
Lecture Notes on Programming Languages

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Lecture 02: Chronology of Programming Languages

This lecture contains:

- Zuse's Plankalkul
- Machine code
- Fortran
- LISP
- ALGOL
- COBOL
- Basic
- PL1
- SBOBOL
- Simula 67
- Prolog
- Ada
- Small Talk
- C++
- Java
- JavaScript and PHP
- C#

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2.1 Introduction

In your introduction to computer science you were no doubt introduced to Konrad Zuse, the first person to propose the binary system. What you perhaps did not know is that as part of his PhD project, Zuse also proposed a programming language that he called Plankalkul. In that project, he also proposed several algorithms for what we now know as Data Structures. His thesis was not published until 1972. In hindsight, he clearly was ahead of his peers.

Since Zuse's Plankalkul, there has been hundreds of programming languages. Figure 2-1 provides a summarized list of some of the major programming languages. Figure 2-2 shows the generations that programming languages have been through.

Figure 2-1: Summary of the History of Programming Languages

Period	Languages Developed
1950s	FORTRAN, LISP
1960s	Simula, COBOL, RPG, ALGOL, PL1
1970s	Ada, C, Pascal, Prolog, Small Talk
1980s	C++, ML, Eiffel, Visual languages
1990s	Java, Hypermedia languages, Visual languages, Ada 95
2000s	Kotlin, Erlang, Go, OCaml, TypeScript, Rust, Elm, Crystal, Elixir, R, Swift, Haskell, Clojure

Figure 2-2: Generations of Programming Languages

Generation	Languages Developed
Machine Code	Each computer (model) has an instruction set of binary instructions. Computer programs were first written in binary code.
Assembly Language	Each computer (model) has an assembly language based on its instruction set. This is a slightly higher level than machine code. Assembly language coding was the first replacement of machine code.
High-level languages (HLLs)	The first set of HLLs included procedural languages and rule-based languages. Then came the introduction of OOPs and hybrid languages.
Fourth Generation Languages (4GLs)	These languages came with the proliferation of relational database management systems (RDBMSs), computer-aided software engineering (CASE) tools, and rapid application development (RAD) tools.
Fifth General Systems (5GS)	This generation includes integrated CASE (ICASE) tools, multi-agent applications, and intelligent systems.

- 2.2 Machine Code** See [Sebesta 2012]
- 2.3 Fortran** See [Sebesta 2012]
- 2.4 LISP** See [Sebesta 2012]
- 2.5 ALGOL** See [Sebesta 2012]
- 2.6 COBOL** See [Sebesta 2012]
- 2.7 Basic** See [Sebesta 2012]
- 2.8 PL1** See [Sebesta 2012]
- 2.9 SNOBOL** See [Sebesta 2012]
- 2.10 Simula 67** See [Sebesta 2012]
- 2.11 Prolog** See [Sebesta 2012]
- 2.12 Ada** See [Sebesta 2012]
- 2.13 Small Talk** See [Sebesta 2012]
- 2.14 C++** See [Sebesta 2012]
- 2.15 Java, JavaScript, PHP, and C#** See [Sebesta 2012]

2.16 Recommended Readings

[Sebesta 2012] Sebesta, Robert W. 2012. *Concepts of Programming Languages* 10th Edition. Colorado Springs, Colorado: Pearson. See chapter 2.

[Webber 2003] Webber, Adam B. 2003. *Modern Programming Languages: A Practical Introduction*. Wilsonville, Oregon: Franklin, Beedle & Associates. See chapter 24.
