An Overview on the Study of Programming Languages

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ABSTRACT: ***Programming has been increasingly popular among engineering students in recent years. Programming is a type of education that consists of a collection of instructions for completing a certain task. To become a developer or programmer, students choose computer science engineering. However, students have a difficulty when deciding which language to learn, as well-known languages like C, C++, Java, JavaScript, Python, and others are in high demand. This perplexes them because they know they've made the right decision because they'll be spending their entire career on this knowledge. Author created this paper to address this issue. The author of this review article has addressed a number of well-known coding languages, including C++, C, Python, SQL, JavaScript, and Java, as well as several recently announced languages. The author also compared the time and memory required by compilers of various languages in this study. Author feels that by doing so, pupils will have a better understanding of programming languages. As a developer or programmer, there are several options in the world of programming. As a result, programming languages have a bright future as the demand for engineers rises owing to technological advancements.***

KEYWORD: Application, Data, Languages, Memory, Programming.

1. INTRODUCTION

Programming is a learning which consists of sets of instructions that is used to complete a certain task. Programming can be done by using programming languages. Currently, there are many trending and famous coding languages such as C, C++, Java, Python, JavaScript, Structured Query Language (SQL) etc. that are widely used by programmers. Programming languages is a language comprised of sets of algorithms or inputs that is used to find certain outputs. Programming is a subject that is very important to the department of computer science students. In this paper, author have discussed about some programming languages with examples, advantages and disadvantages of languages and newly introduced programming languages in the world.

1.1 Programming Languages:

Programming languages are made up of a collection of inputs/instructions that are used to generate a specific output for a certain purpose. The following programming languages are listed below, along with examples and benefits and drawbacks:

a) *C:*

C is a procedural and general-purpose programming language. It's a language that allows low-level memory access and generates language structures that translate well to machine instructions[1], [2]. The C programming language is used to create operating systems such as UNIX. The compiler uses 1.17 MB of memory and offers runtime support in 1.00 seconds. Because of its low-level characteristics, this language is used for cross-platform programming. C is used in everything from embedded microcontrollers to supercomputers, demonstrating that it is available on any platform. C is used in assemblers, test editors, databases, and network drivers, to name a few.

Program on C to add two numbers:

```
#include<stdio.h>
int main () {

    int r=3, s=4, Add;

    Add= r+s;

    printf (“ Add:”, Add);
```

}

Output:

Add: 7

C Benefits:

- The C programming language is simple to learn and reliable.
- As C ideas are utilised in many languages, it serves as a building block for other well-known languages.

C Disadvantages:

- In C, data security is difficult to achieve.
- Because C does not allow oops notions, it does not include classes or objects.

b) C++:

C++ is a procedural and object-oriented language that is easy to learn. Classes, objects, inheritance, polymorphism, encapsulation, and abstraction are all part of it. C++ has a low memory manipulation level[3]. The compiler took 1.56 seconds and used 1.34 megabytes of memory. C++ is a more advanced variant of C. C++ eliminates the difficulties of C. It's commonly utilised in the creation of hardware-accelerated games. C++ is recognised as a powerful programming language since it is used in the Windows operating system. C++ is used in browsers, libraries, graphics, databases, embedded systems, and cloud services, to name a few[4].

Program on C++ to add two numbers:

```
#include<iostream.h>
int main () {

    int t=3, l=8, Add;

    Add= t+l;

    Cout≪“Add:”≪Add;

}
```

Output:

Add: 11

C++ Benefits:

- The C++ programming language is an object-oriented embedded programming language.
- The movement of a programme may be accomplished via a variety of platforms.

C++ Challenges:

- It doesn't offer any protection.
- When used for sophisticated web applications, it's tough to debug.

c) Java:

Java is one of the most widely used and desired programming languages on the planet. Java is a general-purpose coding language that is class-based, object-oriented, and synchronous. This language is mostly used by programmers and developers[5]. The compiler takes 1.89 seconds and consumes 6.01 MB of memory. It is now the most difficult programming language, and it has even taken the top spot with Android OS. This language is used in mobile-based applications, enterprise-level purposes, the production of desktop applications, and Android apps for tablets and mobile phones.

Print a Java program on Friends forever:

```
Class buddy {
    Public static void main (String [] args) {
        System.out.println ("Friends forever")
        }}
```

Result:

Friends forever

Java Benefits:

- Because Java is based on the object-oriented paradigm, it is more practical and simple to learn and understand.
- It is a secure programming language because it does not utilise explicit pointers,.

