MA 511: Computer Programming

Lecture 2

http://www.iitg.ernet.in/psm/indexing_ma511/y08/index.html

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Mon 10:00-10:55 Tue 11:00-11:55 Fri 9:00-9:55 Class: 1G2

MA512 Lab : Wed 14:00-16:55

Computer Characteristics

- Computer are used to transmit, store and manipulate information i.e., data
- Data type:
  - Numeric data
  - Character data
  - Graphic data
  - Sound
- To process a particular set of data, the computer must be given an appropriate set of instructions called a program.

Program

- A computer program is a sequence of instructions (written in a particular sequence in a computer related language) that are executed by a CPU.

- **Machine code** or **machine language**

Machine language instructions

A computer can interpret and execute a set of coded instructions called machine language instructions.

Operation code	memory location
1. 0110	10001110
2. 0111	10001111
3. 1000	01110001

- Load (0110) from memory location 10001110 to CPU register
- Add (0111) the contents of 10001111 to the value of the register
- Result which is in register is to be copied (1000) into location 01110001 of the memory.

Problems in machine language coding

- Very cumbersome to work
  - More than 100 different machine instruction codes and hundreds of thousands of locations in memory.
- Different type of computer has its own unique instruction set
  - Operation codes are differ from one machine model to another
- One machine language program written for one type of computer cannot be run on another type of computer without significant alterations.
- Rewrite the program for different machines.

Computer program should be written in a **high level programming languages** which is independent of machine language.

High Level Language

- A single instruction in High Level Language is equivalent to several instructions machine language.
- Simplicity
  - Instruction set is more compatible with human language.
- Uniformity and portability
  - A program written for one computer can generally be run on many different computer with a little or no alteration.
- General purpose language
  - C, Pascal, Fortran and BASIC.
- Special purpose language
  - CSMP, SIMAN: simulation language
  - LISP: List processing language, is widely used for AI.

Compilation or Interpretation

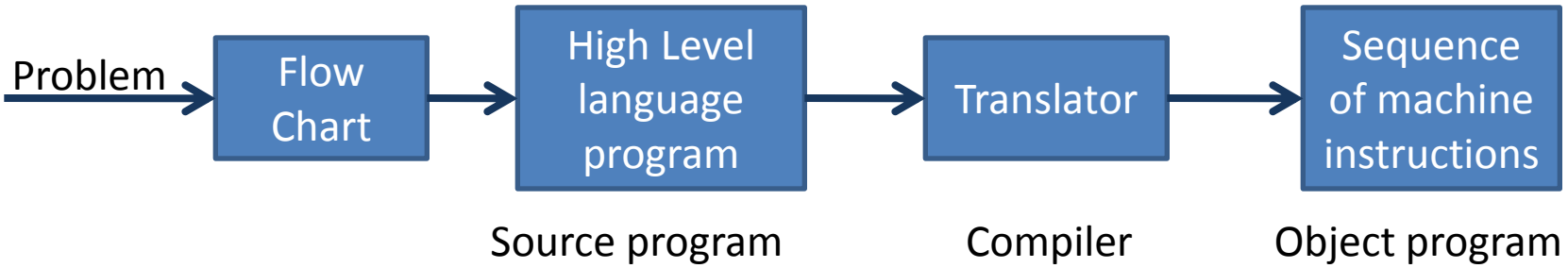
- Compiler:
  - Translate entire program into machine language before executing any instructions.
- Interpreter:
  - process through a program by translating and executing single instructions or small group instructions.

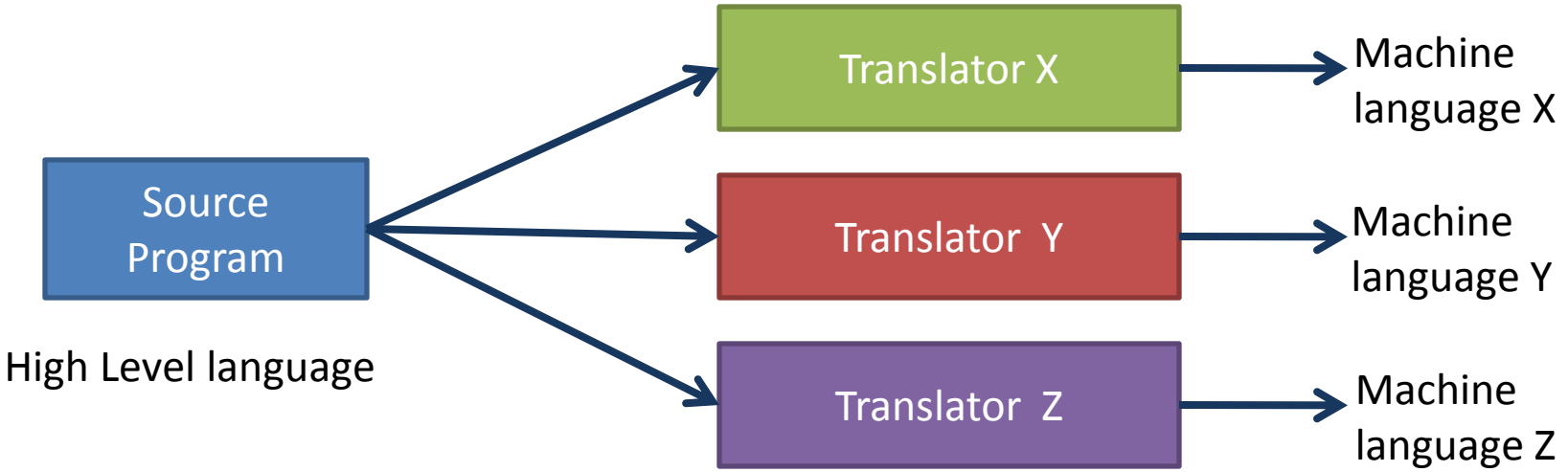
Complier/interpreter

- **Complier/interpreter** is itself a computer program. It accept a program in a high level language like C as input, and generates a corresponding machine language program as output.
- The high level program is called **source program**
- The resulting machine language program is called the **object program.**
- Every computer mush have its own compiler or interpreter for a particular high level language.

