



Compilers

Stanford | Online



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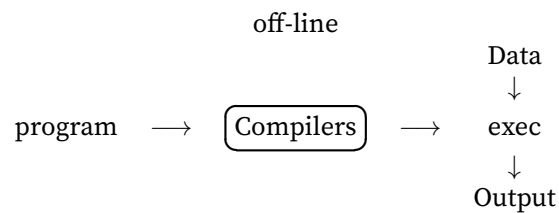
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CHAPTER 1

Introduction

1.1 Introduction

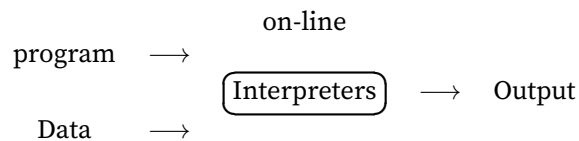
- Compilers



1954 IBM develops the 704
software > hardware
"Speedcoding"

- 10-20x slower
- 300 bytes = 30% memory

- Interpreters



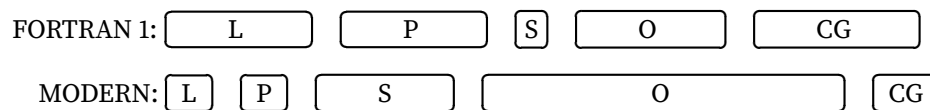
FORTRAN 1(Formulas Translated)
1954-1957
1958 50% program in FORTRAN 1

1.2 Structure of Compiler

5 phases

1. **Lexical Analysis**: divides program text into "words" or "tokens".
2. **Parsing**: diagramming sentences.

3. **Semantic Analysis**: try to understand "meaning". (hard)
Compilers perform limited semantic analysis to catch inconsistencies.
→ Programming Languages define strict rules to avoid such ambiguities.
4. **Optimization**: Automatically modify programs so that they
 - Run faster
 - Use less space
 - Reduce power consumption...
5. **Code Generation (Code Gen)**
 - Produces assembly code. (usually)
 - A translation into another language. (Analogous to human translation)



1.3 The Economy of Programming Languages

Question

1. Why are there so many Programming Languages?

Application domains have distinctive / conflicting needs.

Scientific Computing	→ Good Float Points → Good Arrays → Parallelism	FORTRAN
Business Application	→ Persistence → Report Generation → Data Analysis	SQL
Scientific Computing	→ Control of Resources → Real Time Constraints	C/C++

2. Why are there new programming languages?

Claim: **Programmer training** is the dominant cost for a Programming Languages

- (a) widely-used Languages are slow to change.
- (b) Easy to start a new language. → Productivity > Training Cost
- (c) Languages adopted to fill a void.

New languages tend to look like old languages because of the Claim
→ Reducing programming training, like Java vs C++.

3. What is a good programming language?

There is no universally accepted metric for language design.

CHAPTER 2

The Cool Programming Language

2.1 Cool Overview