Introduction and Overview of Graphics systems

Overview

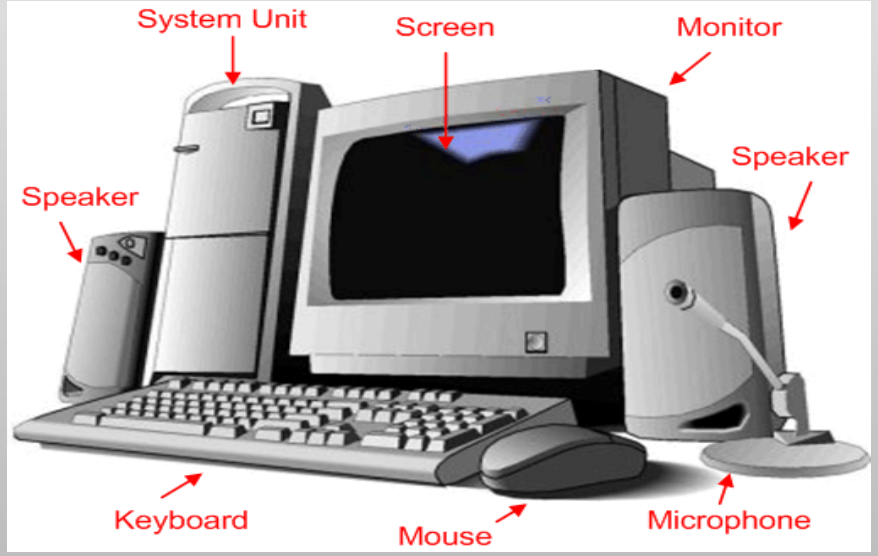
- General review of computer components
- What is graphic and computer graphic
- Application Domains and areas of Computer Graphics
- Hardware and Software
- Two-Dimensional Graphics
- Three-Dimensional Graphics
- Painting and Drawing

What is computer?

Definition of Computer

What is Computer Device?

The computer device is an electronic device that takes raw data as input from the user and processes these data under the control set of instructions (called program) and gives the result as Output.

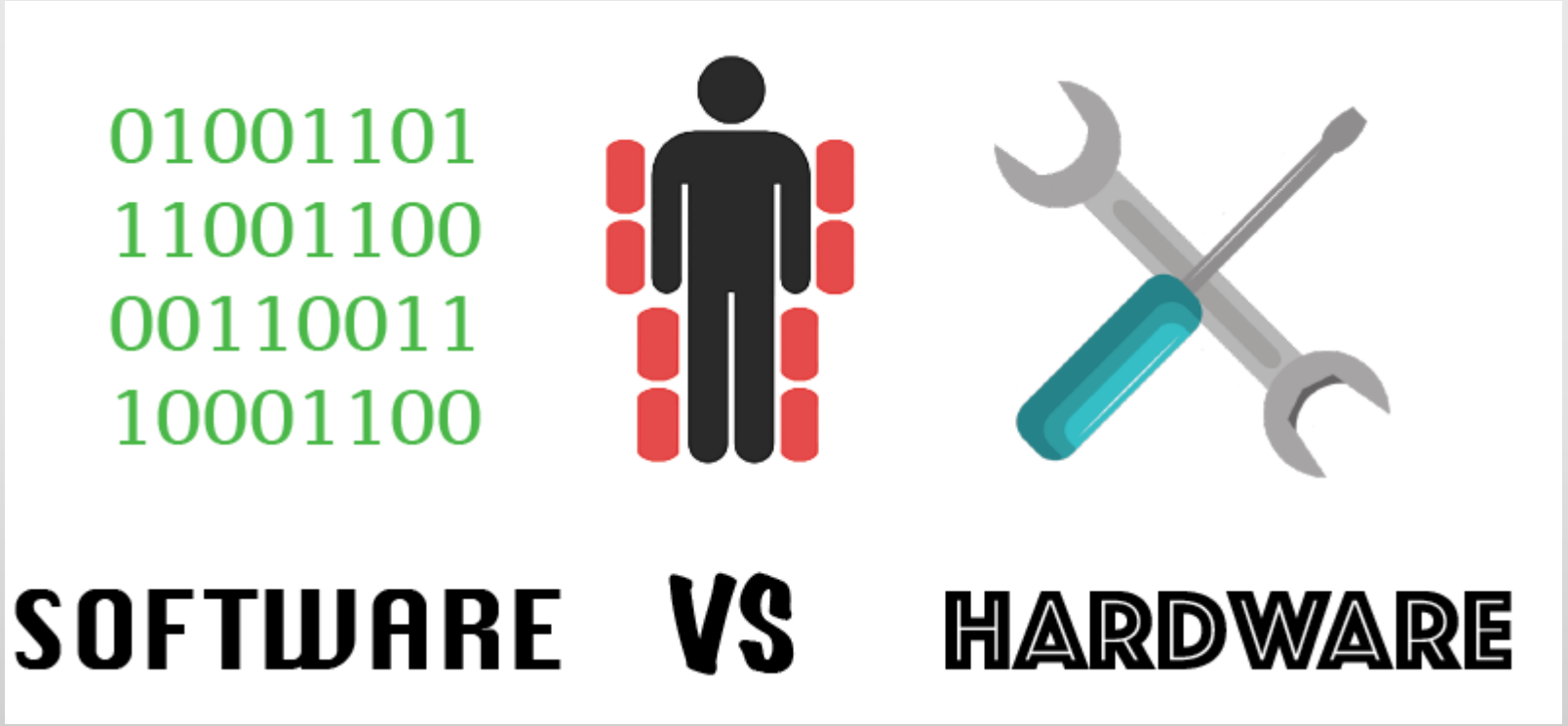


What are the computer components?

