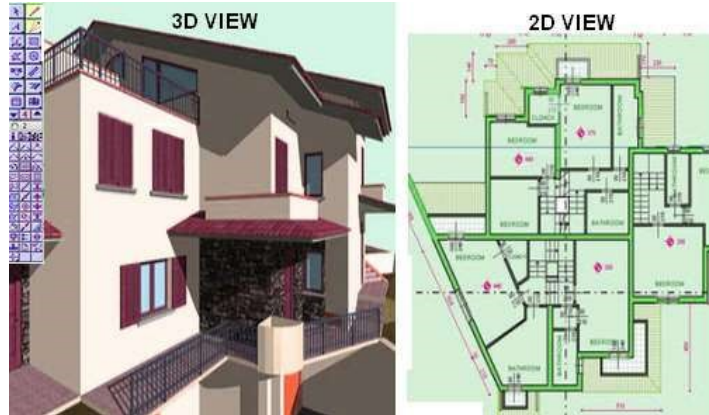


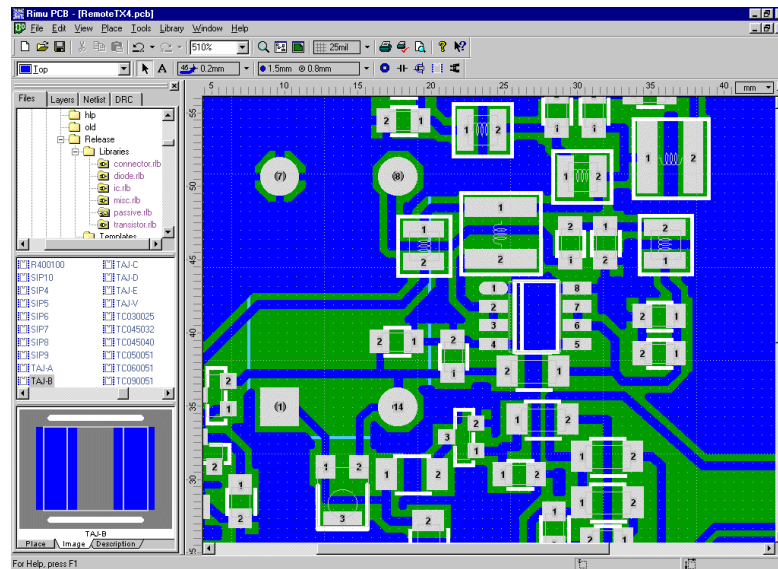
Computer Graphics: They are pictures and films created by the computer with the help of hardware and software tools.

Computer Graphics Applications:

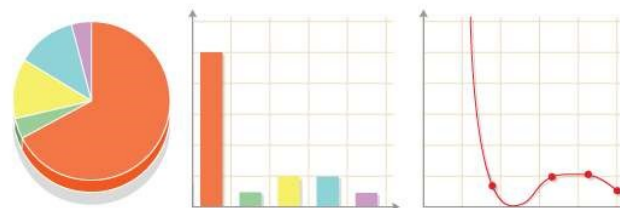
- 1- Design processing: Such in engineering architectural, CAD (Computer Aided Design) is that used to design aircraft and buildings.



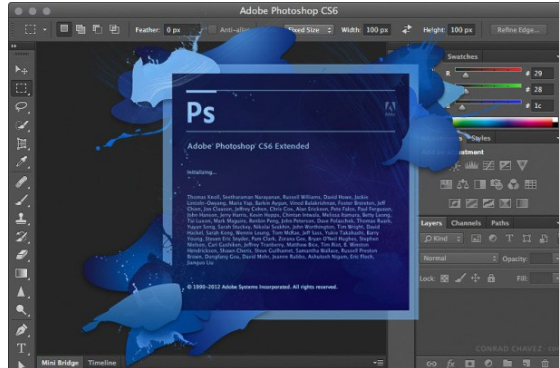
- 2- Printed Circuit Board (PCB): it is a layout designed by a software for the electronic circuits.



- 3- Presentation Graphics: It is used to summarize scientific and economic data for research reports (Pie chart, line graph, etc.).



