

## **C Plus Minus**

### **An Essay About Comparing C and C++**

C is the one of the 28 letters in the alphabet. But in computer science, C and its successor C++ are perhaps two of the most important programming languages .

In this essay we will examine the history of C and C++ ,why they were so popular,why they came from the same origin but later separated , their similarities and differences.

The beginning of C language dates back to the early 1970's. To develop the UNIX operating system in AT&T laboratories,Ken Thompson and Dennis Ritchie used to programming language derived from the B language.This new language was named C because it was the successor of the B language.This new language,unlike B language, supported data types and could be compiled to compensate for its slowness due to fact that B language is an interpretive language. Thus, the C language had become powerful by 1973 ,and much of UNIX written in assembly language was rewritten in C. This is important because you can write any program in C ( C is general purpose language.) ,but that is not what made it popular. The UNIX operating system is the main reason of the popularity and success of C. If you wanted the maintain your UNIX operating system you needed to use C. C was very popular so that is reason C and its other versions were used for different operating system. Because C was not limited to the UNIX operating system. In addition , the C language has become even more popular thanks to " The C Programming Language", published by Brian Kernighan and Dennis Ritchie in 1978 .This book was used as the unofficial standart of the C language for a while.Also in the 2nd edition of this book are the following ANSI C standards.

- **struct, long int and unsigned int were added**
- **==+ changed to +=**

C language bearing the traces of this book is called traditional C language .

Over the years, new C variations have been developed for different brands and models of computers. Although most of them have common features,they generally do not work well with each other. This was a major problem for software production. To find a common standart,a technical committee was established in the USA in 1983 and they adopted the ANSI C standards in 1989. After this event,Dennis Ritchie and Brian Kernighan have republished their books in accordance with ANSI C standards. Although ANSI C standards are not very compatible with the traditional C language, C has gained a widely accepted quality at the end of this process.

The C language was not updated for a long time after setting the ANSI C standards . In the early 2000's ANSI C adopted the standards known as C99 and gained new features. To give a few examples :

- **Bracket declarations**
- **One line comments** "// "
- **New data types like long long int,boolean,complex etc...**

C language is a very special programming language . Because it has features of both high-level languages and low-level languages. For example,like assembly language,C programming language can manipulate computer memory directly .Also ,as with high-level languages,it is much easier to read and write than assembly language.Before we start C++ language and its comparison with the language,let's finish this part with a simple C code.

```
# include <stdio.h>

int main(){

printf(" Hello,World ! ");

return 0;

}
```

Over the years ,as new languages came out in programming and new concepts came,it became clear that C language should be developed in some ways,that is,its should be optimized.This requirement formed the motivation for the emergence of C++.

Like Java, Delphi,Visual Basic,C++ is one of the sources of operating systems such as Windows,Linux,Unix .It was developed by Bjarne Stroustrup in 1979 at Bell Laboratories in New Jersey,USA .It is basically built on the C language .In other words,C++ has treated the C language as a subset. It is also contains a lot of inspiration from Simula 67 language. This new language was called "C with Classes" when it first came out. In 1983 its name was changed to C++.

As in the C language, efforts have been made to find a new standard in the C++ language. There studies, which first started in 1990,were completed in 1997. Due to the rapid development nature of computer science,these studies still continue nowadays.

All traditional programming language problems can be handled with C++ language, which has a new philosophical orientation. With C++, which is produced with an object- oriented approach, really good solutions can be developed in operating environments.

As it can be understood from what has been written, C and C++ languages contain different paradigms and different concepts. Before we compare these 2 languages in detail let's close this part with a sample C++ code.

```
# include <iostream>

using namespace std;

int main(){

cout <<" Hello , World !";

}
```

Although both C and C++ originated from the same origin, nowadays ,the use of both is quite different. We will look at these details in more detail later in this section. First of all, let's take a look at how we compare the 2 languages.

It is very difficult to bring two computer scientists to the same point. Because there are too many techniques, too many concepts. In order to achieve this, 2 languages are tried to be compared in every aspect with more than one criterion and the sub-criteria of each of these criteria. To give an example of these criteria, it can be writability, readability, reliability and speed comparison of 2 languages.

It can be said that the similarities of C and C++ language stem from the development of C++ with the C language. The reason for the differences of these 2 languages can be explained by the fact that the 2 languages accept completely different paradigms. It can be said that while C language is on the procedural and structural paradigm, C++ chooses the object-oriented paradigm as its paradigm.

