INTRODUCTION
to
COMPUTER AND ICT

BY
DR. RAHMAN ALI
&
Mr. Asmat Ali

For BS Computer Science, BS (IT),
BS Geology, BS Mathematics,
BS Commerce, BS Statistics

AL-ILM PUBLICATIONS
Abdul Ghani Plaza, Muhallah Jangi Qissa Khwani Peshawar.
Ph: +92-91-2580325 / 2590315 , Cell: +92 (0) 333-4532836

MANAGEMENT Information System 1st Edition Dr. Rahman Ali

MANAGEMENT
Information System

1st Edition

In accordance with approved curriculum
for BS Commerce, Master of Commerce,
BBA and MBA program of the HEC
and University of Peshawar.

Dr. Rahman Ali
University of Peshawar

Mr. Asmat Ali

Chapter 4:

Computer Software

Dr. Rahman Ali, University of Peshawar.
rahmanac1@gmail.com

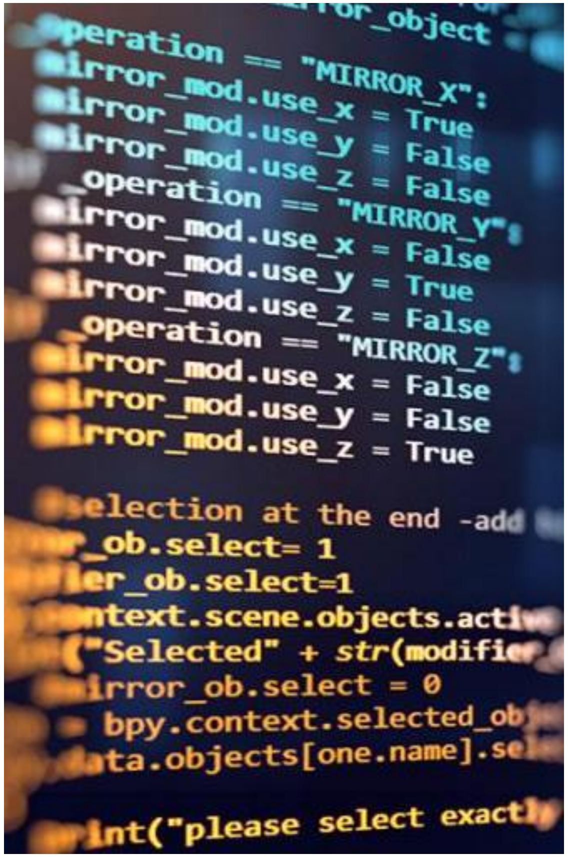
Mr. Asmat Ali, GHSS Mingora Swat.
aasmat76@gmail.com

Outlines

- ✓ Software
- ✓ History
- ✓ Types
  - Classification based on purpose
    - System & Application Software
  - Classification based on availability/copyright Status
    - Shareware, Freeware, Open source
- ✓ Programming Languages
  - Machine, Assembly & high level languages
  - Compilation and interpretation
  - Algorithm
  - Pseudocode
  - Flowchart
  - Graphical Programming
- ✓ Artificial Intelligence
- ✓ Information System

Software

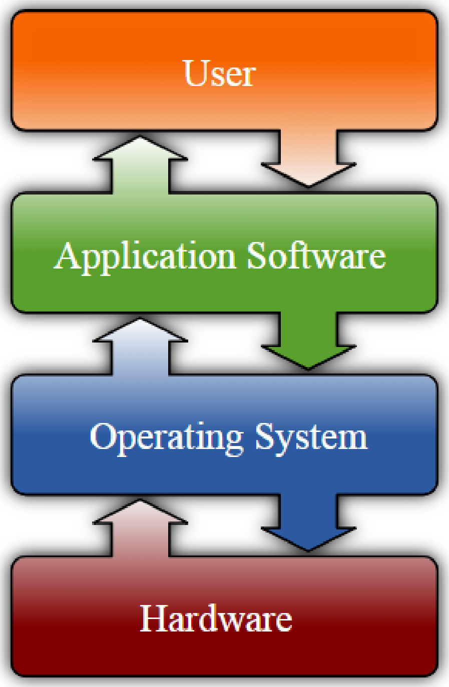
- Computer program.
- A set of instructions that tells the computer what to do and how to do.
- Enable user to interact with hardware.
- A piece of hardware is useless without software.



```
              or_object
peration == "MIRROR_X":
irror_mod.use_x = True
irror_mod.use_y = False
irror_mod.use_z = False
 operation == "MIRROR_Y":
irror_mod.use_x = False
irror_mod.use_y = True
irror_mod.use_z = False
 operation == "MIRROR_Z":
irror_mod.use_x = False
irror_mod.use_y = False
irror_mod.use_z = True

election at the end -add
 _ob.select= 1
er_ob.select=1
ntext.scene.objects.acti
("Selected" + str(modifie
irror_ob.select = 0
 bpy.context.selected_ob
ata.objects[one.name].se

int("please select exactl
```



User

Application Software

Operating System

Hardware

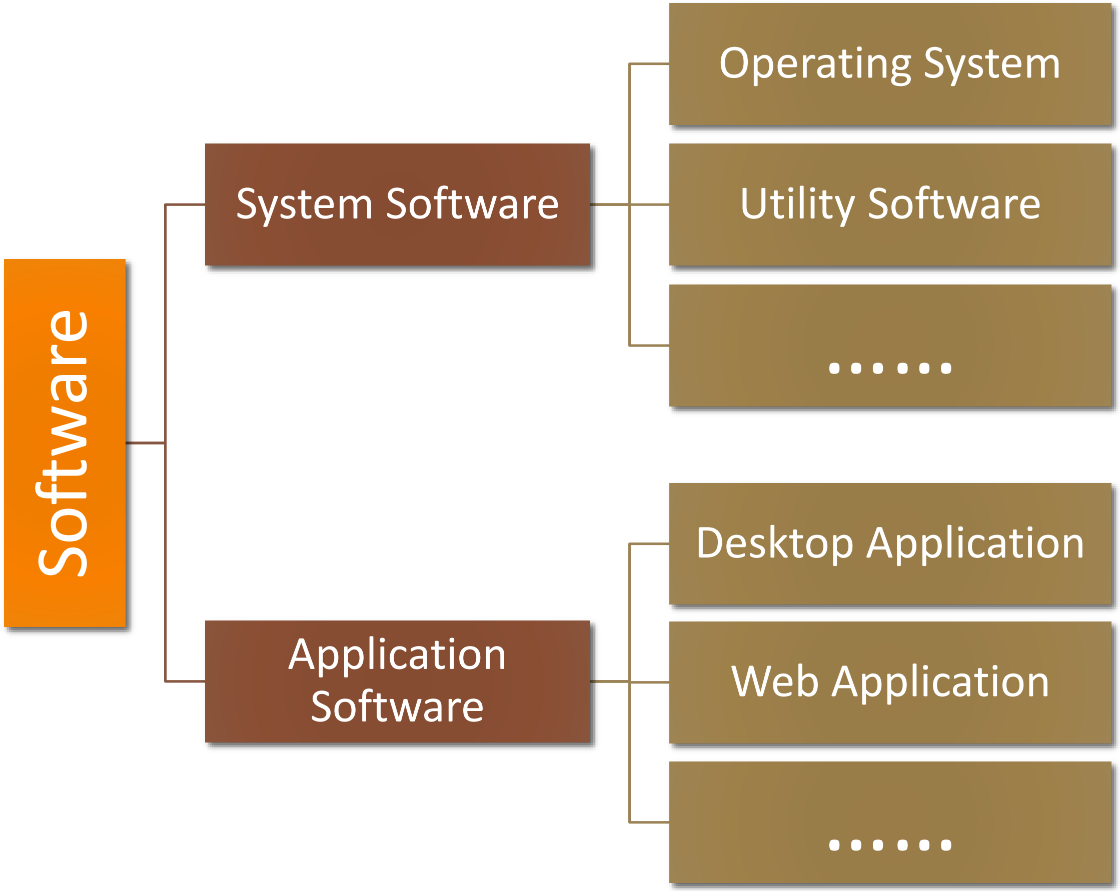
Software

- History
  - Alan Turing was the first man who introduced the theory of software.
  - Claude Shannon explained how binary logic can be used to program a computer. The computer programs in the 1940’s were written directly in machine language.
  - 1957: The first programming language FORTRAN was introduced by IBM.
  - 1962: COBOL.
  - Other programming languages like Pascal, C and C++.
  - 1970’s: Unix OS and the Unix-based Mac OS X were introduced.
  - 1980: Bill Gates and his co-workers introduced DOS OS.
  - 1980’s: Richard Stallman worked on the open source GNU project which led to the development of Linux OS.
  - 1985: The first Windows OS was developed which was evolved over time from Windows 1.0 to Windows 10.