Java Challenges:

- The price is high because of the increased processing,.
- It consumes too much RAM because the application operates atop the virtual machine,.

d) Python:

Python is a strong interpretive, high-level, interpreted, and object-oriented programming language. Python uses tuples and lists. According to theories, increasing code readability, particularly the use of substantial white space, is important. It clarifies programming at all scales, from the tiniest to the largest[6]. Python's uses include web and game development, language and software development, artificial intelligence, machine learning, and scientific and numeric alphabets, to name a few. It is an object-oriented scripting language that takes 71.90 seconds and uses 2.80 megabytes per second to compile.

Program on python to sum two numbers:

```
Num5=1
Num6= 22
Add= Num5+Num6
Print ('Add of Num5 and Num6 is: ')
```

Output:

Add of Num5 and Num6 is 23.

Python Benefits:

- Python is a useful language because it allows users to quickly solve problems.
- In comparison to other languages, it is simple to read, write, and learn.

Python Challenges:

- Because it runs code line by line, the pace of execution is sluggish.
- It has a lot of flaws when it comes to mobile computing.

e) Structured Query Language:

SQL is a programming language for organising data contained in relational databases. SQL is a database, and examples include MySql, Oracle, and Microsoft SQL Server. The user can remove, view, join, union, and many more activities in this window. Users may learn how to get the information they need from

large, multi-faceted databases using this language. SQL is used to write data integration scripts, as well as to set up and perform complicated queries.[7].

SQL Benefits:

- SQL is a language that allows a user to obtain a huge amount of data from a database.
- The user may connect two or more tables together as one, as well as examine and remove them.

SQL Challenges:

- SQL has a complicated interface that makes some users uncomfortable while using databases.
- Some SQL versions are prohibitively expensive, preventing consumers from utilising them.

f) JavaScript:

JavaScript is an interpreted and light-weight programming language. Because it is HTML-based, it is simple to comprehend. It is intended for use in the creation of software applications. It is an object-oriented scripting language that takes the compiler 6.52 seconds to compile and uses 4.59 MB of memory[8], [9].

Program on JavaScript to add two numbers:

```
const h =10;

const g=11;

const Add = h + g;

console.log (“Add: ”)
```

Output:

Sum: 21

JavaScript Benefits:

- JavaScript makes it easier to create web page[10].
- JavaScript is extremely quick because it can be executed instantly in the client-side browser. JavaScript is unaffected by network calls to a backend server unless external resources are requested.
- JavaScript is widely used on the internet.
- JavaScript is a scripting language that works well with other languages and may be utilised in a wide range of applications.

JavaScript Challenges:

- In creation of anything, JS takes too much time.
- Because the code runs on the user's computer, it can be used for malevolent purposes in some situations. This is one of the reasons why some people disable Javascript.

Comparison of time and memory for various programming languages:

Figure 1 compares time (in seconds) and memory (in megabytes) for a variety of languages, including SQL, JavaScript, C, C++, Java, and Python.

