Computer Graphics

Third Classes

2016 - 2017

Computer Graphics

1.1 The term computer graphics involves using a computer to create and hold pictorial information and also to adept and manipulate the display in different ways.

A computer is capable of sending its output to wide variety of devices, many of which are designed for special purposes. We will concern ourselves with devices that capable of producing graphical output on the computer's display.

1.2 The origins of computer graphics

In 1950 the first computer driven display, attached to MIT's computer, was used to generate simple pictures. This display used a Cathode-Ray tube (CRT). Interactive computer graphics made progress and the term computer graphics was first used in 1960.

1.3 Interactive Computer Graphics

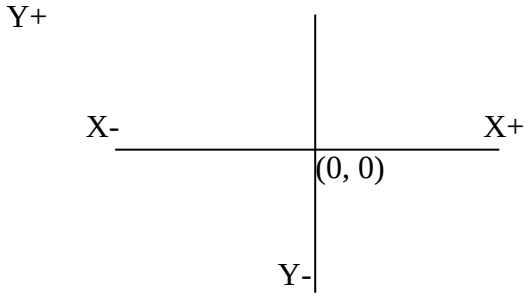
It involves two way communication between computer and user. The computer up on receiving signals from the input device, can modify the displayed picture appropriately.

The main reason for the effectiveness of interactive computer graphics in many applications is the speed with which the user of the computer can assimilate the display information.

1.4 Cartesian coordinate system

A coordinate system provide a framework for translating geometric ideas into numerical expressions.

In a two -dimensional plane, we pick any point and single it out as a reference point called the origin. Through the origin we construct two perpendicular number lines called axes. These are labeled the X axis and the Y axis. Any point in two dimensions in this X-Y plane can be specified by a pair of numbers, the first number is for the X axis, and the second number is for the Y axis.



1.5 How the Interactive Graphics display works

The modern graphics display is extremely simple in construction. It consists of three components:

1- A digital memory, or frame buffer, in which the displayed image is stored as a matrix of intensity values.
2- A monitor
3- A display controller, which is a simple interface that passes the contents of the frame buffer to the monitor.

Inside the frame buffer the image is stored as a pattern of binary digital numbers, which represent a rectangular array of picture elements, or pixel.

The pixel is the smallest addressable screen element. In the simplest case where we wish to store only black and white images, we can represent black pixels by 0's in the frame buffer and white pixels by 1's. The display controller simply reads each successive byte of data from the frame buffer and convert each 0 and 1 to the corresponding video signal. This signal is then fed to the monitor. If we wish to change the displayed picture all we need to do is to change of modify the frame buffer contents to represent the new pattern of pixels.

1.6 Graphical user interface

The aspects of the user interface of a program are the parts of the program that link the user to the computer and enable him to control it.

A good user interface makes the program not only easy to use and learn but also easier to operate and more efficient and vis versa.

1.7 Graphics Devices

Typical examples are plotters, laser printer plotters, films, storage tube and raster scan cathode ray tube (CRT) display. Because the large majority of computer graphics systems utilize some type of CRT display and because most of the fundamental display concepts are embedded in CRT display technology, we will limit our concern to CRT display.

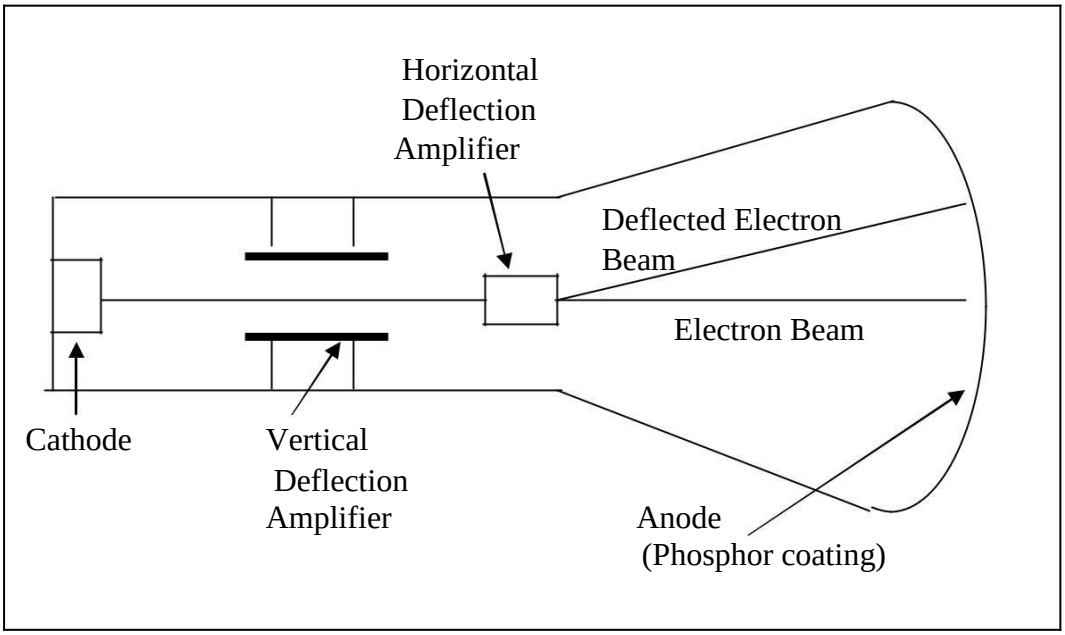
The three most common types of CRT display technologies are:

1- Direct view storage tube display
2- Calligraphic refresh display
3- Raster scan refresh display

Before discuses the CRT display, we must understand the CRT basics.

<u>Cathode Ray Tube basics</u> :

The CRT used in video monitor is shown in the figure below



A cathode (negatively charged) is heated until electron "boil" off in a diverging cloud (electron repel each other because they have the same charge). These electrons are attracted to a highly charged positive anode.

This is the phosphor coating on the inside of the face of the large end of the CRT. If allowed to continue uninterrupted, the electrons would simply flood the entire face of the CRT with a bright glow.

However, the cloud of electrons is focuses into a narrow, precisely collimated beam with an electron lens. At this point the focused electron beam produces a single bright spot at the center of the CRT. The electron beam is deflected or positioned to the left or right of the center and/or above or below the center by means of horizontal and vertical deflection amplifiers.