Types of Software

1. Classification Based on Purpose

- Two broad categories based on Purpose, System Software and Application Software.

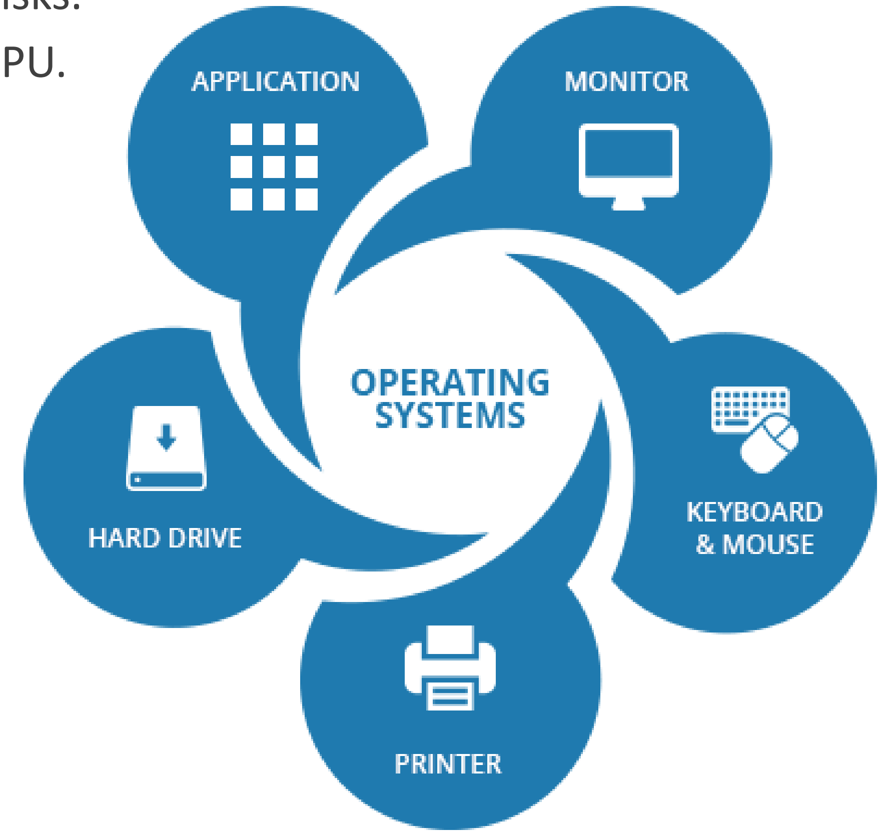


Types of Software

a. System Software

- Provides platform to other software programs.
- Controls and works with hardware.
- Enables the hardware tools to work together:
  - Transferring data between memory and disks.
  - Transferring data between memory and CPU.
  - Rendering output to output devices.
  - Receiving input form input devices.

- Examples:
  - Operating system
  - System development programs
  - Device drivers



System Software

Types of System S/W

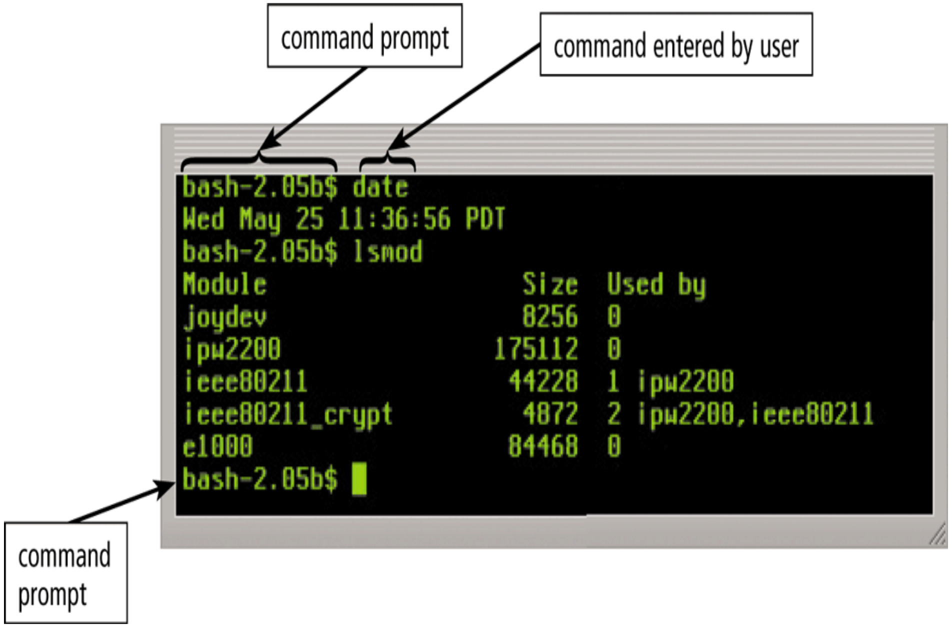
- **Operating System**
  - **Functions**: Booting, Interfacing, Resource, Memory and process Management, Security
  - **Types**: Batch, Timesharing, Distributed, Network, Real-time, Embedded
  - **Others OS:** Windows, OS X, UNIX, Linux and Chrome OS, Mobile category contains Google Android, Apple iOS
- **BIOS**
  - Basic input/output system.
  - Stored on an EPROM.
  - A program that gets computer started when we turn it on.

BIOS Chip

- **Firmware**
  - A piece of software embedded in a hardware.
  - Directly controls any single hardware.
- **Networking software**
  - It is the software that facilitates and interacts with a computer network.

System Software

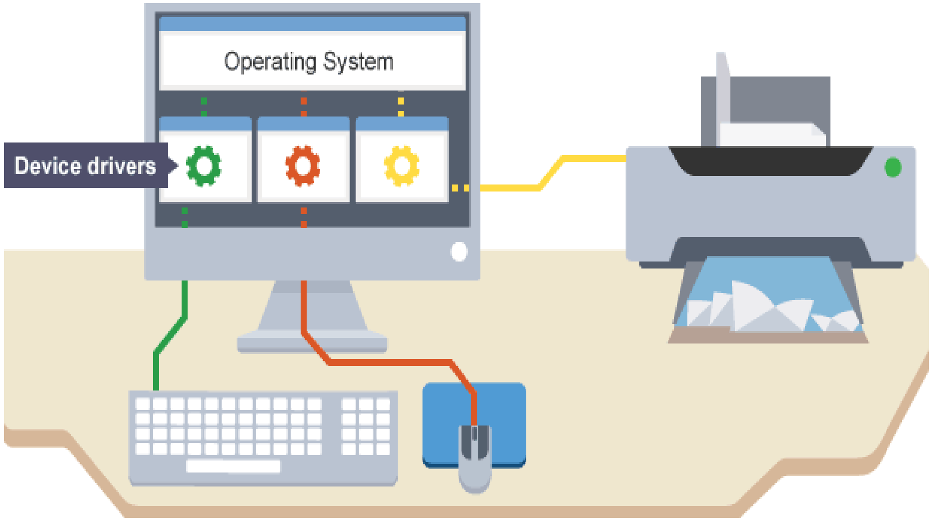
- **Shell**
  - Interface between user and the OS.
  - MS DOS, Ubuntu terminal and graphical user interface etc.
  - Types
    - CLI
    - GUI



```
bash-2.05b$ date
Wed May 25 11:36:56 PDT
bash-2.05b$ lsmod
Module                  Size  Used by
joydev                  8256  0
ipw2200               175112  0
ieee80211              44228  1 ipw2200
ieee80211_crypt         4872  2 ipw2200,ieee80211
e1000                  84468  0
bash-2.05b$ 
```

System Software

- **Device Drivers**
  - A program that operates and controls a particular device.