Computer Components

Computer Software

Computer Hardware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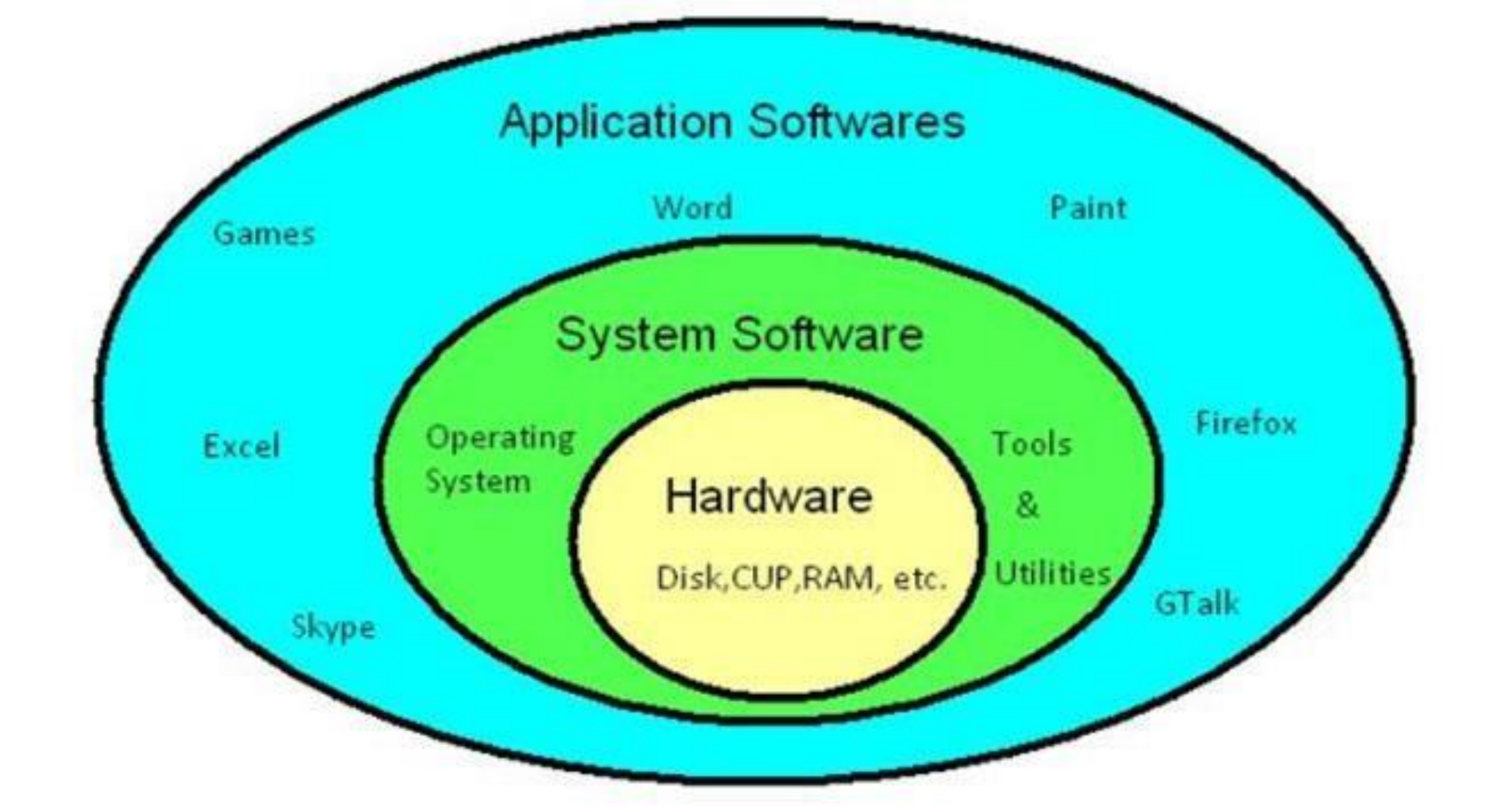
SOFTWARE
VS
HARDWARE

Hardware and Software Interactions



Software Types

System Software

Application Software

Utility Software

Computer Hardware

- Computer hardware are in two parts

- Input Devices
- Data from user to computer

- Output Devices
- Output data from computer to user

Input Devices

- Keyboard
- Mouse
- Microphone
- Scanner

Output Devices

- Monitor
- Speaker
- Printer
- Projector


Monitor


Printer


Speakers


Head Set

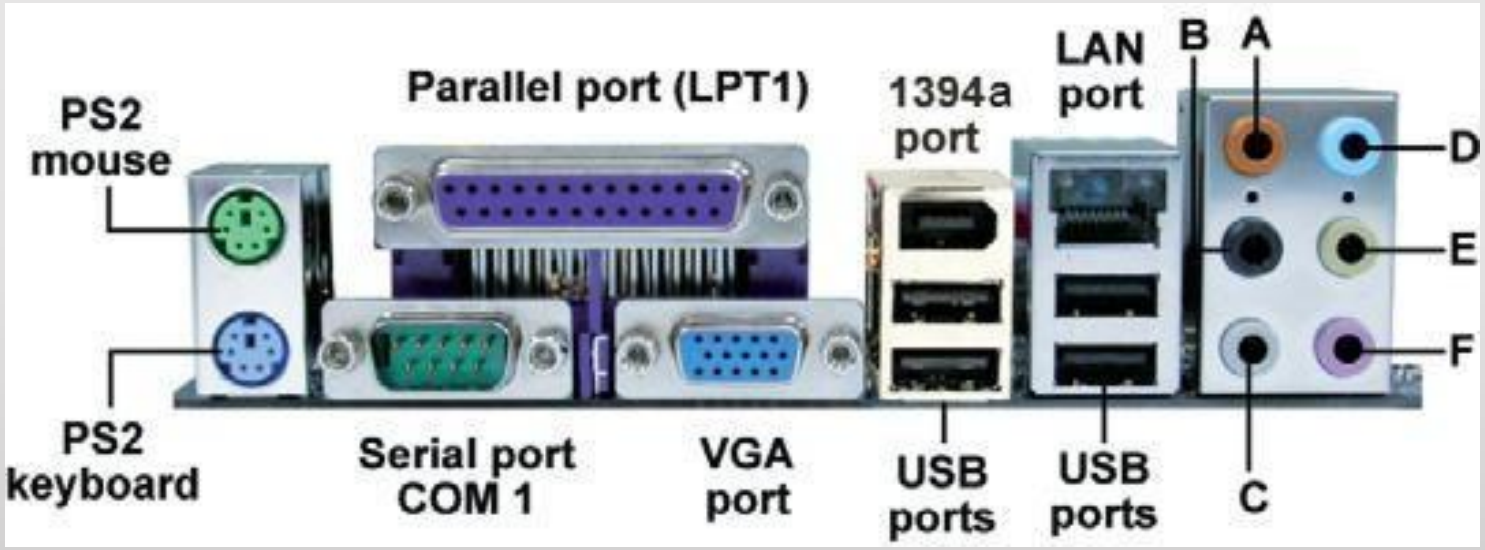

Projector


Plotter

System Unit

- Motherboard
- CPU
- GPU
- RAM
- ROM
- Optical Drive
- Power Supply
- FAN System

Computer Ports



Input Devices (Mouse)

- Mouse device is a small handheld device that user can control the movement of a small arrow on the screen, and it is called a pointer.
- This pointer can select Icons, files and texts that can be seen on the computer screen.

