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Why there are So Many Programming Languages?

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***Abstract*: This paper presents an overview on the existence of many programming languages.**

***Keywords*: Programming languages.**

1. Introduction

To run an electronic machine like computer we need programming languages. A programming language is set of instructions which tell computer to perform a specific operation for a specific task. The programming languages were invented back in 90's and most of them are still popular among the masses. First programming language was invented in 1950's and after that thousands of languages have been discovered. A programming language is a medium for humans to communicate with computers through computer codes. Programming language have a major role in development of internet which has made the life of humans simpler. A programming language is an essential part of our daily to daily life and future advancements too. A language also helps a programmer to innovate new things for the demand and for the future betterment of the masses. A programming language enables to make machine perform the desired task. A programming language is the most essential part when it comes to technology.

A. Characteristics

- A programming language must be easy to learn, read and recognize.
- A programming language must be portable.
- A programming language must be memory efficient and should use computer resources to an optimum level.
- The programming language must have consistent syntax and semantics. The library consisting of functions must be well documented so that sufficient information is available for developing a program or an application.

2. Types of languages

There are mainly three types of programming languages,

- Machine language
- High level language
- Assembly language

A. Machine language

Machine language has a set of numeric codes which helps computer to execute any operation directly. It consists of bits compiled together into groups like bytes(1byte=8bits). It is lowest level language. For users the machine language is inconvenient to read and write as it's code changes from computer to computer. The process of conversion of a program from high level language depends on CPU. It is also known as machine code.

B. High level language

High level language was developed for the use of programmers. This language is closer to human beings. They are convenient for programmers because of their portable nature. The programs written in high level language can run on various platforms and architectures. It is easier to debug the language. Before execution, every program written in high level language is interpreted into machine language.

C. Assembly language

Assembly language is a low level language which needs an assembler to convert its code into machine level language. It has rules similar to English language. It is mostly used in jobs which require fast processing. Comparatively, it requires less memory while executing. It is based on real time system. It requires vast knowledge of computer design and architecture.

3. Different programming languages have different features Algorithmic languages

C was developed by Dennis Ritchie between 1972 and 1973. C is considered to be powerful language to be used in UNIX operating system. It is procedural programming language .it is very simple and machine-independent language and it is known to be basic of all languages. C is considered as base for learning the another language. It is mid-level programming language as it supports the features of both low-level and high -level programming language. It is very simple as it contains a lot of library functions, data types etc. it is machine-independent as it can be easily executed on different machines with some changes. It is widely used in developing databases such as SQL which is very popular database which is developed in C and it

is used in developing operating system such as Microsoft Windows and mobile phone ‘s operating system.

A. Fortran

It is one of the first algorithmic language and it was designed by IBM team led by John Backus.it is used for scientific and numeric computing. it stands for FORmula TRANslator.It is number crunching language and it is used by scientist. This is used by engineers to calculate values with high precision. Programs in Fortan are sometimes inflexible and unable to read.

4. Object-oriented language

A. C++

C++ was developed by Bjarne Stroustrup at bell labs in 1979 as it is considered to be an extension of C. The difference between C and C++ is that C is procedural language and C++ is an object oriented language. Some additional features help C++ to have upper hand on C language. Some of features of C++ to be more advanced than C are given below:

- All the oops features such as Abstraction, Encapsulation, inheritance make it more useful for programmers to perform better.
- Exception handling is also present in C++.
- The concept of virtual functions and also constructors and destructors for objects.
- It also provides reusability of every function which saves memory and time.
- It has a lot of inbuilt function which enhance its library.
- It is extensible as it can adopt new features.

B. Java

Java is one of the world’s most popular programming language in use for web -applications. It was developed by James Ghosling. Java is not only used in designing softwares. But also in designing hardware. Most of features are derived from C++ making java simpler .it is simple and easy to learn. Its syntax is quite simple. Some of confusing concepts of C++ have been re-implemented in cleaner way in java. Some of features of java are given below:

- When comes to security java is always the first choice. Java secure features helps us to develop virus free system and it also provide secure means for developing internet applications.
- Java is portable as first java program is converted into bytecode. This bytecode is platform independent and can run on any platform such as windows, linux and mac.
- Java provides error free programming by giving stress on compile time checking and run time checking.
- Java provides multithreading which make it possible to write a program that will do multi-task simultaneously. The main feature of multithreading is to utilize same memory for multiple threads at same time.