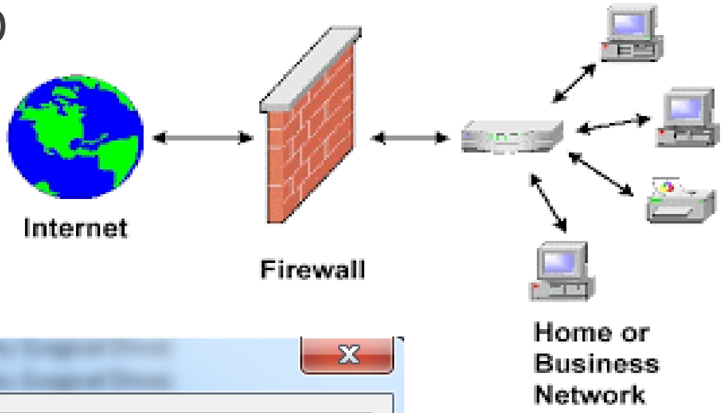
System Software

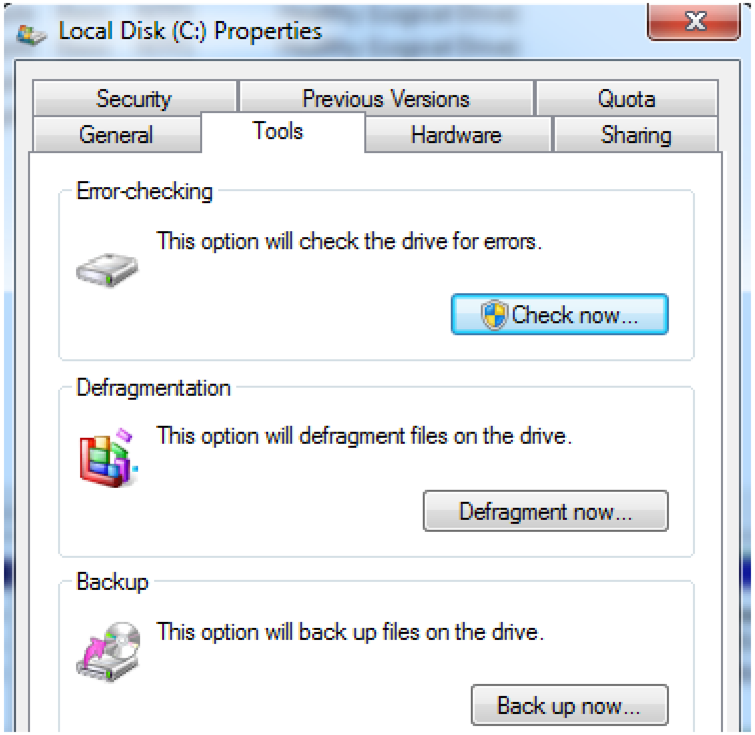
- **Types of System S/W** (continued...)
  - **Translator**
    - Translates a program from high level language to machine language.
      - Assembler.
      - Interpreter.
      - Compiler.
  - **Networking Software**
    - Facilitates and interacts with computer network.
    - Supports the creation and operation of network.

System Software

Utility Software

- Programs distributed with OS but not a part of O
  - ○ Firewall
  - ○ Backup utility
  - ○ Data Compression Tools
  - ○ Archive Managers
  - ○ Disk Defragmenters
  - ○ ScanDisk
  - ○ Disk utilities and more.




Local Disk (C:) Properties

Error-checking

This option will check the drive for errors.

Defragmentation

This option will defragment files on the drive.

Backup

This option will back up files on the drive.

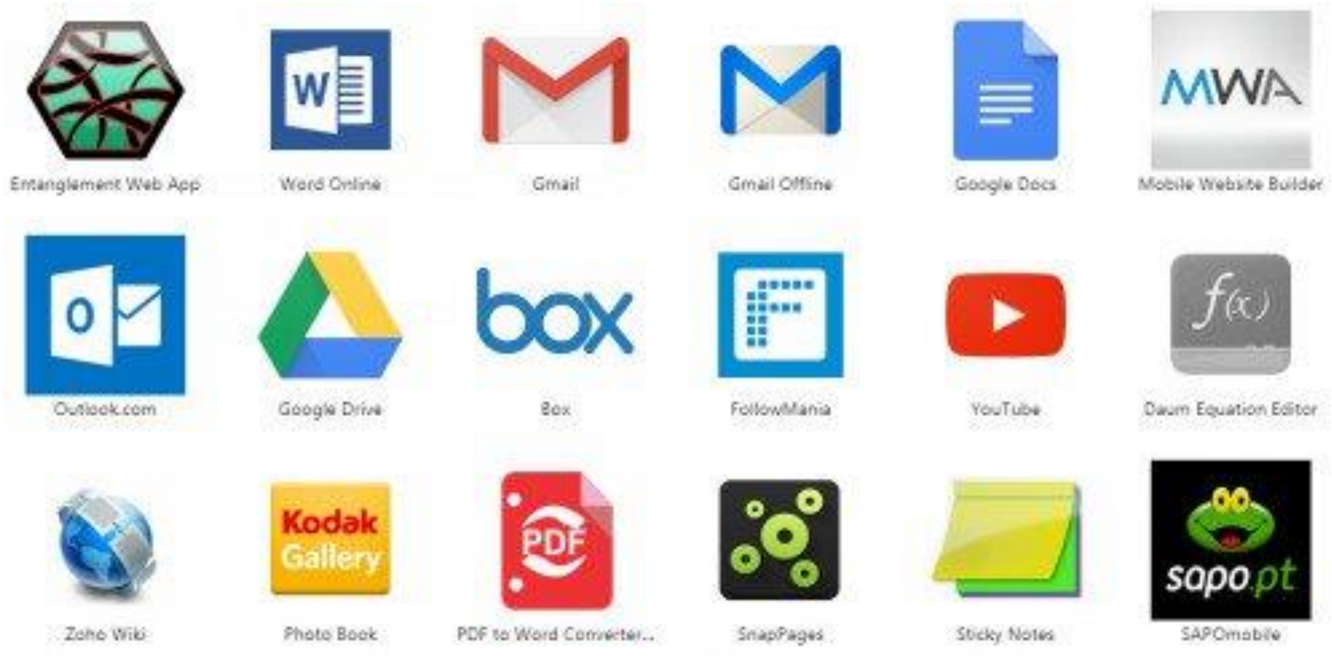
System Development Software

- System development software are tools that are used to write new software and ensure it is working correctly.
- Tools that are classified as following:
  - **Editor:**
    - These are text editors where we write the program.
  - **Compiler**:
    - These are tools that transform the code we write in programming language into machine language that the processor can understand.
  - **Interpreter**:
    - It works like compiler but translates one statement of the source code at a time and directly executes the program.
  - **Debugger**:
    - It is a software tool that is used to test and find errors (bugs) in a program. Software developers use debuggers to debug the code they write. A debugger provides a higher level of control over the program execution so that it can be stopped according to specific conditions. Debugger tries to point out the error in a program when it cashes.
- **IDE:**
  - It stands for “Integrated Development Environment”. It is a software suite (a collection of related programs) that provides a complete development environment to the developers.

Types of Software

b. Application Software

- A computer program designed to perform a specific task or a group of coordinated tasks.
- Not necessary for the basic functionality of computer.
- General purpose or special purpose.
- Broad category with thousands of different software tools.