Input Devices (Keyboard)

Keyboard consist of many buttons that user can press to enter data into the computer.

Two types of keyboard

- Wireless Keyboard
- Wire Keyboard

Output Devices (Monitor)

The monitor displays graphics, text, and videos on a computer screen. Monitor Types:

- Separated Monitor
- Attached Monitor

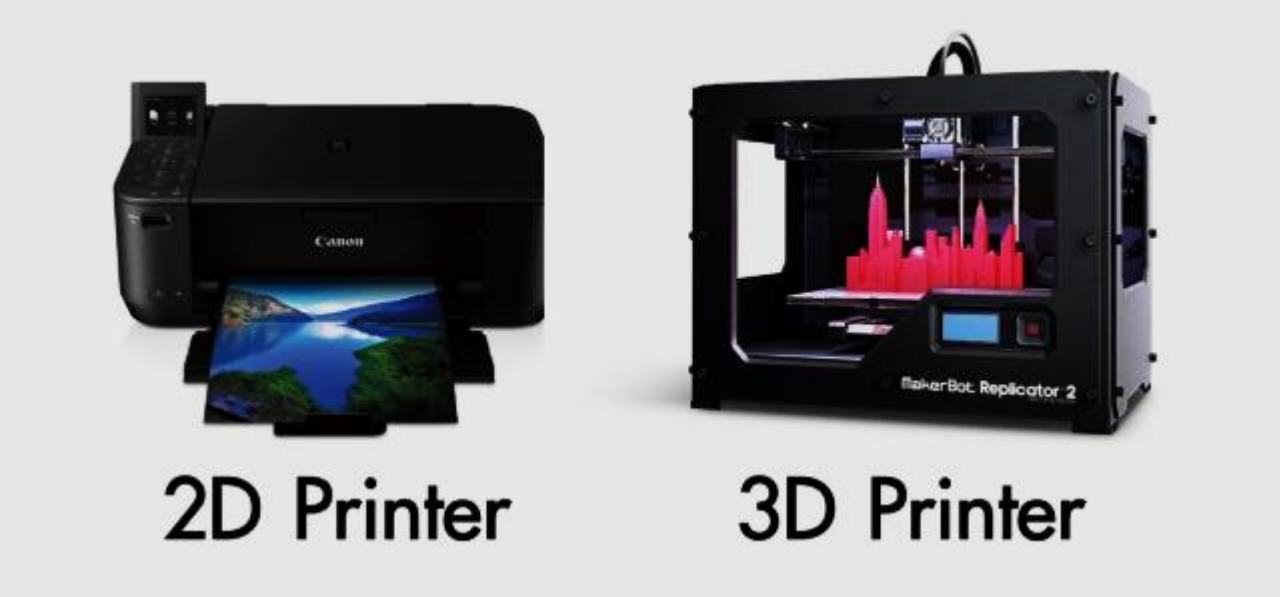
Output Devices (Monitor)

- 2D Monitor Based on pixel on screen such as (CRT Display, Flat Panel Display: Plasma Display and LCD).
- Graphics Adapters (Internal and External differ according to their memory and resolution).
- 3D viewing devices (Virtual Reality devices based on Computer simulation).
- Printer (2D & 3D)
- Plotters

Output Devices (Printer)

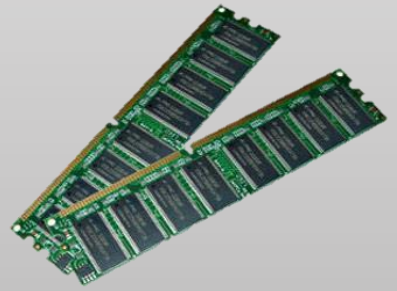
Printer devices produce text and graphics on a physical medium such as paper. Printer Types.

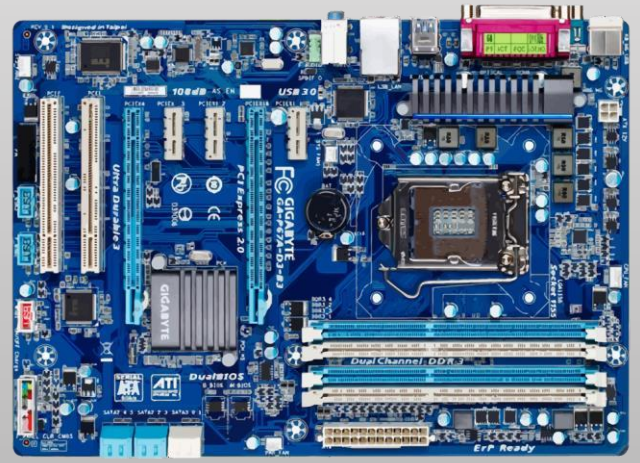
- 2D & 3D Printer



Computer System Unit

- The case that contains the main electronic components of computers that are used to process data, is called system unit.
- The circuit of the system unit usually is part of or is connected to a circuit board called the motherboard.
- On the computer motherboard, there are two main components that are processor and memory.





System Unit (Memory)

- Memory device consists of electronic components that store instructions waiting to be executed by CPU.
- Although some forms of memory are permanent, most memory keeps data and instructions temporarily
- For example, contents in the computer, will erase when the computer is shut off.

System Unit (Computer Processor)

A computer processor, also named as CPU (Central Processing Unit), is the electronic computer component that interprets and carries out the basic instructions that operate on the computer.

