Indian Institute of Information Technology
Sri City

Computer Programming

Introduction to Programming

Instructor(UG-1/Sec-3)
Dr. Balasubramanian (Subu) Kandaswamy
Dr. Bheemappa Halavar

Core Course

Outline

- Introduction to Programming
- Procedural Programming
- Programming Languages

Introduction to Programming

- " A computer is an electronic data processing device, which accepts and stores data input, processes the data input, and generates the output in a required format."
- Programming is the process of writing a set instructions for computer to perform certain tasks.

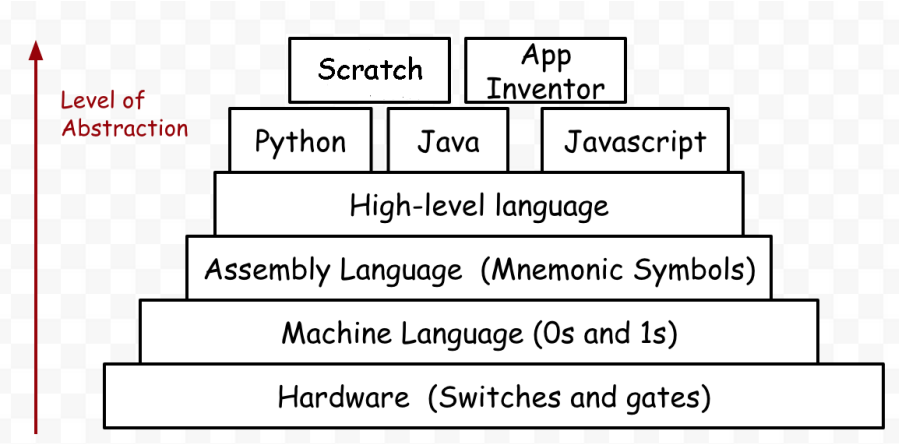
Programming can be done using a variety of computer programming languages

Computer program is sequence of instructions to solve the problem or carry out the task

Methods of Programming

- Procedural Programming
  - Defining set of steps to transform inputs into outputs
  - Translating steps into code
  - Constructed as a set of procedures
  - Each procedure is a set of instructions
- Object-Oriented
  - Defining/utilizing objects to represent real-world entities that work together to solve problem
  - Basic O-O Programming Components
  - Class • Object/Instance • Properties • Methods

Computer Programming Languages



- Machine languages (Binary Bits)
  - Often written in binary strings
  - Consisting of 0s and 1s (also called bits).
- Assembly language
  - Unique to a specific computer design
  - Instructions are written in symbolic statements instead of binary
- High-level languages
  - Use English-like commands
  - Easier than writing programs in machine language or in assembly language
  - These languages include C, C++, C#, and Java

Program

Program in machine language

1	00000000 00000100 0000000000000000
2	01011110 00001100 11000010 0000000000000010
3	11101111 00010110 0000000000000101
4	11101111 10011110 0000000000001011
5	11111000 10101101 11011111 0000000000010010
6	01100010 11011111 0000000000010101
7	11101111 00000010 11111011 0000000000010111
8	11110100 10101101 11011111 0000000000011110
9	00000011 10100010 11011111 0000000000100001
10	11101111 00000010 11111011 0000000000100100
11	01111110 11110100 10101101
12	11111000 10101110 11000101 0000000000101011
13	00000110 10100010 11111011 0000000000110001
14	11101111 00000010 11111011 0000000000110100
15	00000100 0000000000111101
16	00000100 0000000000111101