Application Software

- Types of Application S/W

- **Desktop Application**
  - Runs stand-alone on a desktop or laptop computer.
- **Application Suite**
  - More than one different but relevant applications bundled together.
  - E.g. MS Office (Word, Excel, Access and PowerPoint etc.)
- **Mobile Application**
  - Designed for use on mobile devices, e.g. android and iPhone.
  - May be native app or hybrid app.

- **Web Application**
  - Designed to be delivered over the web through a web browser.
  - Stored on a remote server.

Application Software

- Types of Application S/W (continued...)

  - **Enterprise Software**
    - Designed to address the needs of a large organization.
    - Often runs in a distributed environment.
  - **Content Access Software**
    - Designed to access content without editing it.
    - Media players, web browsers.
  - **Educational Software**
    - Designed for use by educators and students, e.g. for delivering tests.
  - **Simulation Software**
    - Simulate physical or abstract systems.
    - Used in education and research.

Application Software

- Types of Application S/W (continued…)

  - **Media Development Software**
    - Graphic art tools, video composers etc.
    - Generates electronic media.
  - **Product Engineering Software**
    - Tools used to develop software programs.
    - IDE, editor, compiler and more.
  - **General Purpose Software**
    - Programs used for multiple purposes.
    - Spreadsheet applications, word processors, communication software and more.
  - **Special Purpose Software**
    - Customized software.
    - Designed to meet a person or organization’s unique demands.

Types of Software

2. Classification by Copyright Status

- Availability or copyright status.
- Four main categories, shareware, freeware, free software and open source software.

Shareware

- Trial software.
- Full functionality for a short period of time or limited functionality unless a license is purchased.

Freeware

- Freely available without any payment.
- Copyrighted, i.e. can’t be illegally distributed.

Types of Software

2. Classification by Copyright Status (continued...)

- **Free Software**
  - Freely available.
  - Free to use, copy and distribute.
  - Should be redistributed with original terms of use.
- **Open Source Software**
  - Similar to freeware.
  - Source code made available to view and analyze how it was created.
  - Can be modified and extended by adding additional modules.

Software Copyrights and Piracy

Software Copyrights:

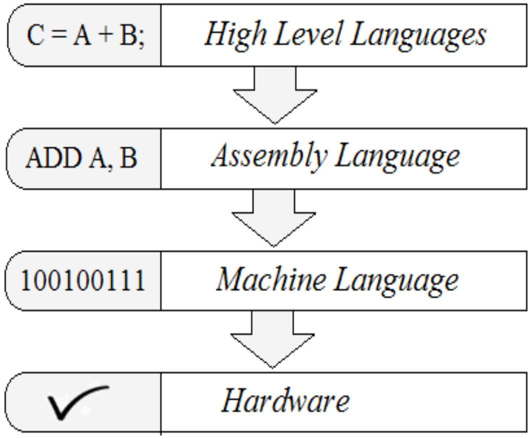
- Copyrights:
  - Protection of any piece of work to protect it from being used, reproduced and distributed illegally.
- Software developers use copyrights to prevent unauthorized copying of their software.
- Each user needs to be licensed for each computer using the program.

Software Piracy

- Illegal use of software
  - Copying
  - Distributing to unlicensed users.
  - Selling copyrighted software.
  - Installing on more devices than the user is licensed for.
  - Sharing login credentials of a web application.

Programming Languages

- A language used to write computer programs.
- Allows the programmer to instruct the computer.
  - Machine language
  - Low level languages
  - High level languages
- Desktop and other applications development:
  - C/C++
  - Java
  - C#
  - Visual Basic
  - Python and more.
- Web designing and development:
  - HTML and CSS
  - Java Script
  - PHP
  - ASP.NET
  - JSP



C = A + B; *High Level Languages*

ADD A, B *Assembly Language*

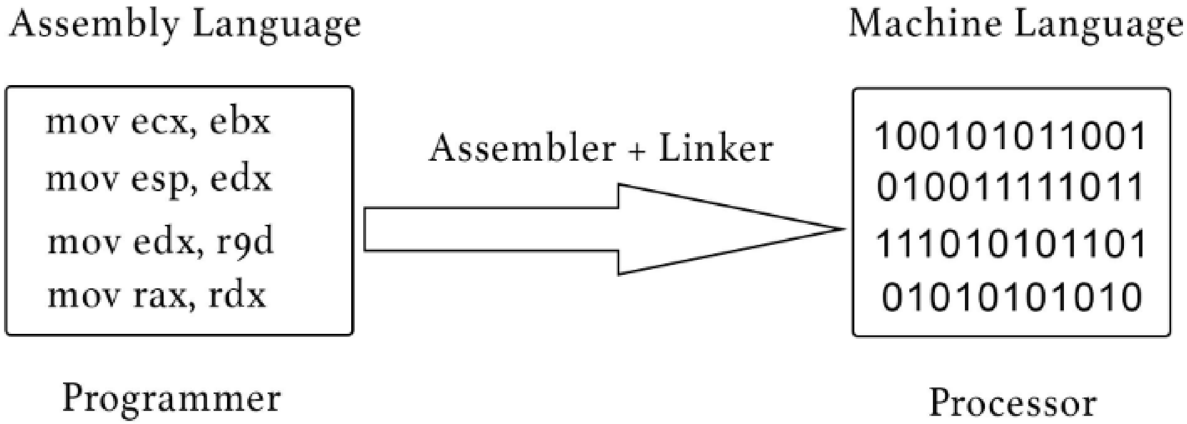
100100111 *Machine Language*

✓ *Hardware*

Programming Languages

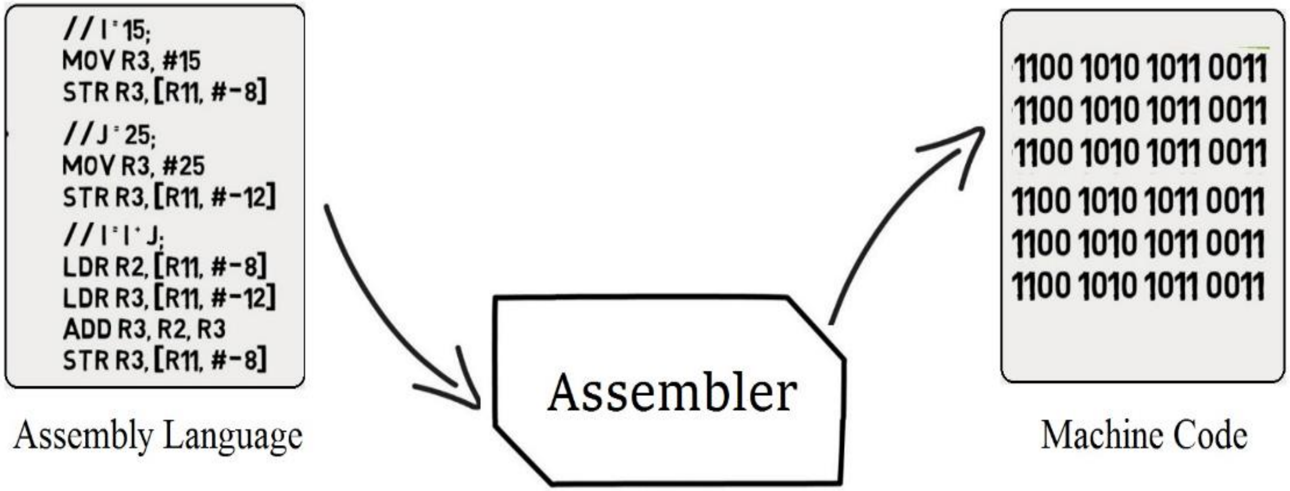
Machine Language

- Collection of binary digits (bits).
- Directly executed by CPU without compilation.
- Only language computer understands; programs written in any other language must first be transformed into machine code.



Programming Languages

- **Low Level Language**
  - Close to machine language.
  - Little or no abstraction of programming concepts.
  - Human readable and understandable form.
  - Easier to write programs.
  - Example:
    - Assembly language, transformed to machine code by an assembler.