What is GPU (Graphical Processing Unit)

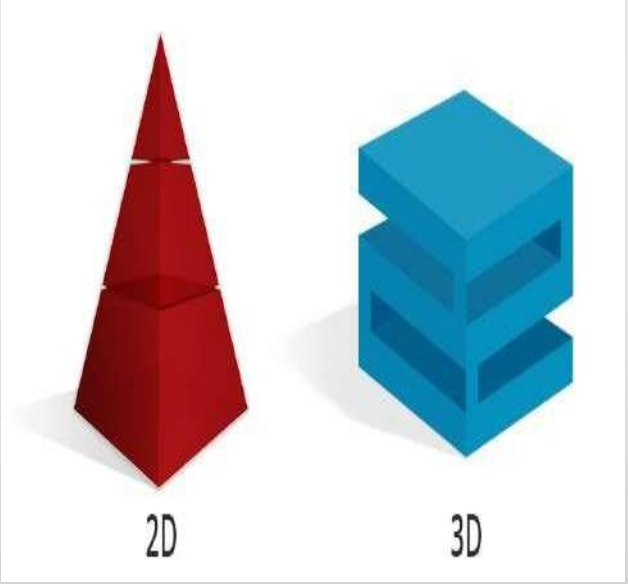
- A graphics processing unit (GPU) is a chip or electrical circuit that can produce images for display on a computer screen. The GPU was first presented to the general public in 1999, and it is best recognized for delivering the smooth visuals that current video and gaming viewers demand.

GPU usages and applications

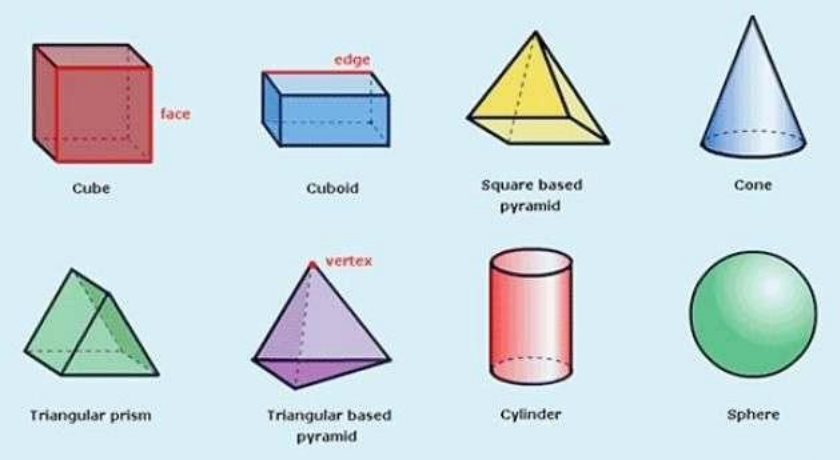
- Polygonal coordinates are translated into bitmaps—a process2 known as "rendering"—and subsequently into signals that are shown on a screen.
- GPUs are also useful in machine learning, artificial intelligence, and other jobs that demand a huge number of complicated and sophisticated computations since this conversion needs a lot of processing power from the GPU.

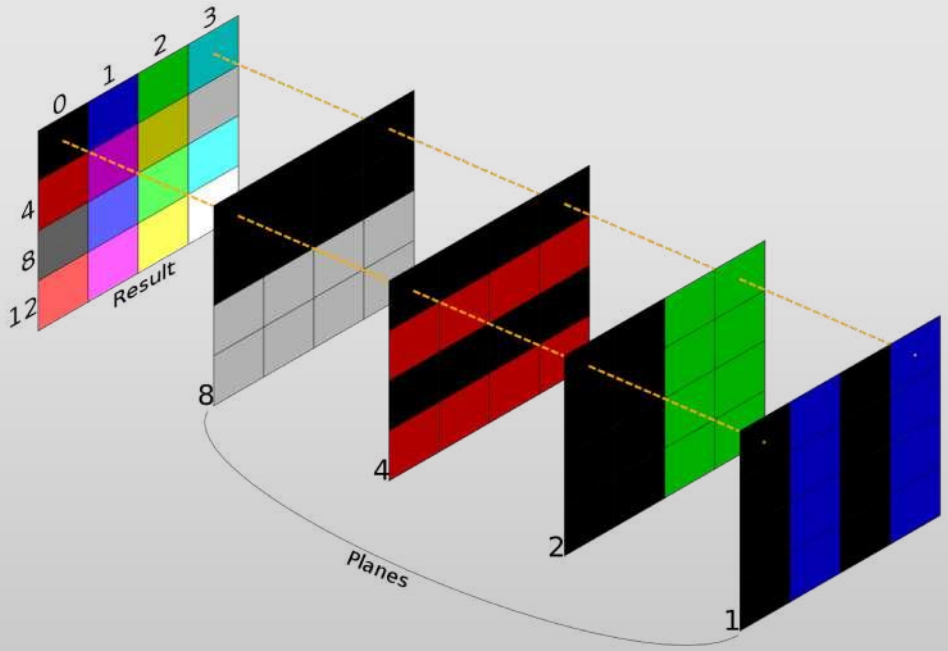
GRAPHICS

- A graphic is an image or visual representation of an object.
- Graphics are often contrasted with text, which is comprised of **characters**, such as numbers and letters, rather than images.
- There are two types of graphics 2D graphics and 3D graphics



COMPUTER GRAPHICS





COMPUTER GRAPHICS

- Computer Graphics involves technology to access. The Process transforms and presents information in a visual form.
- The role of computer graphics insensible. In today life, computer graphics has now become a common element in user interfaces, T.V. commercial motion pictures.
- Computer Graphics is the creation of pictures with the help of a computer.
- The end product of the computer graphics is a picture it may be a business graph, drawing, and engineering.