5. Educational programming languages

These type of language are basically used for learning and educational purposes. Following are some examples of educational programming languages:

A. Basic variants

BASIC (Beginner’s All-Purpose Symbolic Instruction Code) was invented back in 1964 which helped to non-technical students to access computer. It basically focused on making learning of language easy. Its prime objective was to be interactive, easy for beginners, give clear and easy to understand message to users, have quick respond towards the user, it does not demand understanding of hardware or operating system.

B. Pascal

It is a procedural language invented by niklaus wirth. It is named after French mathematician and philosopher blaise pascal. It is a high level language. Some of th4 salient features of pascal are:

- It is a strongly typed language.
- Easy to learn
- Structured language
- has different data types such as arrays, records, sets etc.
- follows structured programming by using functions.
- It has extensive error checking.
- It can also support object oriented programming.

6. Business programming languages

A. Data bus

The data bus language was invented by datapoint in year 1972. It was basically invented as an alternative to language cobol. The need of language arose when cobol was not able to deal with built in keyboard and screen of datapoint. It is a high level language used in designing of applications which are business oriented. The use of data bus is mainly in highly user interactive applications. It was standardized as a ANSI language in year 1994.

B. COBOL

Cobol is high level programming language which is user friendly and all the instructions can be easily written in English words as it is an English-type language. It was designed for business-oriented applications related to financial and defense domain etc. It has advanced file handling capabilities for holding huge data.it is a robust language as its debugging and testing can be easily done on any platform. Cobol has logical control structures which make it easier to modify and read. Cobol has effective error messages which make it easy to debug.

7. Libraries

A library is a collection of pre-defined and pre compiled modules, data, documentations, message, classes,

specifications, values type conversions and functions. The library is pile of codes that are stored together in a single file which can be accessed in future.

While linking, libraries come in two varieties which are:

- Statically linked libraries.
- Dynamically linked libraries.

1) Statically linked libraries

Statically linked library are the ones which make use of copies of all the library functions made by linker to the executable files. Static library need more space on main memory and disk. It is performed at the last of compilation process by linker. In order to workout external references, the linker combines library files with the written program code. In static linking process, the whole code is hold in single executable module.

2) Dynamically linked libraries

In the process of dynamic linking the name of shared libraries are placed in final executable files. It allows different programs to use single copy of viable module. The load time is reduced in the case where the memory already holds the shared library code. The working of code completely depends on its compatibility with the available library. Programs using common libraries are relatively slower than those that make use of statically linked libraries.

8. Security

With every new invention, security within a language is becoming a major issue. Some of the languages does not lend themselves to write safe code. The most lacking in terms features of all is C language. For example, C language allows programmer to write outside an array's bound. Instead of displaying an error it returns a garbage value. This can be a risk to security and can result to corrupted memory. While other languages have strict rules when it comes to such vulnerabilities. For example, some languages have restrictions on out of index excess of an array while other place restrictions on operations performed on different data types.

1) Strongly typed languages

These are the more advanced languages. In such languages each data type like integer, float, char etc. are predefined in library of the language and further in a program every constant and variable must be defined under these data types. Example of such languages are java, ruby, python, smalltalk. In java, typing errors are checked and removed at compile time while others like ruby detect them at runtime. Languages now also place on limits on the concept of 'mutability', which is the ability of the object to change its current state to other. These languages instead favour "immutable" objects, whose value in memory cannot be changed or altered without explicit conversion. They are trending nowadays as multicore CPUs have become popular among the masses because of their ability to perform "thread safety".

9. Change of requirements with time

As modern time has arrived, everything has been added with a taste of modernity. So as coding is changed now a days. Now a days it has become more convenient to use coding because of more flexibility and speed. If we study the statistics of older language like C and assembly language which were more complex to use. But now a day's easier languages like python has taken the race in it's control because of it's better readability key. Programming languages have made a huge evolution over time but still in order to add a new feature in programming language compiler has to be modified first. These changes include addition of keyword, change in syntax, introduction of functions in library. Making changes in old programming languages is lot more difficult and hectic than creating a new one.

10. Need of different languages

The idea of a new computer language is derived from various existing languages by developers. In this process some new features are added, some are altered, some are removed and some are changed for better. To understand this, we can give example of the most used device that are smart phones. The basic purpose of smart phone is communication and entertainment but every year hundred's of new smart phones are launched with some added and some repeated features. The choice of using a smart phone depends on a user's preferences and ease. The similar is the case of languages, the choice of using a programming language depends on the developer's comfort and ease. Similarly, we can see the example of human language, we have tons of different languages used by tons of different people according to their ease. In the world of computer, we have several languages which we choose according to our work, need and ease. For a programmer a language should work the way he or she thinks. Some masses like to use java whereas some like to use python and while others have their different preference.

References

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