedural programming, or what is called Object-oriented programming. It also enabled programs to use databases, made program development cost less and reduce development time. But just like the 3rd generation, it has some drawbacks as it consumes higher memory.

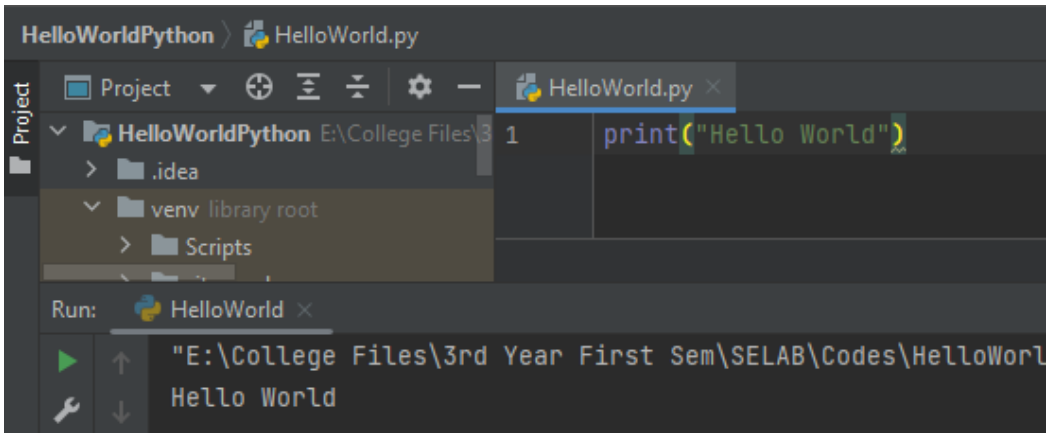
5GL – Fifth Generation Language

In here, Artificial Intelligence (AI) became the concept of programming. Machine Learning takes place which trains applications or programs to think and learn the solutions rather than being solved by programmers using algorithms. This reduces the effort to solve problems making development easier, however, with a cost for expensive resources as well as having a more complex and longer code.

3. **5 modern programming languages**

Popular programming languages nowadays are Python, Java, JavaScript, C# and Rust, according to an article by Muhammad Zulhusni.

- **Python**, as we know earlier, had become 2019's most popular programming language due to its simplicity of code implementations. Looking here we can see how clean a print instruction look compared to other languages.



- **JavaScript** is a very popular language used in web-based programs such as web-browser games and websites. It is commonly the default language used web development. Below is the sample of "Hello World" print instruction.

```
console.log('Hello, World!');
```

https://www.programiz.com/javascript/examples/hello-world

- **Java** is another popular programming language as it implements for object-oriented programming as its core feature and has become reliable over the years. It uses objects and classes which is different from procedural approach. This is the example of a Hello World program.

- **C#** is a versatile programming language that was created by Microsoft. This language took inspiration on Java. Here's how it looks in printing a "Hello World" String

```
// Hello World! program
namespace HelloWorld
{
    class Hello {
        static void Main(string[] args)
        {
            System.Console.WriteLine("Hello World!");
        }
    }
}
```

https://www.programiz.com/csharp-programming/hello-world

- **Rust** is a new programming language which contains features that blend with other programming languages like C/C++, Java, and Python. It is scalable and has better concurrency resulting in a faster compile time. This language offers a friendlier syntax just like in the example of printing "Hello World" below.

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

https://www.programiz.com/rust/hello-world

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