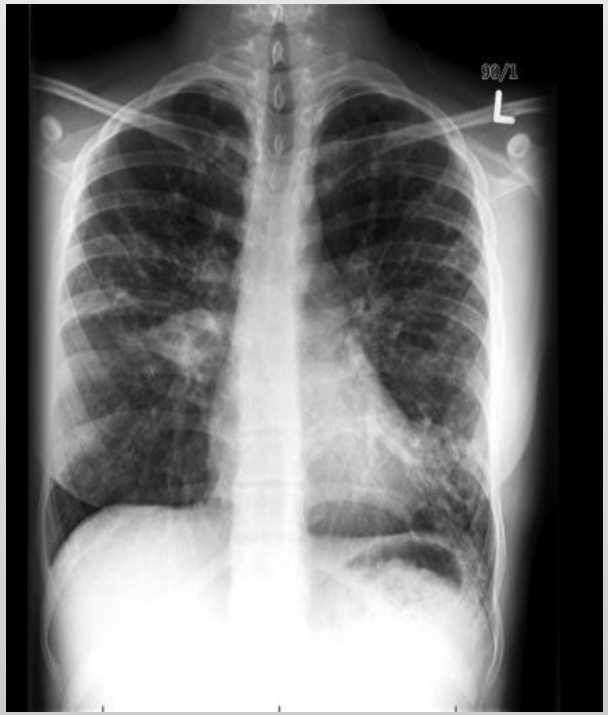
VIDEO…

http://www.youtube.com/watch?v=YqQx75OPRa0

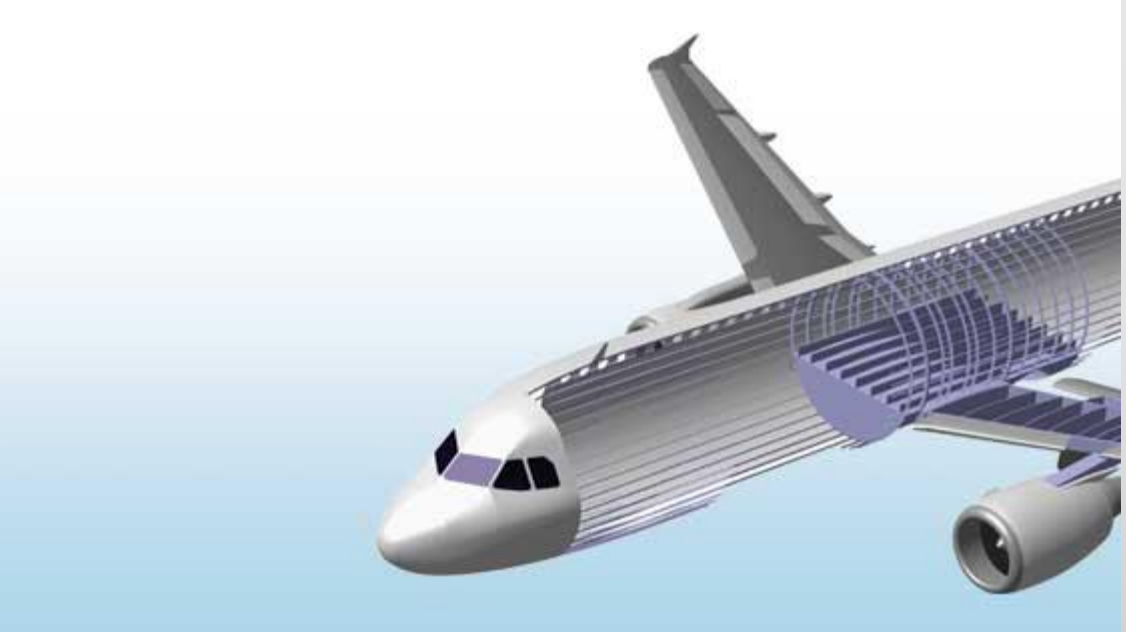
WHY COMPUTER GRAPHICS

- Medical imaging
- Engineering applications
- designers built expensive prototypes and time-consuming
- Computer graphics has also expanded the boundaries of art and entertainment.
- virtual reality

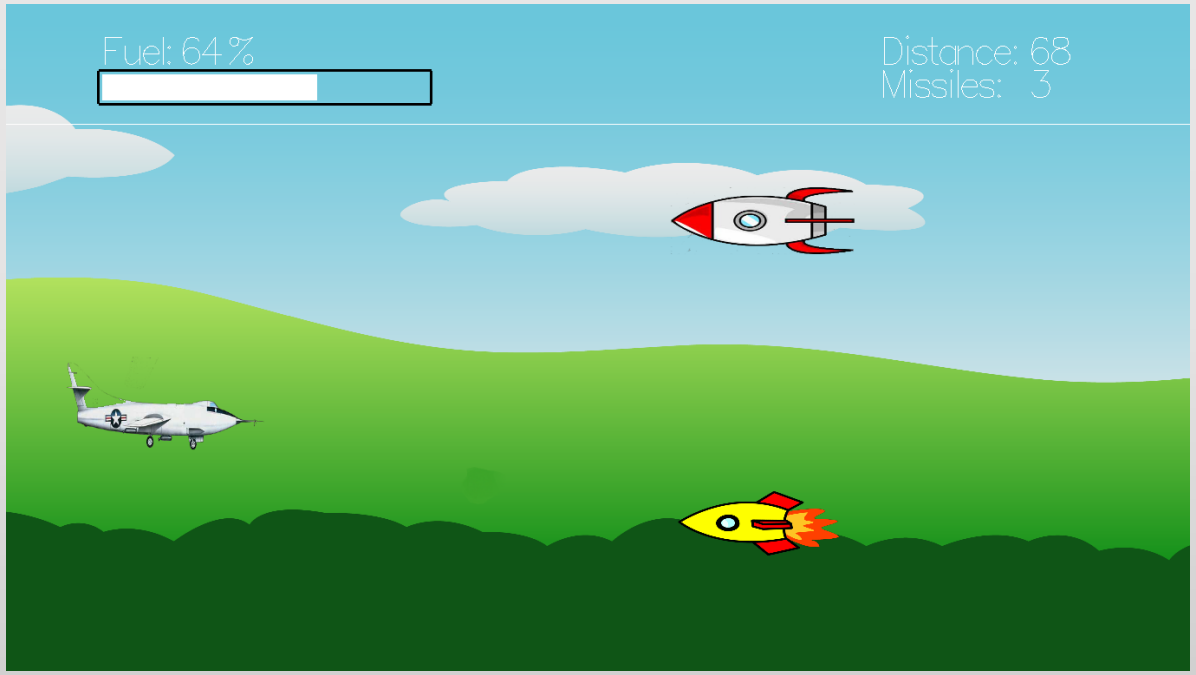
Medical Image



Engineering Application



Game Applications



Virtual Reality

WHY COMPUTER GRAPHICS

- Graphics tools are charts and graphs. A picture can be understood easily just with a single look.
- Interactive computer graphics work using the concept of two-way communication between computer users.
- The computer will receive signals from the input device, and the picture is modified accordingly. Picture will be changed quickly when we apply command.

APPLICATION OF COMPUTER GRAPHICS

- **Use in Biology**
  - Molecular biologist can display a picture of molecules.
- **Computer-Generated Maps**
  - Town planners and transportation engineers.
- **Architect**
  - Architect can explore an alternative solution to design.
- **Presentation Graphics**
  - Graphics are bar charts, line graphs, pie charts.