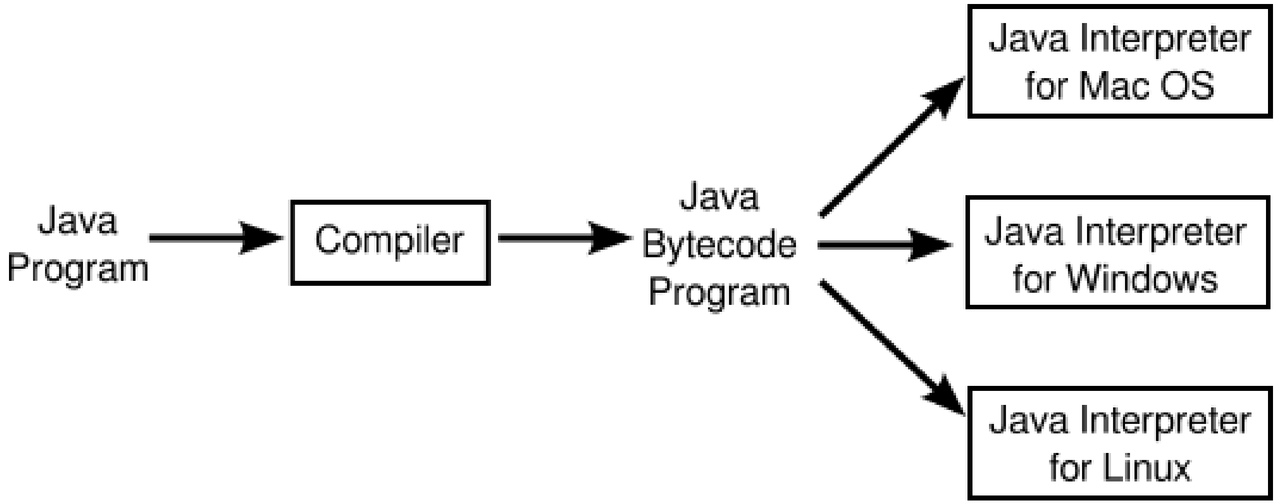
```
//I=15;
MOV R3, #15
STR R3, [R11, #-8]
//J=25;
MOV R3, #25
STR R3, [R11, #-12]
//I=I+J;
LDR R2, [R11, #-8]
LDR R3, [R11, #-12]
ADD R3, R2, R3
STR R3, [R11, #-8]
```

```
1100 1010 1011 0011
1100 1010 1011 0011
1100 1010 1011 0011
1100 1010 1011 0011
1100 1010 1011 0011
1100 1010 1011 0011
```

Programming Languages

High Level Language

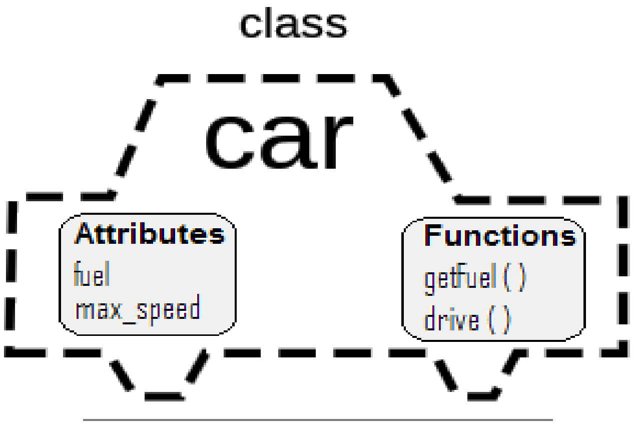
- Provides strong abstraction from the details of the computer.
- Generally independent of the underlying architecture of computer.
- Automates and hides some aspects, e.g. memory management.
- Natural language elements; easier to understand and program.
- Compiled to machine code before execution.

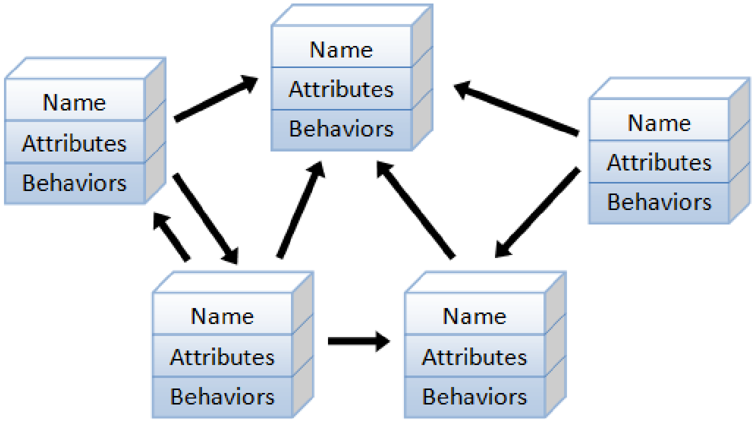

Java Program
Compiler
Java Bytecode Program
Java Interpreter for Mac OS
Java Interpreter for Windows
Java Interpreter for Linux

Programming Languages

Object Oriented Language

- An object oriented language is a high level language that implements objects and their associated procedures to create software.
- Object oriented programming introduces the concept of class. For each entity under consideration, we create a class which includes the data and the functions related to the entity.





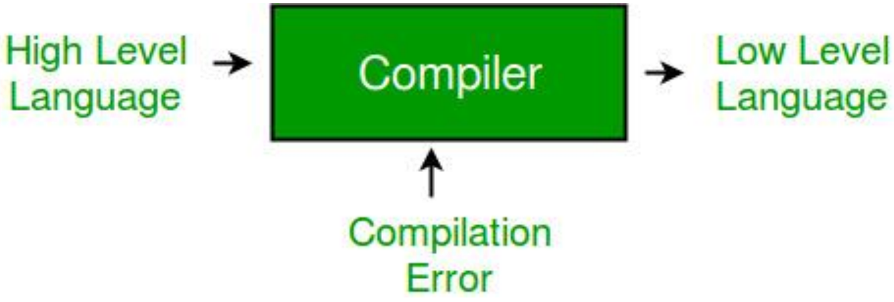
Programming Languages

- **Fourth Generation Language**
  - 4th generation languages (4GLs) are considered to have support for database management, report generation, mathematical optimization, GUI creation and web development.
  - These languages designed to reduce the time, effort and cost of software development.
  - They are closer to human language than the earlier generation languages like Java, C++ and C# etc. which are third generation languages.
  - For example a 4GL command may look something like “FIND ALL RECORDS WHERE NAME IS ‘ALI’”.

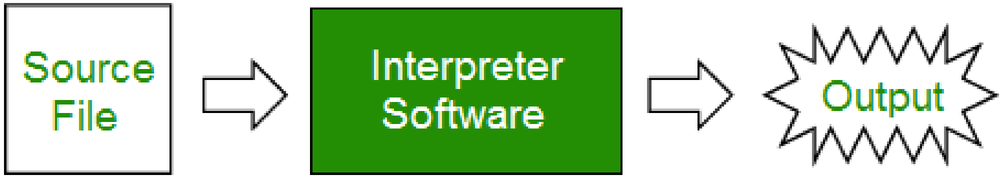
Programming Languages

- Compilation and Interpretation

- **Compilation**
  - Converts program in high level language into machine language.
  - The whole program is converted to machine code as a whole.
  - Produces a list of errors and warnings if any.
  - Doesn't run the program.