- 4- Computer Art: It is software applications that draw and design objects, such as Paint, Photoshop, and Coral draw.



- 5- Video game, motion pictures, 3D ,modeling and rendering, cartoon.
- 6- Education and training: such as simulator for practice sessions, aircraft training, traffic control, and flight simulation.
- 7- Visualization: It is used in virtual environment, games, and medical image.
- 8- Image processing: to modify and interpret an image.

Graphics Area

- 1- Modeling: Deals with mathematical specification of shape and appearance properties in a way that can stored on the computer.
- 2- Rendering: it is like the art. It deals with how image can be displayed.
- 3- Animation: a technique of motion for the image.

Graphics API (Application Program Interface)

It is a software interface that provides a model for how an application program can access system functionality, such as drawing an image into a window. Example of API is java and OpenGL where graphics and user interface toolkits are provided inside the program.

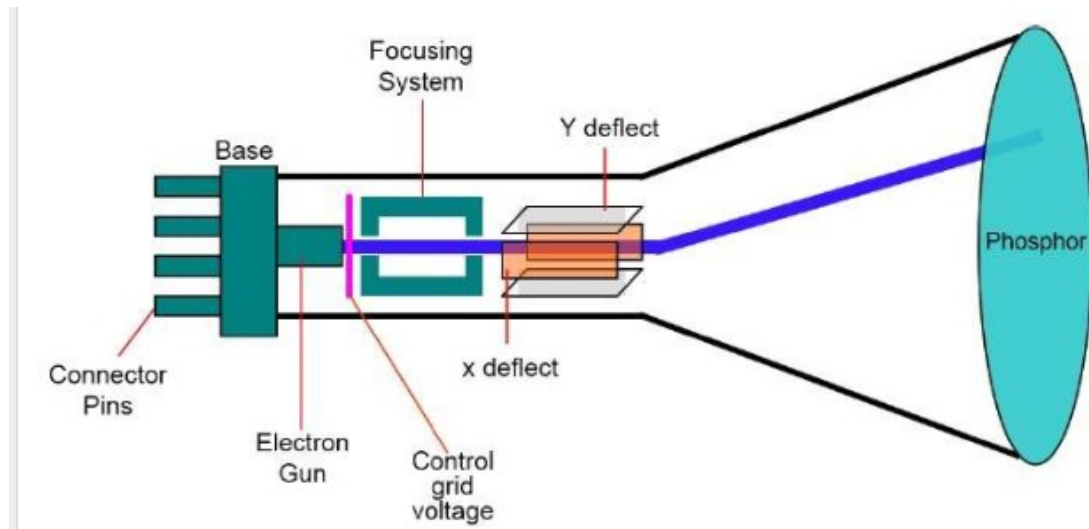
Display devices

The primary output devices in a graphic systems is video monitor.

CRT (Cathode Ray-Tube)

A beam of electron emitted by electron gun passes through focusing and deflection that direct the beam towards specified position on the phosphor-coated screen. The phosphor then emits a small spot of light at each position contacted by the electron beam,

To maintain the fully display image, one-way to keep the phosphor glowing is by re-draw the picture repeatedly. This can done by directing the electron beam back and forward over the same point (Refresh CRT).



Note that the distance the electron beam must travel to different points on the screen vary because the radius of the curve on the TV screen. Therefore, the electron beam will focus only at the center of the screen. The system the adjust the focusing system to let the beam moves to the outer edge of the screen. The refresh rate to display an image on CRT system is between 60Hz to 80Hz.

Some Vocabularies: -

1- **Pixel:** - It is thousands (or millions) of small dots in the screen.

A pixel represents the smallest piece of the screen that can be controlled individually. Each one can be set to a different color and intensity (brightness).

Pixel is measure by number of bits, the black and white system with 1 bit per pixel called bitmap.

2- **resolution** : - The number of pixels that can be displayed on the screen is referred to as the *resolution* of the image; this is normally displayed as a pair of numbers, such as 640x480

Pixels are smaller at high resolution and detail can be hard to make out on smaller screens. Resolutions generally fall into predefined standard sets; only a few different resolutions are used by most PCs.

