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CONSIDERATIONS ON MODERN PROGRAMMING LANGUAGES

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ABOUT ARTICLE

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Abstract: This article provides an overview of modern programming languages. Today there are about 8 thousand such languages, many of which are understandable only to the authors. However, there are programming languages that have become international and are used by millions of people every day. No computer will work without a programming language. With its help, certain mathematical algorithms are created that help the computer execute user commands. Two powerful programming languages in the programming world, Python and C++, a general, complete approach to young learners, which programming language is better, which one is better for them according to their future direction, differences, advantages and disadvantages of the two languages.

INTRODUCTION

Computers have become such an integral part of our lives that we can no longer imagine it without them. It is hard to believe that it was only half a century ago that the first computers appeared, which were slow and cumbersome. Now we have a huge variety - from ultra-thin laptops to powerful gaming computers.

Now progress has gone so far that technology can intuitively understand the user's request. However, it is worth remembering that all programs, browsers and sites are based on programming languages.

Today there are about 8 thousand such languages, many of which are understandable only to the authors. However, there are programming languages that have become international and are used by millions of people every day [12].

No computer will work without a programming language. With its help, certain mathematical algorithms are created that help the computer execute user commands.

The programming language does not look at all the way we used to imagine the language - it is a set of various characters that are converted into a computer-understandable code.

The classification of programming languages from low to high levels depends on how close the language is to humans. The less a programming language is understood by a person, the lower it is in terms of level.

Most languages are converted into machine-readable code using translator programs. With their help, lexical, semantic and syntactic rules are prescribed, which will determine what actions the user will request and the appearance of the program.

A programming language is an integral part of how any computer works. In the modern world, programmers work with them, who write codes and create programs using complex code structures.

For an ordinary person, writing even the first page of the site will seem like a strange combination of different symbols. For a programmer, this code allows you to give the computer the desired command and execute it. In a programming language, an ordinary user communicates with a computer [12].

MATERIALS AND METHODS

Now, before talking about modern programming languages, we would like to quote a quote from the founder of Ford Motor Company, Henry Ford. He once said, *"If I had asked people what they wanted, they would have said faster horses."* In 1913, Ford introduced a revolutionary method of production - the conveyor. The introduction of the world's first moving conveyor belt will help drastically reduce the time it takes to assemble cars. This, in turn, will lead to a decrease in the price of cars, and not only the nobles, but also the common people will have their own cars. The first personal computer was created in 1973 by French Nruogh Trohg Ti, and at that time such computers were seen as toys. Then, in 1977, it was improved and mass produced by the American company "Apple Computer" headed by Steve Jobs. Since then, the computer has taken a firm place in our lives and has become the most modern means of information processing. The evolution of personal computers also saw the emergence of popular programming languages such as Python and C++. Python is known for its simplicity and versatility, making it a popular choice for a wide range of

applications. C++, on the other hand, is known for its speed and efficiency, making it an ideal choice for applications that require high performance and low levels of control. Choosing the right programming language for a project requires a thorough understanding of the requirements, goals, and constraints. Each programming language has its own strengths and weaknesses, and no single language is best for every project. By taking the time to understand the needs of the project, developers can choose the programming language that best suits their requirements and allows them to create software that meets their goals.

In general, this field has been added for a short period of time compared to the period of human development, but people have been widely engaged in programming for about half a century. Programming languages have revolutionized the way we interact with technology and changed the world as we know it. Among the many programming languages available today, two of the most popular and widely used are Python and C++. These two programming languages have conquered the world with their unique strengths and capabilities and have become the cornerstone of modern software development. In this article, we will delve deeper into the features and benefits of these two programming languages and compare them. We explore their strengths and weaknesses and help you choose the best programming language for your project. Whether you are a beginner or an experienced programmer, this article will provide you with valuable insights into the world of programming languages and help you make the right decision. So let's get started and explore the world of Python and C++.

What is C++?

C++ is a programming language introduced by Bjarne Stroustrup in 1979 in New Jersey. It is a general-purpose programming language that is used to create software for a variety of applications. It used to be called C with classes instead of C++ because it was designed as an extension of the C language.

C++ is considered a middle-level programming language because it contains features of both high-level programming and low-level programming languages.

C++ Language Syntax: C++ syntax includes:

- Header files;
- Main function;
- Class;
- Methods;
- Objects;
- Sample variables;
- Return statement.

Header Files: Header files located at the top of the program. These files instruct the compiler to include all necessary functions associated with the header file. This is included using the #include preprocessor directive. <iostream> is a header file usually included in C++ programs, and this file allows us to use I/O operations.

Main Function: The main function can be called the entry point from where the execution of our program starts. Every C++ program contains a main function, and when the program executes, control passes directly to the main function.

Class: A class can be defined as a diagram that describes the behavior of objects or you can say it is a collection of objects. A class is defined by the keyword class and has its own members called member functions or methods, variables and constructors, etc.

Methods: A method or function is one of the most important parts of C++ programming because it is used to write logic, manipulate data, and perform all other important operations inside a method. You can give the function name along with the return type, and then we can write the actions or logic inside the parentheses.

Objects: Objects can be defined as an instance of a class. If an object is created for a particular class, then that object can be used to access the data members and functions of that class using the dot operator. This can be done by writing the object name before the dot operator and then the function name after the parentheses.

Instance variables: These are variables defined inside a class but outside of methods. They are mostly object-specific, and each object has its own set of instance variables.

What is Python?