APPLICATION OF COMPUTER GRAPHICS

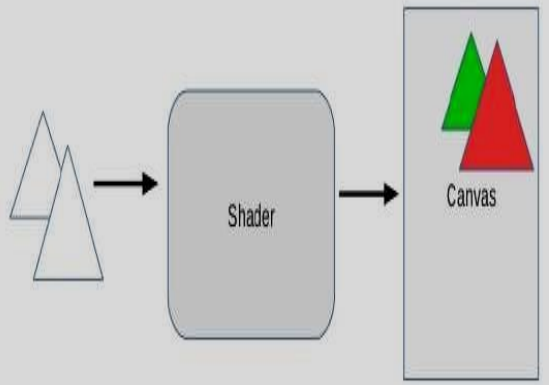
- **Visualization**
  - It is used for visualization of scientists, engineers, medical personnel.
- **Entertainment**
  - Computer Graphics are now commonly used in making motion pictures.
- **Computer Art**
  - used in the field of commercial arts.

APPLICATION OF COMPUTER GRAPHICS

- **Educational Software**
  - Computer Graphics is used in the development of educational software for making computer- aided instruction.
- **Printing Technology**
  - Computer Graphics is used for printing technology and textile design.
- **Presentation Graphics**
  - Graphics are bar charts, line graphs, pie charts.

GRAPHIC -APIS

- Graphics API (Application Programming Interface), like every interface, is just the means of communication - standardized, documented definition of functions and other stuff that is used on the application's side and implemented by the driver.
- Driver translates these calls to commands specific to particular hardware.

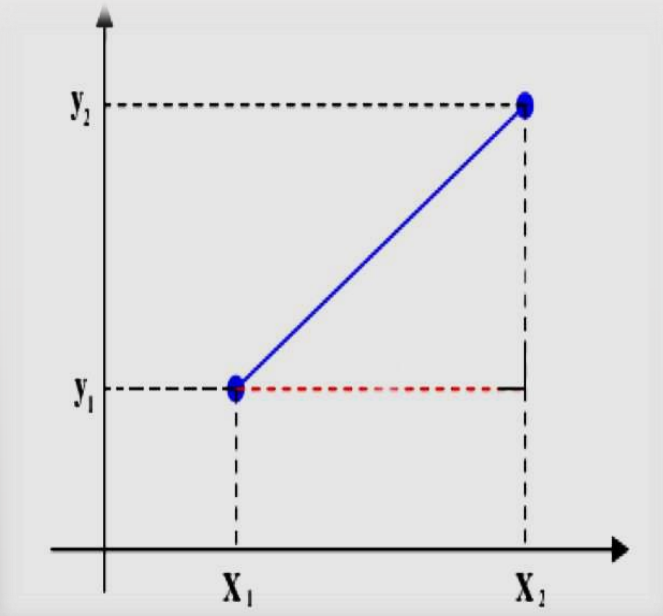


GRAPHICS PIPELINES

- The purpose of the graphics pipeline is to draw a certain shape on an image.This shape can be as simple as a single triangle, or can be complex like a human body for example.
- Computer graphics pipeline or rendering, is a conceptual model that describes what steps a graphics system needs to perform to render a3D scene to a2D screen.

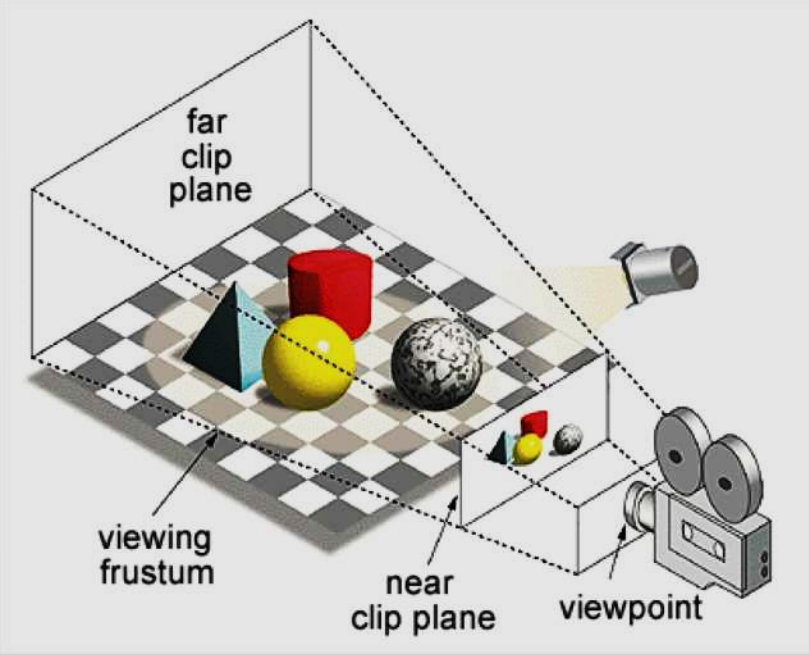
2D GRAPHICS

- People are most familiar with 2D graphics in traditional cartoons. 2D graphics are widely used in animation and video games, providing a realistic, but flat, view of movement on the screen.
- Points (x,y) Lines Two points
- Draw by drawing all points in between.
- Low-level support for this in hardware or software.



3D GRAPHICS

- The creation, display and manipulation of objects in the computer in three dimensions.
- 3D CAD and 3D graphics programs allow objects to be created on an X-Y-Z scale (width, height, depth).
- As 3D entities, they can be rotated and viewed from all angles as well as be scaled larger or smaller. They also allow lighting to be applied automatically in the rendering stage.