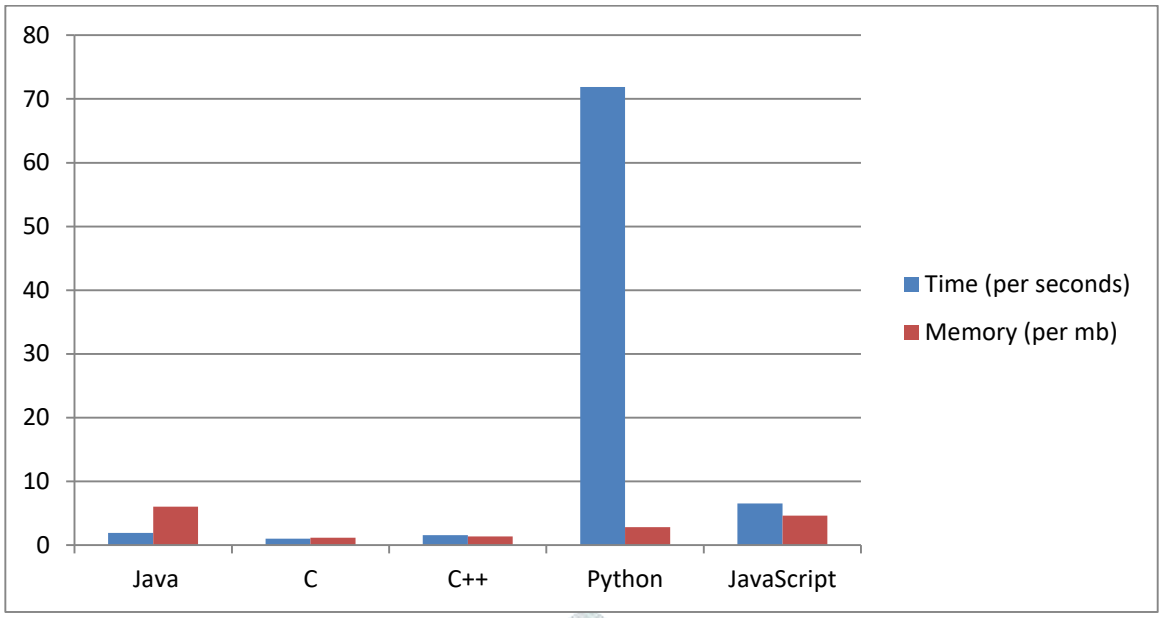

Figure 1: The graph shows the comparison of time and memory in various languages

1.2 Latest Programming Languages:

Several programming languages which are newly introduced in the year of 2019-2021are stated below:

- *Go:*

Google has just released Go, a new programming language. It's a C-style language that was created by Google engineering and is one of the fundamental languages. Go is an excellent low-level language for developers interested in systems development. It contains many of the same characteristics as C++, but without the complex syntax and steep learning curve. This language may be used to construct or run web servers, data pipelines, and machine learning systems[11].

- *Kotlin:*

Android app development, online application development, desktop application development, and server-side application development are all common uses for Kotlin. The goal of Kotlin was to make it a more well-known programming language than Java. The majority of Google's apps are written in Kotlin. Kotlin is used by companies like Coursera, Pinterest, and PostMates as their own programming language.

- *Elm:*

It's a programming language for developing front-end web apps. When Elm collates to JS, it may create UIs that run rapidly and without problems. Elm is a functional programming language that allows developers to create client-side frameworks without having to deal with HTML and CSS's demonstrative features.

- *TypeScript:*

This language was created by Microsoft. It's a free, open-source static type system built on top of JavaScript. TypeScript is an object-oriented programming language that was created to expand the capability of the JS programming language (JavaScript). It's a JavaScript superset. This language makes it simple for developers to write and maintain code. Typescript's compiler looks for type differences and verifies the error at compile time to avoid runtime problems. It's also well-organized and simple to comprehend. Its comprehensive toolset accelerates the development of applications.

- *Python 3:*

Python 3 is a version of Python 2 that has been updated. Python 3 was launched because it comes with pre-written code. The distinctions between binary code, Unicode, and plain text are straightforward to explain now that Python 3 has been released. Installing Python 3 adds a new command called asyncio.

2. DISCUSSION

As previously said, programming is a method of learning that consists of a collection of instructions for completing a certain goal. Students are increasingly choosing programming languages since programming is becoming more popular, and companies like as Coursera, Udemy, and nptel provide beginner programming classes. Computer programming is now being used to harness computer power as the world's technology evolves and people need to be able to regulate the connection between humans and machines. To make advantage of such processing capability, we utilise computer programming. The author of this review article discusses programming languages with examples, newly introduced languages, and a comparison of the compiler's time and memory use. The pros and cons of several programming languages were also explored in this study. The author feels that this article will assist students in deciding whether or not to pursue a career in programming. In addition, technology is advancing at a rapid pace. The need for programmers, web developers, and software developers has risen as a result of this technological advancement. As a result, programming languages have a bright future.

3. CONCLUSION

Currently, technology in the world is evolving on a daily basis, and every business has a strategy in place to change their product technology. Because programmers and web developers have a solid understanding of computer languages, their demand has risen as technology for diverse goods evolves. A programming language is a collection of methods or inputs that are used to generate certain outputs. With a rudimentary understanding of programming, you can do a wide range of data processing jobs. The author of this article discusses several programming languages with examples, newly introduced languages, and a comparison of the compiler's time and memory use. This document will be useful for anyone who is having trouble deciding which language to study. Programming languages have a bright future because technology is evolving at a rapid pace, increasing the demand for programmers.

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