UNIT 1

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"No one was ever really taught by another; each of us has to teach himself. The external teacher offers only the suggestion which rouses the internal teacher to work to understand things"

Outline

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Role of programming languages

Initial Goal : to execute programs efficiently.

- In olden days (Mid 60s), computer was a critical resource and programmers were not expensive. Languages : FORTRAN, COBOL,LISP and ALGOL. Main task was to compile programs on a large expensive computer
- After few days, machines were less expensive. Programming , porting, maintenance cost was larger than computer cost. Main task was to make it easier to develop correct programs to solve problems for some given application area.
- During 1960 to 1970 compiler technology matured. Main task was to solve domain specific problem. Eg. For scientific applications - FORTRAN, business applications - COBOL, Military applications - JOVIAL , AI - LISP, embedded military applications - Ada.
- Programming Languages evolved. ALGOL was replaced by Pascal, which in turn was replaced by C++ and Java.COBOL replaced by C++. Even languages like APL,PL/I and SNOBOL4, Pascal

A programming language

- Why a particular language is popular/ dead ?

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There may be external reason.
e.g. use of COBOL or Ada was enforced in US by Govt.
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Lets see some more reasons...

Attributes of a good language

Clarity, simplicity and unity Conceptual integrity, semantic differences should reflect in syntax.

Orthogonality Features when combined in various ways should be meaningful.

Naturalness of application syntax $->$ program structure $->$ logical structure.

Support for abstraction Allow data structures, data types and operations to be defined and maintained as self-contained abstractions.

Program verification Simplicity of semantic and syntactic structure

Programming environment

Portability of programs

Cost of use Cost of program execution, translation, maintenance creation, testing and use.

Why to study concepts of programming languages ?

Increases capacity to express ideas

Improves background for choosing appropriate language

Increases ability to learn new languages

Better understanding of the significance of implementation

Programming Paradigms

Many people debate on the efficiency of the array declaration in C++ versus Java or value interpretation vs compiling program.
We should focus on understanding how languages are constructed.
Some definitions : [2]

Programming paradigm is an approach to programming a computer based on a mathematical theory or a coherent set of principles.

Programming language is a tool for developing executable models for a class of problem domain

Four basic computational models :

- Imperative / procedural : command driven/ statement oriented
- Applicative / functional : functions
- Rule based/ logical : Checking presence of certain conditions and then excuting appropriate action
- Object Oriented : Objects are built and limited set of functionalities is provided to operated those data.

- Declarative
  - functional: LISP/Scheme, ML, Haskell
  - dataflow: Id,Val
  - logic,constraint-based: Prolog, spreadsheets
  - template-based: XSLT
- Imperative
  - von Neuman: C, Ada, FORTRAN....
  - Scripting: Perl, python, PHP....
  - Object-oriented: Smalltalk, Eiffel ,Java

There are many languages developed.
Top-10 languages are : C , Java, Objective-C , C++, C# , PHP, JS ,Python, Perl, PL-SQL [3]

[3] http://www.tiobe.com/index.php/content/paperinfo/tpci/index.html

Why to study Programming paradigms

1. Increasing no. of programming languages implementing similar paradigms exists.
2. 27 paradigms in total but some are in similar concept
3. Studying the 4 distinct basic programming paradigms allow us to easily pick up any programming language.