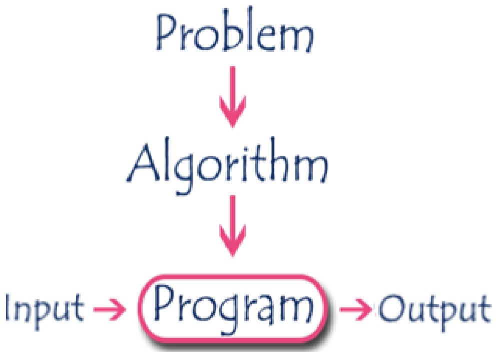


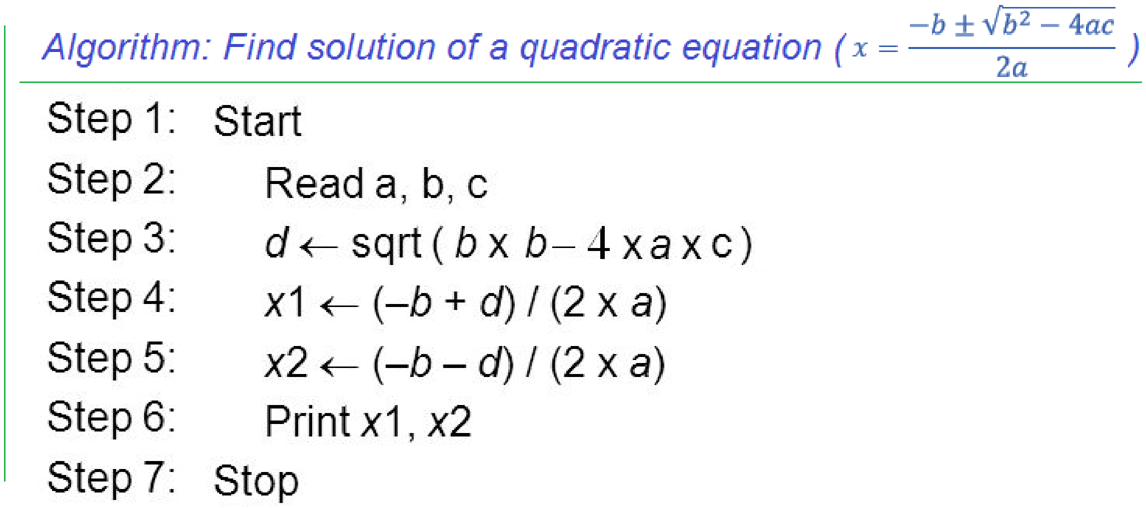
- **Interpretation**
  - Converts program into machine code.
  - Reads the programs line by line, transforms and executes.
  - Stops if any error found.
  - Slower than compilation.



Algorithm

- Step by step method to solve a particular problem.
- Series of instructions to carry out an operation.
- The step by step solution is transformed to computer program by programmers.



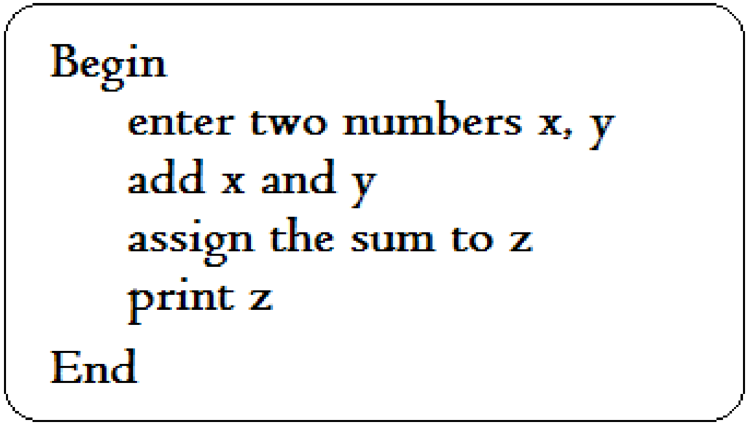


Algorithm: Find solution of a quadratic equation ($x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$)

```
Step 1:  Start
Step 2:      Read a, b, c
Step 3:      $d \leftarrow$ sqrt ( $b$ x $b$ – 4 x a x c )
Step 4:      $x1 \leftarrow (-b + d) / (2 \times a)$
Step 5:      $x2 \leftarrow (-b - d) / (2 \times a)$
Step 6:      Print $x1$, $x2$
Step 7:  Stop
```

Pseudocode

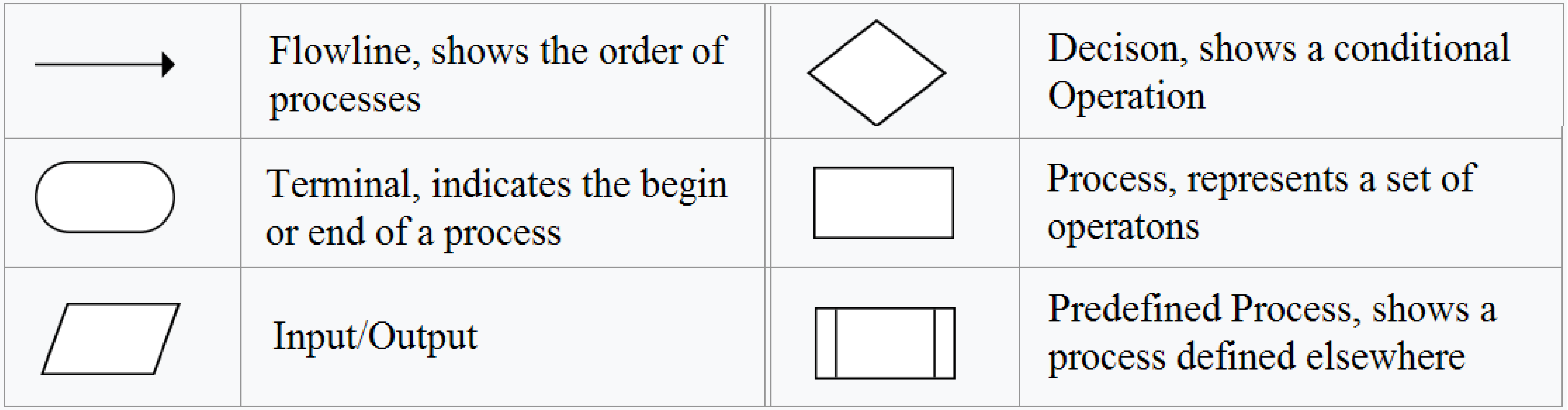
- The detailed, human readable description of a program.
- Described in natural language.
- Provides a template for what the programmers have to program.
- Ensures to meet the clients requirements.
- No standard, the style varies from designer to designer.
    - **Example:**



```
Begin
    enter two numbers x, y
    add x and y
    assign the sum to z
    print z
End
```

Flow Chart

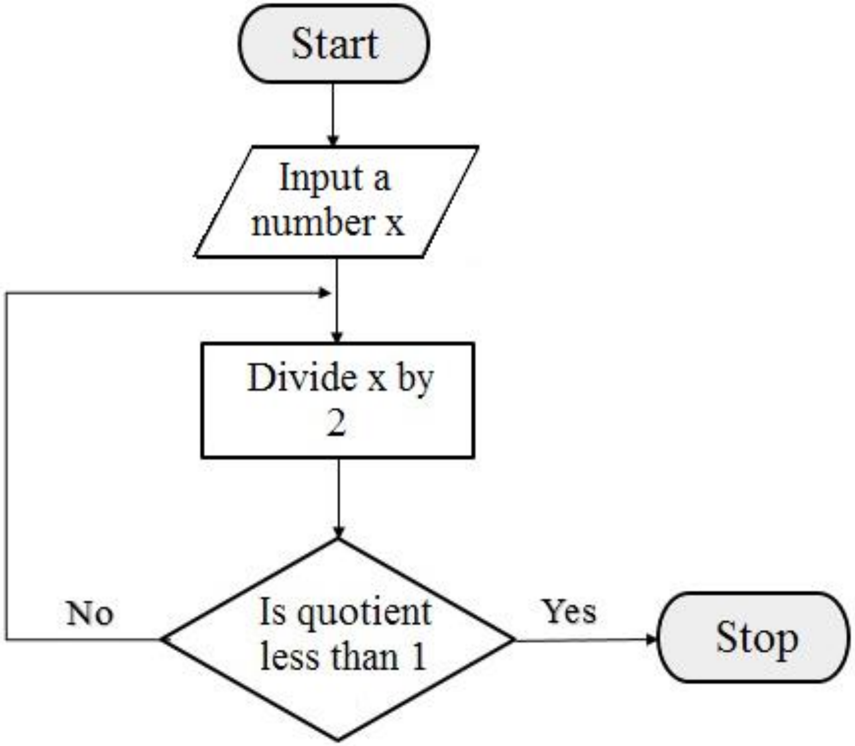
- The diagrammatic representation of an algorithm or a process.
- Represents the sequence of activities involved in the process.
- Comprised of different elements:
    - Different type of boxes, interconnected by arrows.



