

COMPREHENSIVE STUDY OF SEVEN WONDERS OF PROGRAMMING LANGUAGES

Piyush Choudhary

Associate Professor in Department of Computer Science and Engineering, Prestige Institute of Engineering, Management & Research, Indore(M.P)

piyushchoudhary2210@gmail.com

Vaishali Choudhary

Student, Mater of Science, Government Tilak P.G. College, Katni (M.P.)

“There are no great limits to growth because there are no limits of human intelligence, imagination and wonder” –Ronald Reagan

World consist of various complex systems of communication and that complex system is known as **Language**. It is a method of interaction among people. There are various classifications of languages available; the simple one is like regional languages, national languages and international languages. Humans interact with one another with the help of these languages, but what about the interaction of human with electronic devices. As we all known that electronic devices like computers understand only machine language and it is very difficult to write and understand something directly in machine language. One solution to this problem is that, we may write programs in language that we know and then convert it into machine language with the help of specific programs like Compilers and Interpreters. A programming language is a formal computer language or constructed language designed to communicate instructions to a machine, particularly a computer. Programming languages are used to create programs to control the behavior of a machine and to express algorithm. This paper “**Comprehensive study of Seven Wonders of Programming Languages**” illustrates the review of popular programming languages viz COBOL, C, C++, Java, PASCAL, Perl and PYTHON. This paper helps the researchers and programmers to know the theory of popular languages at a single point.

Wonder No. 1 : COBOL

“**COBOL**” is an acronym for Common Business Oriented Language designed for business use. It is first imperative, procedural and object oriented language since 2002. It is computer programming language like English that first appeared in 1959, 57 years ago. It is primarily used in business, finance and administrative systems for companies and governments. Although, it is 57 year old language, still it is used in various legacy applications deployed on mainframe computers such as large scale batch and transaction processing jobs. But due to its declined popularity and the availability of experienced COBOL programmers, programs are being migrated to new platforms, rewritten in modern languages or replaced with software packages. Most programming in COBOL is now purely to maintain existing applications.

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COBOL was designed in 1959, by “Conference/Committee on Data Systems Languages” CODASYL”. The principal creators involved in design of COBOL were Howard Bromberg, Howard Discount, Vernon Reeves, Jean E. Sammet, William Selden, Gertrude Tierney. It was created as part of US department of Defense effort to create a portable programming language for data processing. It was standardized in 1968 and since been revised four times. Its expansion includes support for structured and object oriented programming.



Fig 1: COBOL Team during 25th Anniversary Celebration at Computer Museum on May 16, 1985

Its various versions include COBOL 60, COBOL 61 to 65, COBOL 68, COBOL 74, COBOL 85, COBOL 2002, Object Oriented COBOL and COBOL 2014. All versions has English Like syntax which was designed to be self documenting and highly readable. According to study conducted in 1997 that over 200 billion lines of COBOL code were still in existence, accounting for 80% of all business software code.

Wonder No. 2 : C

“C” is a programming language developed at AT & T’s Bell Laboratories of USA in 1972. It was designed and written by Dennis Ritchie between 1969 to 1973. It was used to re-implement the Unix operating system. It has since become one of the most widely used programming languages of all time.

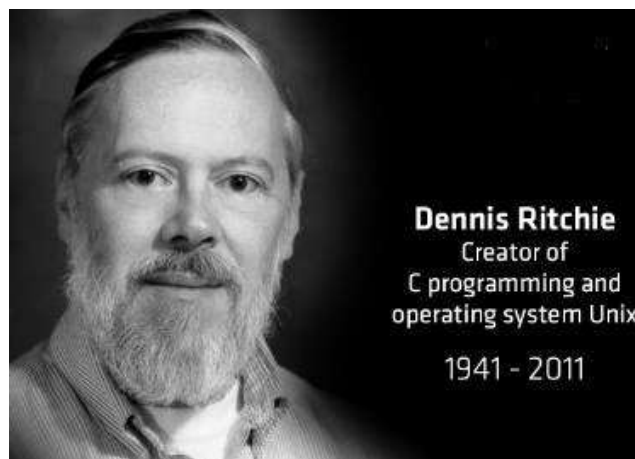


Fig 2: Dennis Ritchie: Father of C and UNIX Operating System

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C is imperative (procedural language) which emphasis on doing things or algorithm. It was designed to be compiled using a relatively straight forward compiler, to provide low level access to memory and to provide language constructs that map efficiently to machine instructions and to require minimum run time support. Therefore, 'C' was useful for many applications that have formerly be coded in assembly language. For example: System Programming.