Program

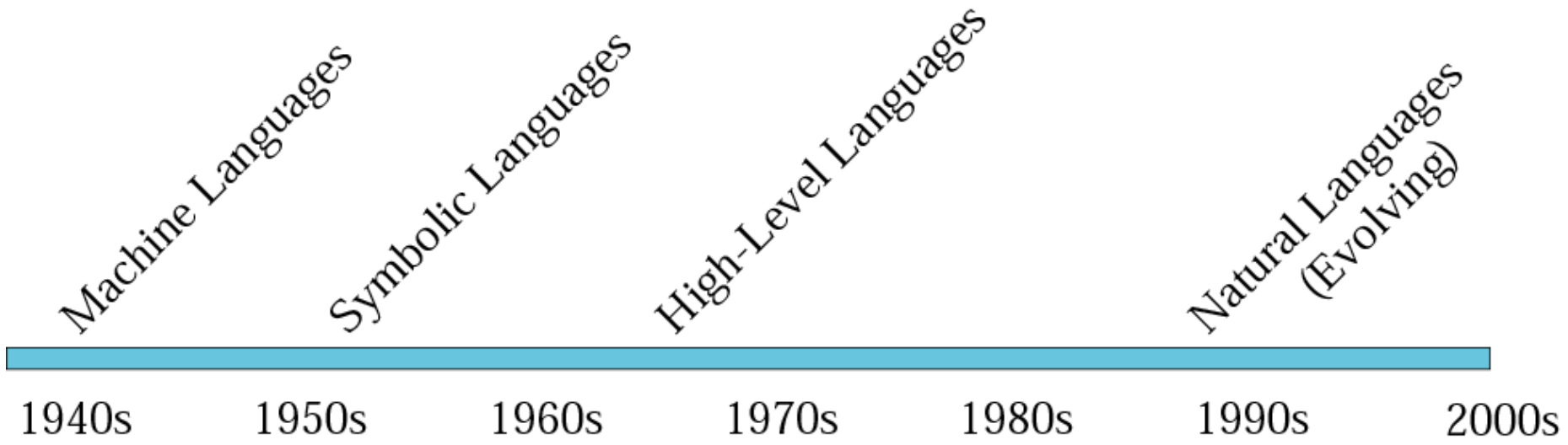
Program in symbolic language

```
1     Entry     main,     ^m<r2>
2     subl2     #12,sp
3     jsb       C$MAIN_ARGS
4     movab     $CHAR_STRING_CON
5
6     pushal    -8(fp)
7     pushal     (r2)
8     calls     #2,read
9     pushal    -12(fp)
10    pushal    3(r2)
11    calls     #2,read
12    mull3     -8(fp),-12(fp),-
13    pushal     6(r2)
14    calls      #2,print
15    clrl       r0
16    ret
```

Program Program in C language

```
1   /*    This program reads two integer numbers from the
2         keyboard and prints their sum.
3   */
4   #include<stdio.h>
5
6   int main()
7   {
8         // define variables
9         int a, b, c;
10        // read input numbers
11        printf("Enter two numbers to add\n");
12        scanf("%d%d",&a,&b);
13        // add numbers
14        c = a + b;
15        // print result
16        printf("Sum of the entered numbers = %d\n",c);
17        return 0;
18  }
```

Evolution of computer languages



Procedural language

- A procedural (imperative) language is a set of instructions that are executed one by one from beginning to end unless an instruction forces the control elsewhere.
  - FORTRAN
  - COBOL
  - Pascal
  - C
  - Ada

FORTRAN

- FORTRAN: FORmula TRANslation
  - Designed by a group of IBM engineers (1957)
  - The first high-level language
  - Features:
    - High-precision arithmetic
    - Capability of handling complex numbers
    - Exponentiation computation (a^b)

COBOL

- COBOL: COmmon Business-Oriented language
  - Designed by Grace Hopper group
  - A business programming language
  - Features:
    - Fast access to files and databases
    - Fast updating of files and databases
    - Large amounts of generated reports
    - User-friendly formatted output

Pascal

- Pascal
  - Invented by Niklaus Wirth (1971)
  - Pascal was designed ---
    - To teach programming to novices by emphasizing the structured programming approach
  - Pascal became the most popular language in academic

C

- C
  - Developed by Dennis Ritchie at Bell Laboratories (1970s)
  - Most of the UNIX operating system is written in C
  - Features:
    - C has all the high-level instructions
    - C has some low-level instructions
    - C is a very efficient language; its instructions are short
    - C has been standardized by ANSI and ISO

Object-Oriented languages

- In object-oriented programming, the objects and the operations to be applied to them are tied together.

- The objects in object-oriented programming are active.
  - C++
  - Java

C++

- C++: developed by Bjarne Stroustrup at Bell Lab
- Three principles:
  - Encapsulation
    - The user knows what to do with the data without knowing how it is done.
  - Inheritance
    - When a general class is defined, you can define a more specific class that inherits some of the characteristics of the general class but also has some new characteristics.
  - Polymorphism
    - You can define several operations with the same name that can do different things in related classes.

Java

- Java:
  - Developed at Sun Microsystems,, Inc.
  - The language is totally class oriented.
  - Every data item belongs to a class.
  - The browser can download the applet and run it locally.
  - Features:
    - Class library
    - Multithreading

Building a program

- Three steps to building a program:
  - Writing an editing the program
    - Using text editor to edit the source file
  - Compiling the program
    - Two programs: the preprocessor and the translator
  - Linking the program with the required library modules
    - The linker assembles all of the subprograms into the final executable program

Introduction to compiler