→	Flowline, shows the order of processes	◇	Decison, shows a conditional Operation
⬭	Terminal, indicates the begin or end of a process	▭	Process, represents a set of operatons
▱	Input/Output	◫	Predefined Process, shows a process defined elsewhere

Flow Chart

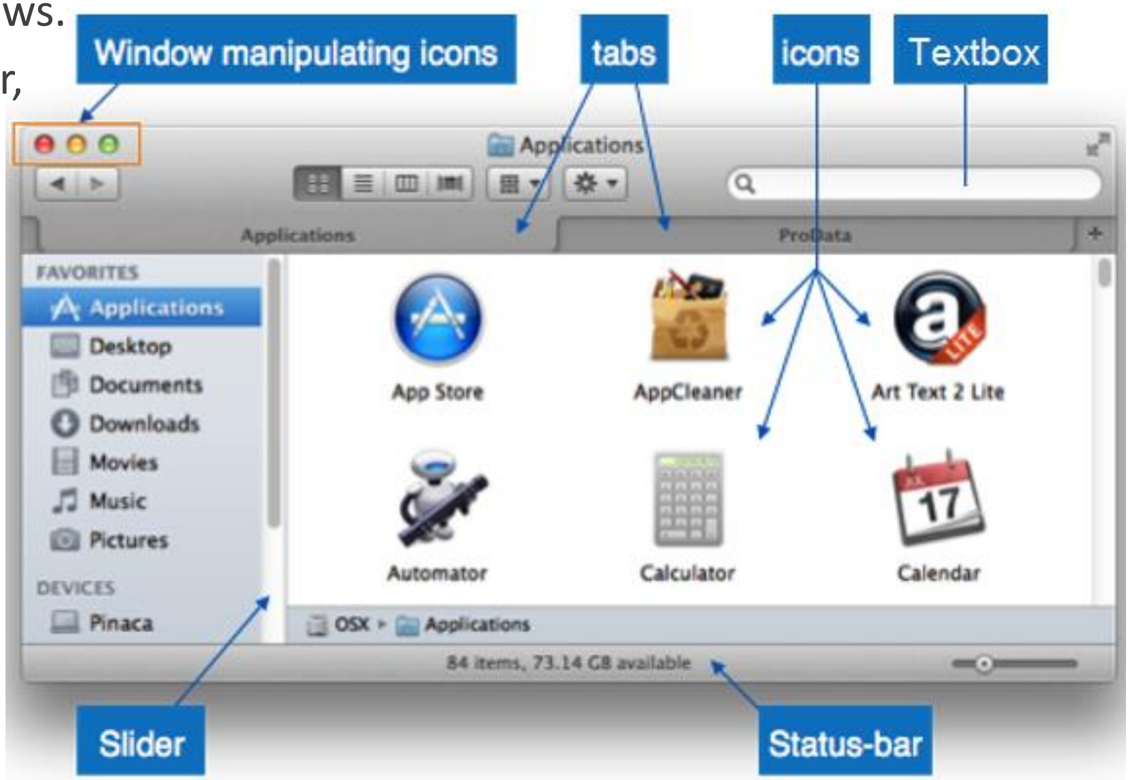
- **Example:**
  - Divide a given number by 2 repeatedly until the quotient is less than 1.



Graphical User Interface

- The interface between user and electronic devices comprised of visual elements.
- Introduced by Xerox Palo Alto research lab in the 1970’s.
- Faster way to interact with computer.

- **Elements**
  - Widget, for displaying a collection.
  - Tabs, to switch between windows.
  - Interaction elements like cursor, pointer etc.
  - Button
  - Window
  - Menu
  - Icon
  - Checkbox and radio button
  - Labels
  - Dropdown list
  - Textbox and text area.

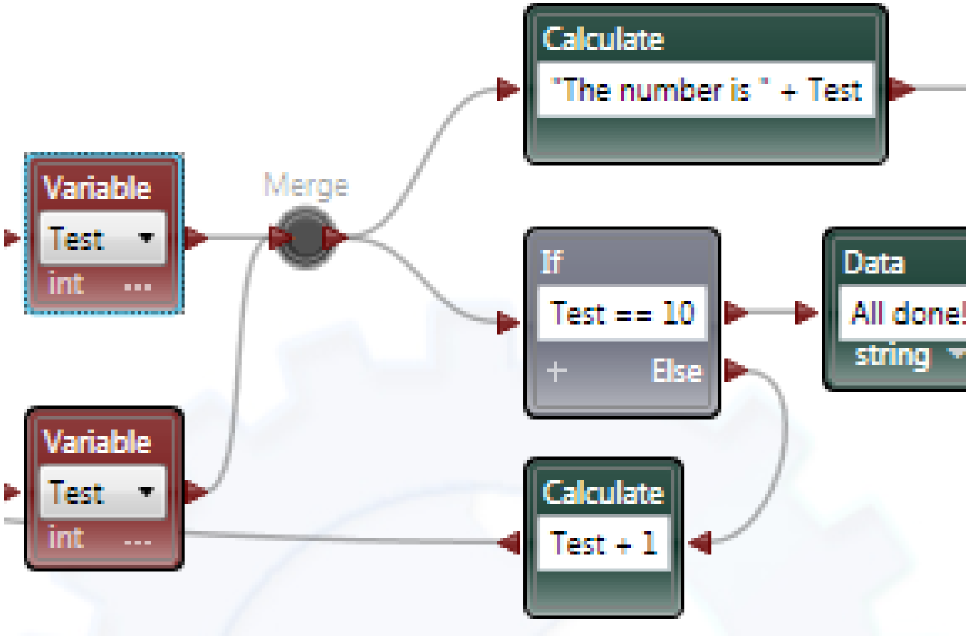


Graphical Programming

- Uses visual blocks to code instead of text.
- Easier for non-programmers to implement algorithms.

- A flow of the app describing:
  - Entities.
  - Relations.
  - User interactions.
  - What happens to data at each stage

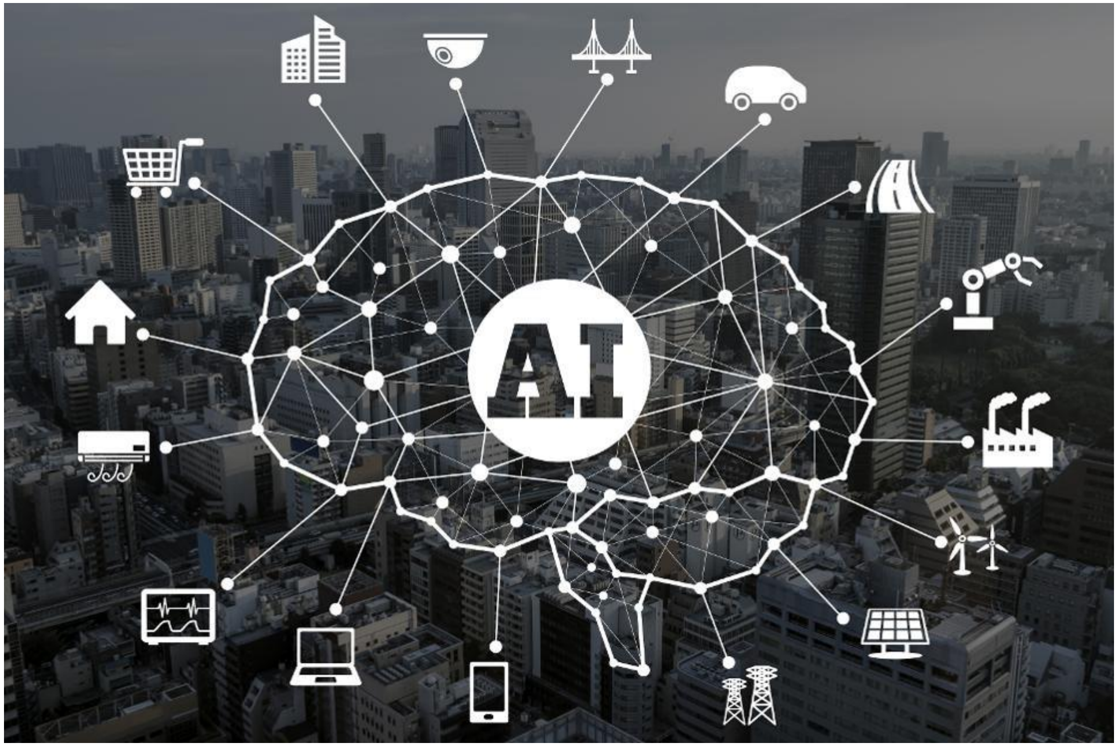
- This flow is converted to a working software by the programming tool.
- Example:
  - Scratch (scratch.mit.edu), online programming tool for children to create projects using a block like interface.