Compiler/Interpreter

Computer Language





Computer Algorithms

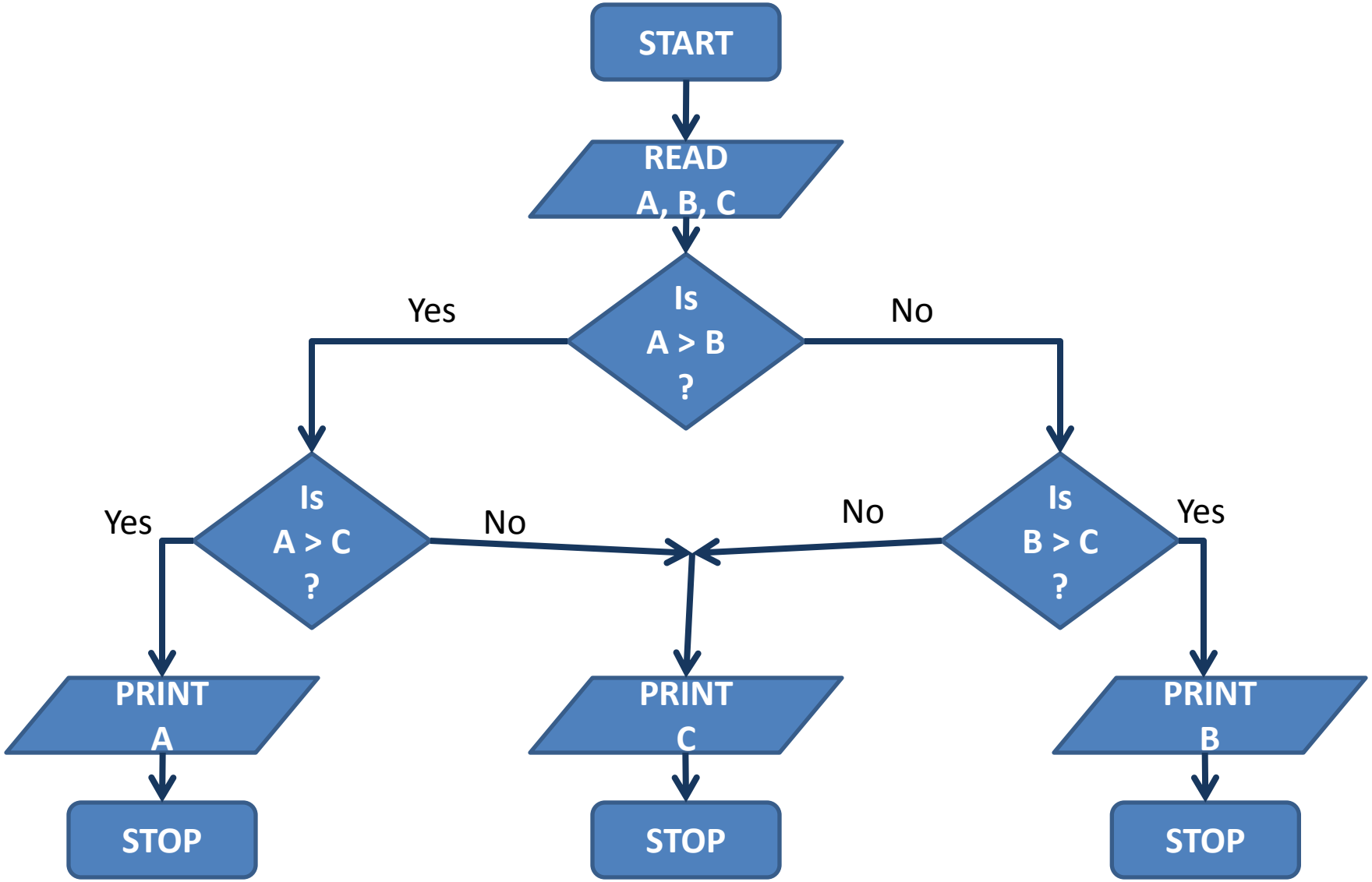
- Fundamental knowledge necessary to solve problems using a computer.
- Definition:
  - finite sequence of instructions to be carried out in order to solve a given problem.
- Instruction must be written in a precious notation, can be interpreted and executed by a computing machine are called computer programming
- The notation is called computer programming language.
- **Programming language**
  - artificial language that can be used to control the behavior of a computer
  - defined by syntactic and semantic rules which describe their structure and meaning respectively.
- Example:

  different syntaxes (languages), but result in the same semantic:
  - x += y; (C, Java, etc.)
  - x := x + y; (Pascal)
  - Let x = x + y; (early BASIC)
  - x = x + y (most BASIC dialects, Fortran)

Developing Algorithms

- Flow Charts
  - illustrates pictorially the sequence in which instructions are carried out in an algorithm.

Pick the largest of three nos



Flow Charts

- Convention
  - Parallelograms are used to represent input/output.
  - Rectangles are used to indicate any processing operation such as storage and arithmetic.
  - Diamond shaped boxes are used to indicate questions asked or conditions tested.
  - Rectangles with rounded ends are used to indicate the beginning or end points.
  - Circle is used to join different parts of a flow chart, called connector.
  - Arrows indicate the direction to be followed in a flow chart.