Principles of Programming Languages(CS F301)

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Evolution of Programming Languages (Ch.2 of T1)

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First known Programming Language:

Plankalkul, by a German Scientist Konrad Zuse ("Tsoo Zuh") was the First PL designed for his computer Z4 around 1945. But published in 1972.

Pseudocodes

Not in the same sense as we understand it now.

Between 1940-50 certain languages were known as *pseudocodes*.

Computers were slow, unreliable, expensive and had small memories.

Initially coding done in machine language. (tedious and error prone)

This led to HighLevel PLs.

1949- Short code:

It was interpreter.

Called Automatic Programming.

No floating point operations supported by HW.

1954- Speed coding:

It was interpreter.

Easier than machine code.

1951-53 UNIVAC Compiling systems

Convert pseudo code to machine code.

IBMs 704 and FORTRAN

1950-54: First (compiled) HL PL. at IBM.

Included indexing, FP

The environment when it was developed:

Small memory, slow, unreliable

Primary use was for Sc. Computations

No existing effective & Efficient PLs

Cost of HW was high. Speed of generated object code was of primary goal of first FORTRAN Compilers.

IBMs 704 and FORTRAN

1954: FORTRAN-0

1957: FORTRAN-1

1958: FORTRAN-2

1960-62: FORTRAN-4 (ANSI 66)

1977:FORTRAN-77

1990:FORTRAN-90

1995:FORTRAN-95

2003:FORTRAN-2003

2008:FORTRAN-2008

Effect of FORTRAN

1. Its effect on computers was great.
2. All subsequent PLs owe a debt to FORTRAN.
3. Type and storage of all variables is fixed before runtime. (up to F-90)
4. It dramatically changed the way computers were used.

Evolution of FORTRAN

Is a general-purpose, compiled imperative programming language that is especially suited to numeric computation and scientific computing.

Fortran encompasses a lineage of versions, each of which evolved to add extensions to the language while usually retaining compatibility with prior versions.

Support for structured programming and processing of character-based data (FORTRAN 77),

Array programming, modular programming and generic programming (Fortran 90),

High performance Fortran (Fortran 95),

Object-oriented programming (Fortran 2003),

Concurrent programming (Fortran 2008),

Parallel computing capabilities (Coarray Fortran 2008/2018).

Functional Programming LISP

1950; Its based on applying functions to arguments.

Need: Some methods to allow computers to process symbolic data in linked lists.

At that time, most computations were on data in Arrays.

Required- recursion, conditional expressions, dynamic allocation & deallocation of linked list space.

FORTRAN-1 did not support these.

Two descendants of LISP:

Scheme 1970: small size, treat functions as first class entities, best suited for teaching course on PLs.

Common LISP: 1970-80 Amalgam of different dialects of LISP. Complex.

ALGOL 58

(ALGOrithmic Language)

1958; Descendant of FORTRAN.

Objective: to introduce a PL that is not tied to HW, more flexible and powerful, i.e., combination of simplicity and elegance.

The reason for its failure to become popular.

ALGOL 60

First to use of BNF (Backus-Naur Form) to describe the language.

[Backus and Peter Naur]

Features and Evaluation:

Refer to the textbook.

COBOL

COmmon Business-Oriented Language (1960)

Widely used.

Compiled language.

COBOL's Progenitor is FLOW-MATIC. (early 1950)

Philosophy: Data processing programs must use English like words rather than mathematical expressions.

Evaluation: Refer to the textbook.

BASIC 1971

By *Mather and Waite*.

Got little respect.

Like COBOL ignored by Computer Scientists.

Had meager set of control statements.

Evaluation: Refer to the textbook.

PL/I (1965)

innovate achieve lead

Represents the first large scale attempt to design a language that could be used for broad spectrum of application areas.

All previous languages have focused particular application area as – AI, Scientific, business etc.

Features:

First PL to…

Evaluation:

Refer to the textbook.

Two Dynamic Languages

APL- 1960

SNOBOL -1971

Evaluation: Refer to the textbook.

SIMULA 67

Evaluation: Refer to the textbook.

ALGOL-68

Evaluation: Refer to the textbook.

Early Descendants of ALGOL 68

Early descendants of ALGOL:

PASCAL- 1971

A portable system language – C- 1972

Prolog

Evaluation:

A prolog database contains: Rules and Facts

Ex: Fact statements.

Mother(x,y)

Father(m,n)

Rule statements:

Grandparent(a,b) :- parent(a,c), parent(c,b).

Prolog database can be interactively queried with goal statement.

Father(m,n).

Ada

Evaluation: Refer to the textbook.

Smalltalk

Evaluation: Refer to the textbook.

Evaluation: Refer to the textbook.

Other hybrid family languages

Objective C

Delphi

Go

Java

Scripting languages

Sh (shell)

Perl

Java Script

PHP

Python

Ruby

.NET C#

Markup languages

XML

XSLT

JSP

Summary

- We understood the evolution of some important languages.
- We investigated the development and development environments of a number of important PLs.
- Now e are ready to start with discussion of the important features of contemporary PLs.