Artificial Intelligence

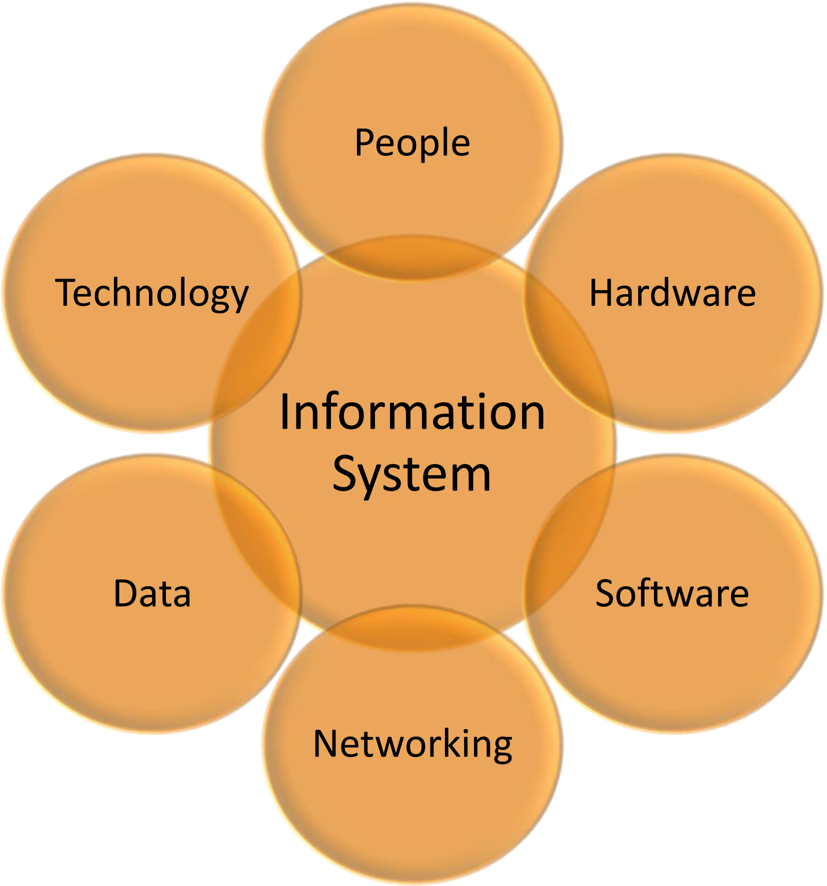
- The creation of machines and programs that intelligently work and react like humans.
- Imitate the intelligence and decision making capabilities of humans.
- Understand the environment and take actions to maximize the chances to reach a solution.

- Address various problems like:
  - Knowledge engineering
  - Problem solving
  - Machine learning
  - Reasoning
  - Speech recognition
  - Machine translation.



Information System

- An organized combination of hardware, software, people, data resources, infrastructure, policies and procedures to facilitate control, decision making and planning in an organization.
- A software that helps an organization in various aspects related to the organization.

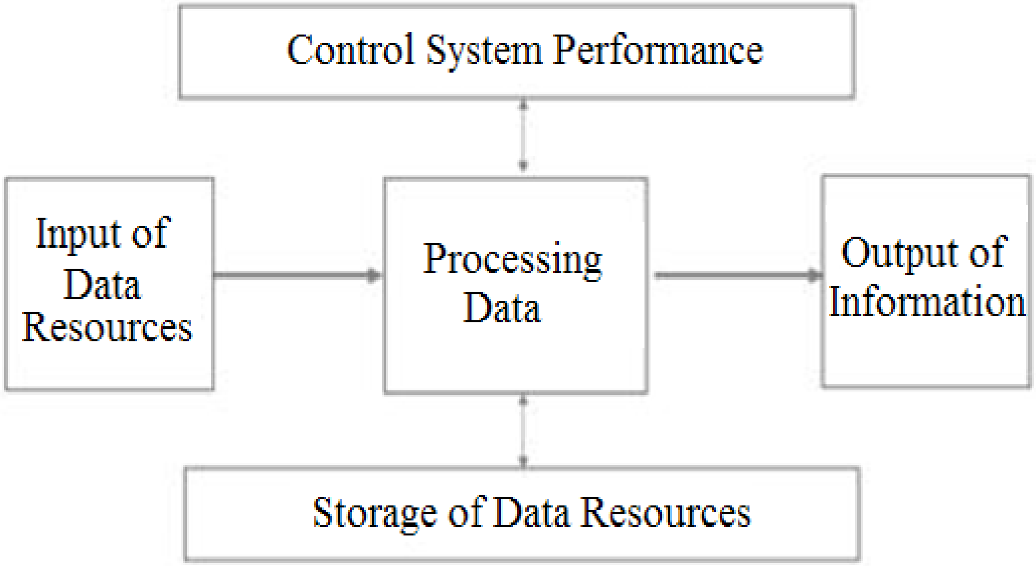


Basic Components

- People
- Software
- Hardware
- Network
- Data resources.

Information System

- **Basic Activities**
  - Input of data
  - Processing of data
  - Output of data
  - Storage of data
  - Control of system performance.



The Need for Programming

- **Only hardware is of no use**
  - Need an operating system and some application programs to make use of hardware.
- **Machine language is tedious**
  - The early computers were operated this way. It is very tedious, almost a non-practical way to interact with computers.
- **Interface**
  - Programming languages are an interface between humans and machines.
- **Problem solving**
  - Health
  - Business
  - Governance
  - Education
  - Scientific research and more.

Social and Legal Issues

- The software engineer needs to understand and deal with a number of issues, such as:

- **The impact of software**
  - A program may have adverse effects e.g.
  - Malware
  - A social network, not well managed.

- **Reliance on software**
  - A vast majority of modern day machines rely on software.
  - The solutions developed should be reliable, virus-free and efficient.

- **Acknowledging the property of others**
  - Use work of others only if allowed.
  - Acknowledge the original creator.

Social and Legal Issues

- **Copyrights**
  - Illegal use of software.
  - Distribution for financial gain.
- **Use of Networks**
  - Licenses allow use of software on a single device.
  - Purchase network license to use it on several machines over a network.
- **Software market**
  - Determine and fulfill the needs of customers.
  - Understand and consider social, legal and ethical issues while developing marketing strategies.

References

- Ali, R. & Ali, A. (2018). Chapter 4: Computer Software. *Management Information System (MIS) – 1st Edition* (pp. 61-84). Muhalla Jangi, Qissa Khawani, Peshawar, Pakistan: Al-ilum Publications.

Thanks!

Any Questions

?