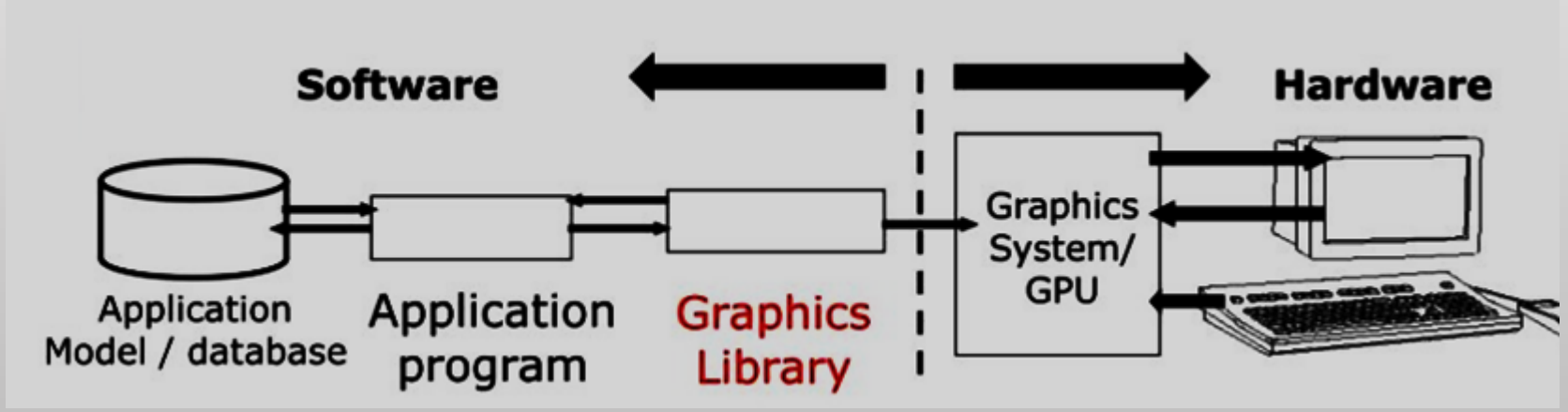


Hardware and Software – part 1

- User can control content, structure and appearance of objects and their displayed images via rapid visual feedback.
- The interactive graphic system with basic components are:
- Input devices (e.g., Mouse, Keyboard, tablet, multi touch).
- Processing (and storage)
- display as output (screen, paper based printer, video recorder)

Hardware and Software – part 2

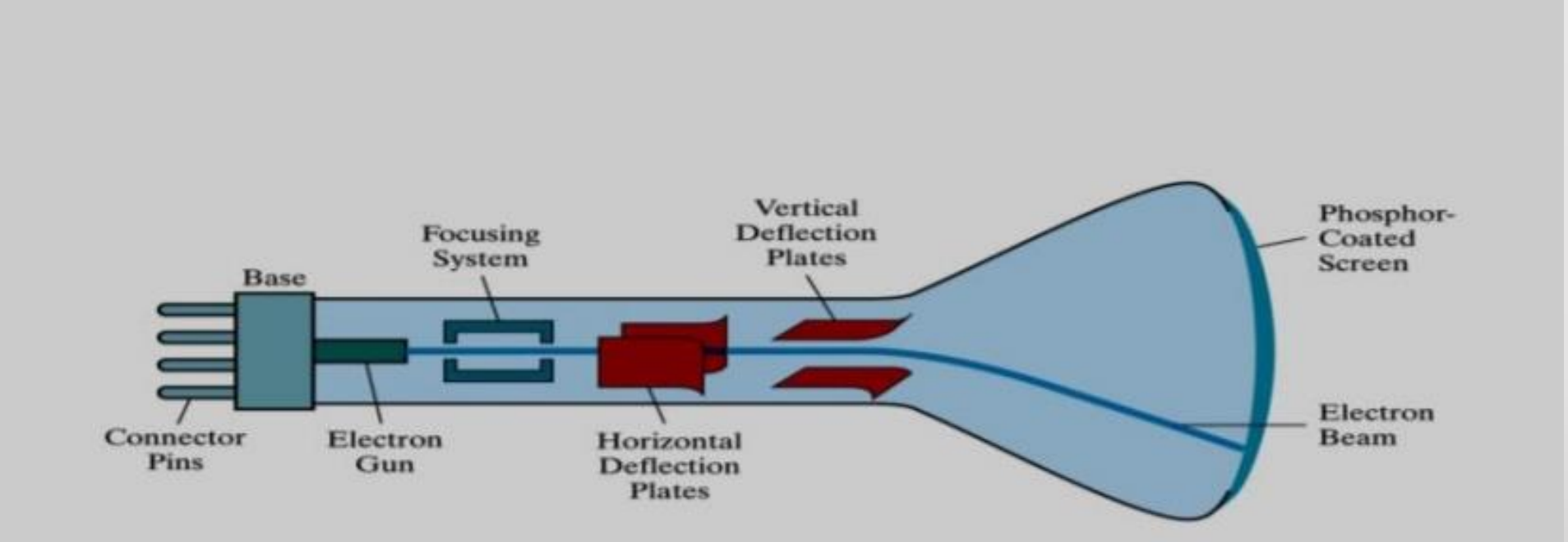
- Graphic Library between application and display hardware.
- Application Program – An application program maps all application objects to images.
- Graphic System – An interface that interacts between graphic library and hardware.
- Modifications to images are the results of user interaction.



Displays devices

- The primary display of the output is the monitor, which is based on cathode ray tube (CRT).
- LCD – Liquid Crystal Display
- Plasma
- Color CRT Monitors

CRT

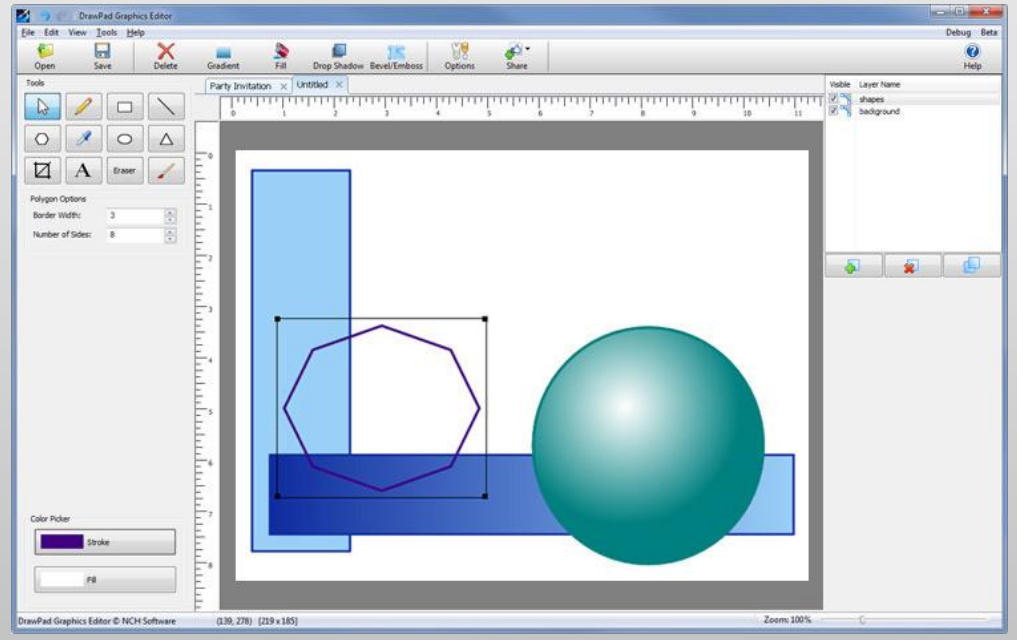

Base
Focusing System
Vertical Deflection Plates
Phosphor-Coated Screen
Connector Pins
Electron Gun
Horizontal Deflection Plates
Electron Beam

Displays devices

- CRT – Common display device for personal computer.
- LCD – A smaller, lighter, lower power, replacement for the CRT
- LED – A smaller, lighter, lower power, replacement for the CRT
- Plasma screens – a more brighter compare to LCD but more expensive
- Plotters – good for vector graphics.
- Oscilloscope – an early vector graphics output device.