- 3- The *aspect ratio* of the image is the ratio of the number of X pixels to the number of Y pixels. The standard aspect ratio for PCs is 4:3, but some resolutions use a ratio of 5:4

The table below lists the most common resolutions used on PCs and the number of pixels each uses:

| Resolution | Number of Pixels | Aspect Ratio |
|------------|------------------|--------------|
| 320x200 | 64,000 | 8:5 |
| 640x480 | 307,200 | 4:3 |
| 800x600 | 480,000 | 4:3 |
| 1024x768 | 786,432 | 4:3 |
| 1280x1024 | 1,310,720 | 5:4 |
| 1600x1200 | 1,920,000 | 4:3 |

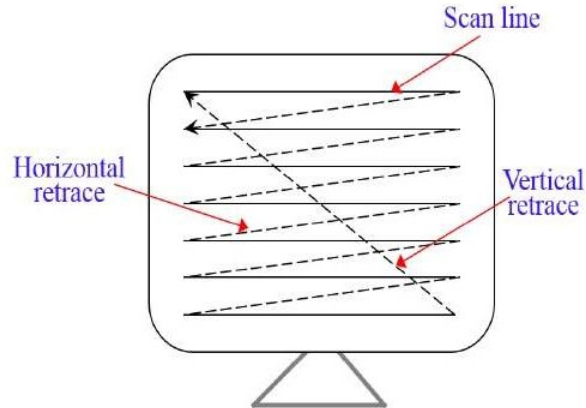
- 4- **Frame buffer** is A. The memory area in which the image, being displayed, is stored

There are two ways (Random scan and Raster scan) by which we can display an object on the screen.

Raster Scan

In a raster scan system, the electron beam is swept across the screen, one row at a time from top to bottom. As the electron beam moves across each row, the beam intensity is turned on and off to create a pattern of illuminated spots (pattern of image).

The image will be stored in frame buffer that holds the intensity values and retrieved the information from refresh buffer to paint on the screen one row at a time.

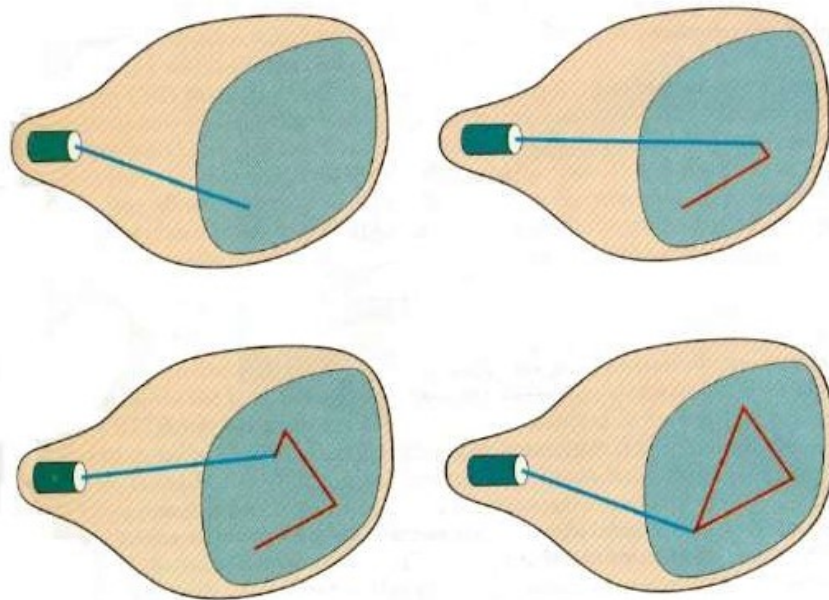


Raster scan system display an object one point across the screen.

Random Scan (Vector Scan)

It is designed for line-drawing application, the buffer store the number of line drawing instruction instead of the intensity values of the screen points.

In this technique, the electron beam is directed only to the part of the screen where the picture is to be drawn rather than scanning from left to right and top to bottom as in raster scan. It is also called **vector display**, **stroke-writing display**, or **calligraphic display**.



Random scan system draws an object in any order and one line at a time.

Lecture 1 finished.