The "C" language exhibits various characteristics some of them are as follows:

- 2.1 There is a small, fixed number of keywords, including a full set of flow of control primitives: for, if/else, while, switch and do/while.
- 2.2 There are large numbers of arithmetic and logical operators like +, +=, ++, & etc.
- 2.3 More than one assignment may be performed in single statement.
- 2.4 Functions returned values can be ignored when not needed.
- 2.5 All data has its type, but implicit conversions can be performed.
- 2.6 User defined and compound types are possible.

Some of the standards committee formulates the "C" language as American National Standard Institute C (ANSI C) in 1983. This is also referred to as Standard C or C89.

"C" standard was again revised in late 1990's as ISO:IEC 9899:1999 and commonly referred to as C99.

In 2007, work began on another revision of "C" as "C1X" or "C11", which adds numerous of new features , including type generic macros, anonymous structures, improve Unicode support, atomic operation, multithreading and bound checks functions.

"C" standard committee added set of extension as Embedded C to support exotic features like fixed point arithmetic, multiple distinct memory banks and basic I/O operations.

"C" has directly and indirectly influenced various languages like C++, C#, Java, D etc. C++, Objective C, Ch, Cilk, and Unified parallel C are nearly supersets of C.

Wonder No. 3 : C++

C++ is an object oriented programming language developed by Bjarne Stroustrup at AT & T Bell laboratories in Murray Hill, New Jersey, USA in the early 1980's. Bjarne Stroustrup, an admirer of Simula 67 and a strong supporter of C, wanted to combine the best of both the languages and create a more powerful language that could support object oriented programming features and still retain the power and elegance of C. The result was C++. Therefore, C++ is an extension of C with a major addition of the class construct feature of Simula67. Since the class was a major addition to the original C language, Stroustrup initially called the new language 'C with Classes'. However, later in 1983, the name was changed to C++. The idea of C++ comes from the C increment operator ++, thereby suggesting that C++ is an augmented version of C.



Fig 3: Bjarne Stroustrup: Inventor of C++

During the early 1990's the language underwent a number of improvements and changes. In November 1997, the ANSI/ISO standards committee standardized these changes and added several new features to the language specifications.

C++ is a superset of C. Most of what we already know about C applies to C++ also. Therefore, almost all C programs are also C++ programs. However, there are a few minor differences that will prevent a C program to run C++ program.

The most important facilities that C++ adds on to C are classes, inheritance, function overloading and operator overloading. These features enables creating of abstract data type inherit properties from existing data types and support polymorphism, thereby making C++ truly object oriented language.

The object oriented feature in C++ allow programmers to build large programs with clarity, extensibility and ease of maintenance, incorporating the spirit and efficiency of C. The addition of new features has transformed C from a language that currently facilitates, top down, structured design, to one that provides bottom up and object oriented design.

C++ is versatile language for handling very large programs. It is suitable for virtually and programming task including development of editors, compilers, databases, communication systems and any complex real life application systems.

Wonder No. 4 : Java

Java is a platform independent object oriented programming language developed by Sun Micro System in the duration of 1991 to 1995.

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In 1991, Sun Micro System wants to develop a software to control electronic devices. This software is developed under the act of Green Project. An electronic device known as Star 7, for which operating system has to be developed. The language they used to develop the software was C++. Hence, he developed a new language for Star 7. He named it “OAK”, as he used to see oak tree outside his office. The members other than James Gosling involve in the development process of OAK are Patrik Naughton, Chris Warth, Ed Frank and Mike Sheridan. But later they found that the name “OAK” was being used by some other language, sun renamed this language as “Java” in 1995.

Various versions of Java programming language includes JDK 1.0, JDK 1.1, J2SE 1.2, J2SE 1.3, J2SE 1.4, J2SE 5.0, Java SE 6, Java SE 7, Java SE 8.