Graphic software

- Graphic software is also called image editing software, which is a program or collection of program that give users ability to manipulate visual images on computer such raster image editor and vector image editor.



Draw Pad

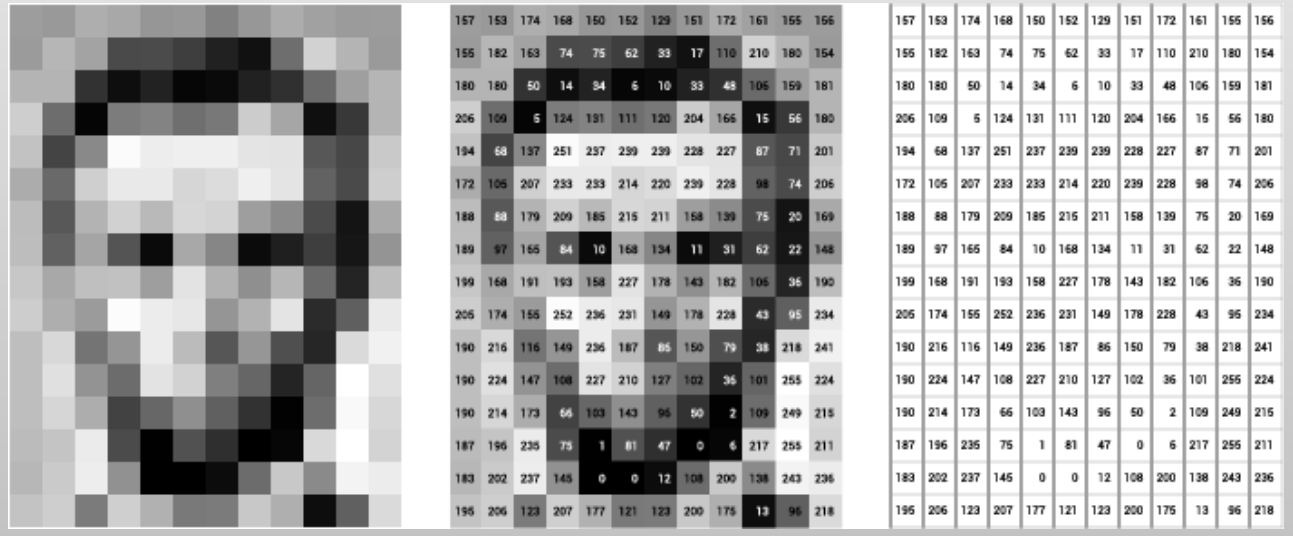
Photoshop

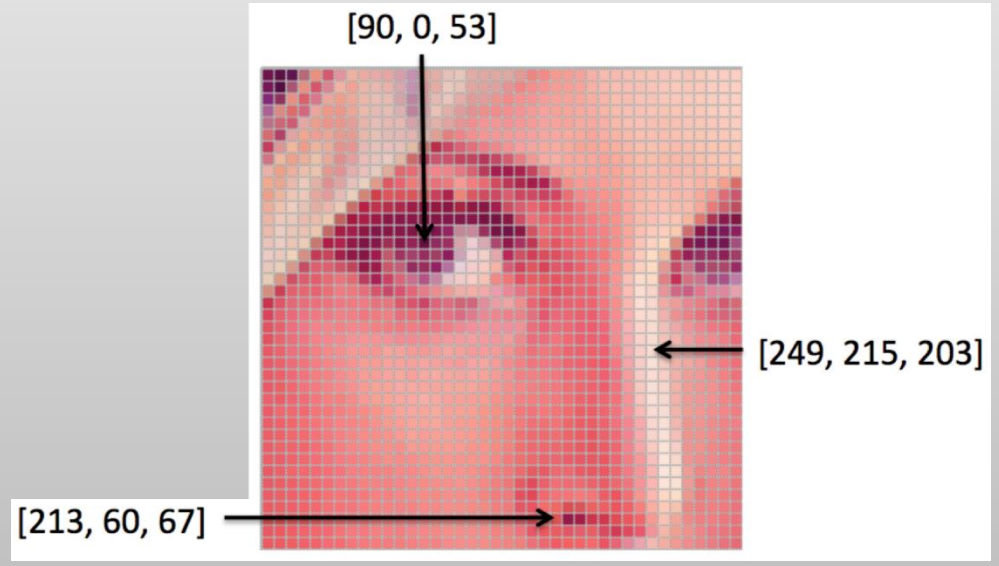
Painting and Drawing – Part 1

- An image is a visual representation of something.
- An image is a picture that has been created or copied and stored in electronic form.
- An image can be described in terms of vector graphics or raster graphics.
- An image stored in raster form is sometimes called a bitmap.

Painting and Drawing – Part 2

- An Image is represented in pixels
- Computer screen – is rectangular grid of pixels arranged in row and columns.
- Pixels are not easy to see individually – they are high resolution display
- Each pixel shows only one color





Painting and Drawing – Part 3

- RGB is the color scheme that is associated with electronic displays, such as CRT, LCD monitors, digital cameras and scanners.
- It is an additive type of color mode that combines the primary colors, red, green and blue, in various degrees to create a variety of different colors.
- When all three of the colors are combined and displayed to their full extent, the result is a pure white.
- When all three colors are combined to the lowest degree, or value, the result is black.

Painting and Drawing – Part 4

- Grayscale is a group of shades without any visible color.
- On a monitor, each pixel of a grayscale display carries an amount of light, ranging from the weakest amount of light, or
- Back, to the strongest amount of light, or white. Grayscale
- Only contains brightness information, not color.