Speaking of paradigm, let's talk about it briefly. Paradigm can be said to be the first presentation of an idea that has not yet been accepted. contains experience and evidence. In short, it can be said that it is a design assumption of an accepted paradigm.

In the previous lines, we said that these 2 languages accept 2 different paradigms. C language is a procedure-oriented language as a paradigm. So we can say that C is a function-oriented language. C++, on the other hand, is an object-oriented language as a paradigm. It is object-oriented. At the same time, it is a procedure-oriented language as it

derives from the C language. So when we look at these articles, it can be said that the main difference between the 2 languages is whether they support the object-oriented paradigm. So what does it mean for a language to be object-oriented?

Object-oriented programming is one of the most important programming techniques. Object-oriented programming has unique features such as encapsulation, abstraction, inheritance and polymorphism. What is encapsulation? The ability to hide or abstract a piece of information is called encapsulation. Inheritance provides rewritability in code writing. Polymorphism is when a name has more than one meaning. These properties are the characters of the object-oriented program. While C++ provides these features, the C language does not support object-oriented programming.

In C language, the program is divided into functions and the structure of the code is set from top to bottom. In C++, the code is divided into smaller parts, namely classes. Again, this class feature does not exist in C language. To answer why the object-oriented paradigm is combined with C to form C++, C language has been the source of the formation of C++ language due to its high speed and strong features of assembly language, but not supporting OOP.

After all these explanations, we can now come to the comparisons. We will first consider readability. Readability is one of the most important comparison units. Because one of the first important features of programming languages is that it is effective. For a program to be readable, it must be readable and understandable. In this article, we will discuss readability under subheadings. We start with general simplicity first.

The overall simplicity greatly affects the readability. When we look at the C and C++ languages, the syntax of these 2 languages is quite similar. The 2 languages use almost the same operators and keywords. Only C++ has more keywords than the C language. To give an example of keywords in C++ but not in C, `bool`, `namespace`, `friend` etc... It also has main function in 2 languages. Overloading likewise affects readability. While C does not allow overloading, there is no limitation in C++.

Another factor affecting readability is data types. Although they generally have similar data types, C++ has different types such as `bool`, `class`.

Finally, one of the factors affecting readability is syntax design. We have already mentioned that they are similar in previous sentences.

Another factor to consider when comparing 2 languages is writability. Writability is how easily a programming language can do this while solving any problem. All the cases we mentioned in readability also affect writability. We mentioned that C is a subset of C++. Therefore, it has its own characteristics as well as those of C in terms of writability.

While `printf` and `scanf` functions can be used in both languages, `cin` and `cout` functions can also be used in C++. Again, the use of functions in struct is not allowed in C language, but it can be used in C++. To give another example, while C has dynamic memory allocation functions such as `malloc` and `calloc`, it can be done with the `new` function in C++. Likewise, the `delete` function can be used in C++ instead of the `free` function. Such factors give C++ an advantage over C in terms of writability.

Another factor we will look at when comparing 2 languages is reliability. If a program can provide its own features under all conditions, that program is reliable. One of the factors that ensures reliability is exception handling. While C does not support exception handling, C++ does. So what is this exception handling? The program's ability to catch errors at runtime is called exception handling, and this feature greatly affects reliability. This does not mean that C++ is more reliable than C. We can say that C language is more reliable than C++ because the compile time controls are more strict.

Another factor we can look at when comparing 2 languages is the cost of that program. There are many variables that affect this cost. The language in which the program is written is very important. The experience of the person writing the program is also a factor. A programmer who knows the language well will write more effective code than those who do not. Another factor affecting the cost is related to the way the language is compiled. Likewise, how the program is solved affects the cost. Considering these factors, there is a huge performance difference between C and C++. We cannot say it is. Because both languages come from the same base.

After all these comparisons, before we finish our article, let's look at where these 2 languages are used and then finish our experiment with a short summary. The C language is generally used for low-level calculations that care about speed and efficiency. Likewise, the C language is used in operating systems, embedded systems, system programming and compiler programming. we can say. C++ is generally used in large-scale programs because it provides speed and efficiency and allows the programmer to manipulate the machine. Likewise, C++ is widely used in game engine development, web browsers and computer graphics.

If we briefly summarize all that we have mentioned, we can say that C and C++ are two different languages that come from the same origin and are similar to each other in terms of syntax, but have different usage areas and methods due to the different paradigms they accept.

## References

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