Fig 4: Java Development Team

Various features of Java programming language are:

1. Simple
2. Object Oriented Programming language
3. Platform Independent
4. Secured
5. Robust
6. Architecture Neutral
7. Portable
8. Dynamic

Wonder No. 5 : Pascal

Pascal is an imperative and procedural programming language, designed in 1968/1969 and published in 1970 by Niklaus Wirth as a small and efficient language intended to encourage good programming practices using structured programming and data structuring. A derivative known as Object Pascal designed for object oriented programming was developed in 1985.

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Fig 5: Father of Pascal Niklaus Wirth

Pascal was designed on the name of French mathematician and philosopher Blaise Pascal by Niklaus.



Fig 6: Blaise Pascal: Famous Mathematician

The Pascal programming language is available on number of different platforms, both commercially and through open source.

Pascal is available for:

1. Open VMS VAX
2. Open VMS Alpha
3. Tru64 Unix
4. Windows 95/98/ME
5. Windows NT
6. Linux
7. FreeBSD Unix
8. OS/2
9. Macintosh

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Wonder No. 6 : Perl

Perl is a family of high level, general purpose, and interpreted, dynamic programming languages developed by Larry Wall in 1987 as general purpose unix scripting language whose objective is to make report processing easier.



Fig 7: Creator of Perl – Larry Wall

The Perl language borrows features of other programming language including C, Shell Script, AWK and Sed. They provide powerful text processing facilities without the arbitrary data length limit of many contemporary Unix command lines tools which facilitates easy manipulations of text file.

Various versions of Perl programming language includes:

1. Perl 1.0 in 1987
2. Perl 2 in 1988
3. Perl 3 in 1989
4. Perl 4 in 1993
5. Perl 5.000 in 1994
6. Perl 5.001 in 1995
7. Perl 5.002 in 1996
8. Perl 5.003 in 1996
9. Perl 5.004 in 1997
10. Perl 5.005 in 1998
11. Perl 5.6 in 2000
12. Perl 6 in 2001
13. Perl 5.8 in 2002
14. Perl 5.10.0 in 2007
15. Perl 5.12.0 in 2010
16. Perl 5.14 in 2011

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- 17. Perl 5.16 in 2012
- 18. Perl 5.18 in 2013
- 19. Perl 5.20 in 2014

Perl has many and varied applications, compounded by the availability of many standards and third party module. It is chiefly being used to write CGI script. It is often used as Glue Language. Its code can be made portable across Windows and Unix and supports GUI.

Wonder No. 7 : Python

Python is widely used high level, general purpose, interpreted, dynamic programming language developed by Guido Van Rossum at Centrum Wiskunde & Informatica in the Netherlands in the year 1989. Language design philosophy emphasizes code readability and its syntax allows programmer to express concepts in fewer lines of code.

It supports multiple programming paradigms, including object oriented, imperative, functional or procedural style. It features a dynamic style system and automatic memory management and has a large comprehensive standard library.

Python 2.0 was released on October 16, 2000 and had many new major features, including cycle detecting garbage collector and support for Unicode. With this release the development process was changed and became more transparent and community backed.

Python 3.0 was released on December 03, 2008 with many features that have been back ported to the backward compatible Python 2.6x and 2.7x versions.



Fig 8: Creator of Python – Guido Van Rossum

Since 2003, Python has ranked in the top ten most popular programming language as measured by the TIOBE Programming community index. As of June 2004 it was fourth most popular programming language.

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It was ranked as programming language of the year in 2007 and 2010.

Python can serve as scripting language for various web applications and has been successfully embedded in many software products. It is also used for artificial intelligence task and often used for natural language processing.

Python design philosophy influenced several programming languages, as:

1. Boo
2. Cobra
3. ECMA Script
4. Go
5. Groovy
6. Julia
7. Coffee Script
8. Swift etc.

CONCLUSION

“The most important thing in the programming language is the name. A language is not succeed without a good name, I have recently invented a very good name and now I am looking for a suitable language.” –

Donald Knuth



Fig 9: Donald Knuth – Father of the analysis of Algorithms

The paper “**Comprehensive study of seven Wonders of Programming languages**” will be very useful for person who wants to know the history of Programming world. This article manly emphasizes only on selected seven languages and can provide information at single point.

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