It is common now for software packagesto provide a graphical interface.A major components of a graphical interface is a window manager that allows a user to display multiple windows areas.

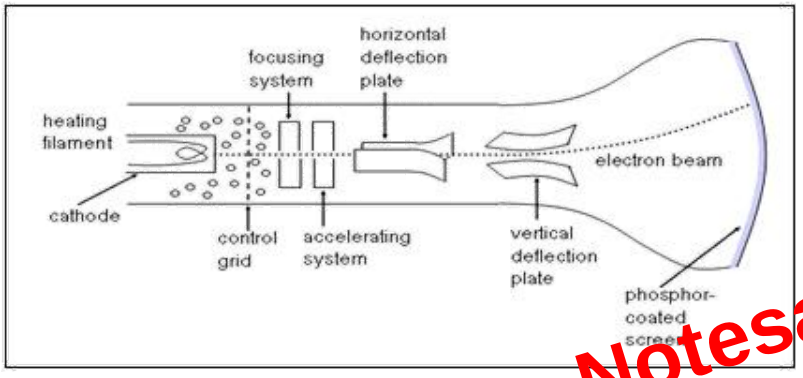
2)Graphics Systems

1.Cathode Ray Tube

The primary output device in a graphical system is the video monitor. The main element of a video monitor is the **Cathode Ray Tube (CRT),** shown in the following illustration.

Basic Operation of a CRT

The basic operation of CRT is shown in figure below:



Electron Gun

The primary components of an electron gun in a CRT are the heated metal cathode and a control grid. The cathod is heated by an electric current passed through a coil of wire called the filament. This causes electrons to be boiled off the hot cathode surface. In the vacuum inside the CRT envelope, negatively charged electrons are then accelerated toward the phosphor coating by a high positive voltage. The accelerating voltage can be generated with a positively charged metal coating on the in side of the CRT envelope near the phosphor screen, or an accelerating anode can be used. Sometimes the electron gun is built to contain the accelerating anode and focusing system within the same unit.

Focusing System

Keyboard

The keyboard is the most common input device for entering numeric and alphabetic data in to a computer system by pressing a set of keys which are mounted on the keyboard, which is connected to computer system.

The keys on computer keyboards are often classified as follows:

- Alphanumeric Keys - letters and numbers.
- Punctuation Keys - comma, period, semicolon, and so on.
- Special Keys - function keys, control keys, arrow keys, Caps Lock key, and so on.
- Application:Used to enter Text string,Short cuts to many function.
- In graphics:Used to provide screen coordinates,Menu selection,, Gaming Control.

Mouse

- A mouse is a small device that a computer user pushes across a desk surface in order to point to a place on a display screen and to select one or more actions to take from that position.
- A mouse consists of a metal or plastic housing or casing, a ball that sticks out of the bottom of the casing and is rolled on a flat surface, one or more buttons on the top of the casing, and a cable that connects the mouse to the computer.
- Hand held box used to position the screen cursor.
- Wheels or roller on the buttom are used to record the position of the screen. Generally there are 2 or 3 buttons used for operations like recording of the cursor positions or invoking of a function.
- In order to increase the number of INPUT parameters,additional devices can be included. The z-mouse is an example of this.

Digitizer

- A graphics tablet (or digitizing tablet, graphics pad, drawing tablet) is a computer input device that allows one to hand-draw images and graphics, similar to the way one draws images with a pencil and paper. These tablets may also be used to capture data or handwritten signatures.
- A graphics tablet (also called pen pad or digitizer) consists of a flat surface upon which the user may "draw" an image using an attached stylus, a pen-like drawing

- Two commanly type plotters are:

  Drum Plotters
  Flatbed Plotters

GRAPHICS SOFTWARE

It is a any kind of software which can be used to creat,edit & manage 2D computer graphics.These computer graphics may be clip art,web graphics,logos,headings,backgrounds,digital photos or other kind of digital images.

3D modeling and CAD software is also graphics software .

Types:(1)Programming package(2)Application package

DDA Algorithm

Digital Differential Analyzer (DDA) algorithm is the simple line generation algorithm which is explained step by step here.

Step 1 − Get the input of two end points (X0,Y0)(X0,Y0) and (X1,Y1)(X1,Y1).
Step 2 − Calculate the difference between two end points.

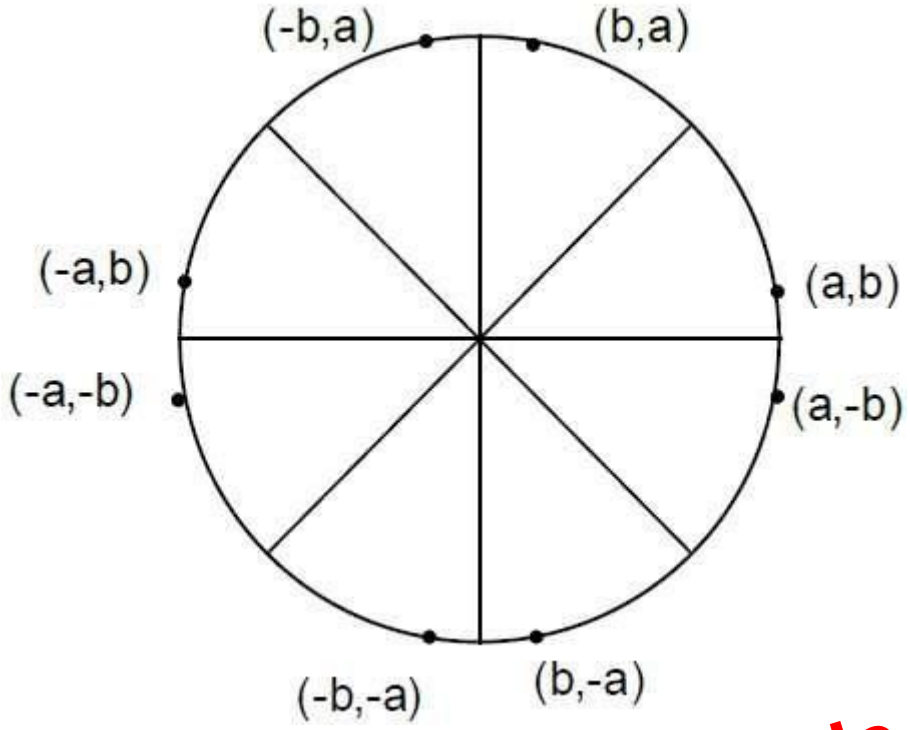
$dx = X_1 - X_0$
$dy = Y_1 - Y_0$

Step 3 − Based on the calculated difference in step-2, you need to identify the number of steps to put pixel. If dx > dy, then you need more steps in x coordinate; otherwise in y coordinate.

```
if (absolute(dx) > absolute(dy))
  Steps = absolute(dx);
else
  Steps = absolute(dy);
```

required to draw the circle. Let us discuss the algorithms in detail −

The equation of circle is X2+Y2=r2,X2+Y2=r2, where r is radius.



Bresenham's Algorithm

We cannot display a continuous arc on the raster display. Instead, we have to choose the nearest pixel position to complete the arc.

From the following illustration, you can see that we have put the pixel at (X, Y) location and now need to decide where to put the next pixel − at N (X+1, Y) or at S (X+1, Y-1).