Python is a programming language introduced in 1991 by Guido van Rossum. It is named after Monty Python's Flying Circus TV show. Python is a high-level object-oriented programming language. It is one of the easiest and simplest languages to learn because it is close to pseudocode. Its version 3.11.2 was released on February 8, 2023, which included features such as garbage collection for memory management. Python is widely used in machine learning, data analysis, statistics, etc. Python supports several programming models, including procedural, object-oriented, and functional programming. It also includes features like dynamic linking and dynamic writing.

Python Language Syntax: Python syntax includes:

- Notes;
- Lines of documents;
- Line;
- Quote;
- Identifiers;
- Variables;

- String formatters.

Comments: Comments in Python are used to store tags in appropriate places in the code. It is mainly used to explain sections of code and is declared using the # symbol.

Docstrings: Docstring is also used to explain code in Python. The developer can check them at runtime. Its boundaries are defined by three double quotes, and within those double quotes you can write or explain.

Indentation: In Python, indentation refers to spaces at the beginning of a line of code; if there is no space, it will show a syntax error. You can limit the number of spaces or tabs.

Quote: Quotes are used to create string objects in Python. If you use a single quote at the beginning of a line, you must end it with a single quote, and the same goes for double quotes.

Identifiers: Identifiers are used to uniquely identify an element in Python; now this element can be a variable, function, class, etc., there are some rules related to it. An identifier can only be uppercase A to Z and lowercase a to z or start with an underscore.

Variables: Python is a dynamically typed language, so we don't define the type of a variable; a decision is made based on the value. You can assign a string to a variable and an integer to a variable; prints both.

String formatters: A string formatter is used to display and format a string into a more elegant output.

RESULTS AND DISCUSSION

Based on the above information, we will now focus on the aspects of using C++ and Python programming languages, which are considered modern programming languages, their features and their main differences.

Using C++:

- C++ is used for game development. It can handle the complexities of 3D games, and also provides multi-layer networking, which makes it capable of developing game systems and 3D games;
- C++ is used to create compilers for other programming languages because it is closer to the hardware;
- in addition, it plays a major role in software development. C++ is used to develop advanced software applications; for example, Adobe, Spotify and Youtube have different parts written in C++;
- C++ is also used to create embedded systems. It is closer to the hardware and thus it is preferred for manufacturing gadgets like smartwatches, medical devices, IoT devices, etc.

Using Python:

- Python is widely used in modern technologies such as artificial intelligence and machine learning. Python is suitable for building machine learning models because it supports various libraries;

- Python is used for web development. It has many frameworks that reduce your task significantly. Python provides Django and Flask for website development;

- Python is also used as an auxiliary language in software development; it was used to develop the Dropbox desktop application;

- Python is widely used in the field of robotics and is one of the most common languages for automating robotic processes.

Features of C++ language:

- C++ is a portable language, which means you can use the same piece of code in different environments;

- C++ is a fast and efficient language;

- C++ allows dynamic memory allocation;

- Unlike C, C++ is an object-oriented language with concepts like abstraction polymorphism, inheritance, etc.

Features of the Python language:

- Python is a platform independent language. You can use the same code on different platforms and it is an open source language;

- Python is also an object-oriented language with features such as dynamic type checking and high readability;

- Python supports automatic garbage collection and interactive modes of debugging and testing;

- Python has a large standard library, so you don't have to write code for every task.

The main differences between C++ and Python are:

Language Simplicity: When it comes to the simplicity of C++ language, C++ is a bit more complex and it has more syntax rules as well as programming conventions.

Python is a friendly language. It has a simple and easy-to-learn syntax. In addition, its features are easy to use, allowing you to write short and readable code.

In speed: C++ is faster than Python because it is statically typed, which results in faster code compilation. Python is slower than C++, it supports dynamic typing and also uses an interpreter which slows down the compilation process.

Memory Management: Memory management in C++ is done manually as it has no garbage collector. It also uses benchmarks that are more vulnerable to memory leaks. Python provides automatic programmable memory management because python has a garbage collector.

Declaration: If you want to declare a variable, you must declare it with a type in C++. In Python, you don't need to declare any data type with a variable.

Usage: Python is widely used in technologies such as machine learning, artificial intelligence, database, etc., and is widely used in back-end development. C++ is good at coding at the hardware level, so it is widely used for building embedded systems.

CONCLUSION

As we have seen in this article, Python and C++ are two powerful programming languages that have revolutionized the software development industry. Both languages have unique strengths and weaknesses that make them ideal for specific applications and use cases. Python's simplicity and versatility make it a great choice for beginners and applications that require rapid development, such as data science, artificial intelligence, and machine learning. Its extensive standard library and ease of use have made it one of the most popular programming languages today, with a growing community of developers and users. On the other hand, C++ is known for its speed and efficiency, making it an ideal choice for resource-intensive applications that require low-level management, such as video games, real-time systems, and operating systems. Its compiled nature allows for faster execution and better memory management, making it an excellent choice for high-performance applications. The choice between Python and C++ ultimately depends on the specific requirements and constraints of the project. Developers must consider factors such as performance, memory management, ease of use, and availability of libraries and tools. By understanding the unique features and benefits of each language, developers can choose the best tool for the job and create software that meets their goals and exceeds expectations. It should be noted that while Python and C++ are powerful programming languages, they are not the only options. The software development industry is constantly evolving, with new languages, tools, and frameworks emerging every year. Developers need to stay abreast of the latest trends and technologies to stay ahead of the game and create software that meets the needs of users.

In short, the world of programming languages and software development is complex and ever-changing. Python and C++ are two of the most popular programming languages today, and each has its own strengths and weaknesses. By understanding the capabilities and limitations of each language, developers can create software that meets their needs and achieves their goals. As technology continues to evolve, it's imperative that developers keep up with the latest trends and technologies to stay competitive in the industry.

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