Program: B.C.A.

Course Code: BCAS3003

Course Name: Computer Graphics

Course Prerequisites

- ❑ **Knowledge of Mathematics**
- ❑ **Fundamental knowledge of Computer**

Unit 1 - Overview of Graphics Systems

- ❑ **Graphics Introduction**
- ❑ **Video Display Devices**
- ❑ **Raster-Scan System**
- ❑ **Random-Scan Systems**
- ❑ **Graphics Monitors and Work Stations**
- ❑ **Input Devices: Hard Copy Devices, Graphics Software**

Random Scan System

❑ Random scan systems are also called vector, stroke-writing, or calligraphic displays.

❑ Random scan system uses an electron beam which operates like a pencil to create a line image on the CRT. The image is constructed out of a sequence of straight line segments.

❑ Each line segment is drawn on the screen by directing the beam to move from one point on screen to the next, where each point is defined by its x and y coordinates.

❑ After drawing the picture, the system cycles back to the first line and design all the lines of the picture 30 to 60 time each second.

❑ When operated as a random scan display unit, a CRT has the electron beam directed only to the parts of the screen where a picture is to be drawn.

Random Scan System

❑ Refresh rate on a random scan system depends on the number of lines to be displayed.

❑ Picture definition is now stored as a set of line drawing commands in an area of memory referred to as the **refresh display file**.

❑ Random scan systems are designed for line drawing applications and can not display realistic shaded scenes.

❑ Since picture definition is stored as a set of line drawing instructions and not as a set of intensity values for all screen points, vector displays generally have higher resolution than raster systems.

Random Scan System

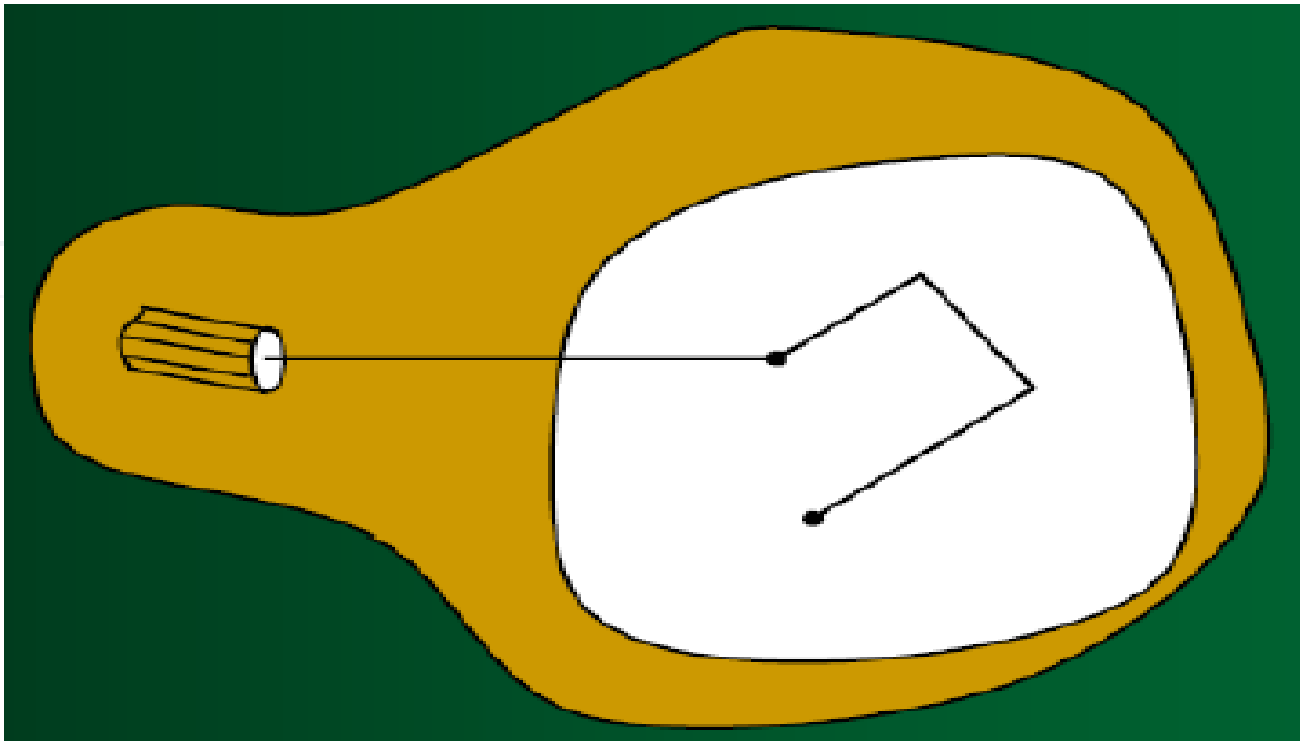The component lines of a picture can be drawn and refreshed.

Figure 6: Random Scan System

Random Scan System

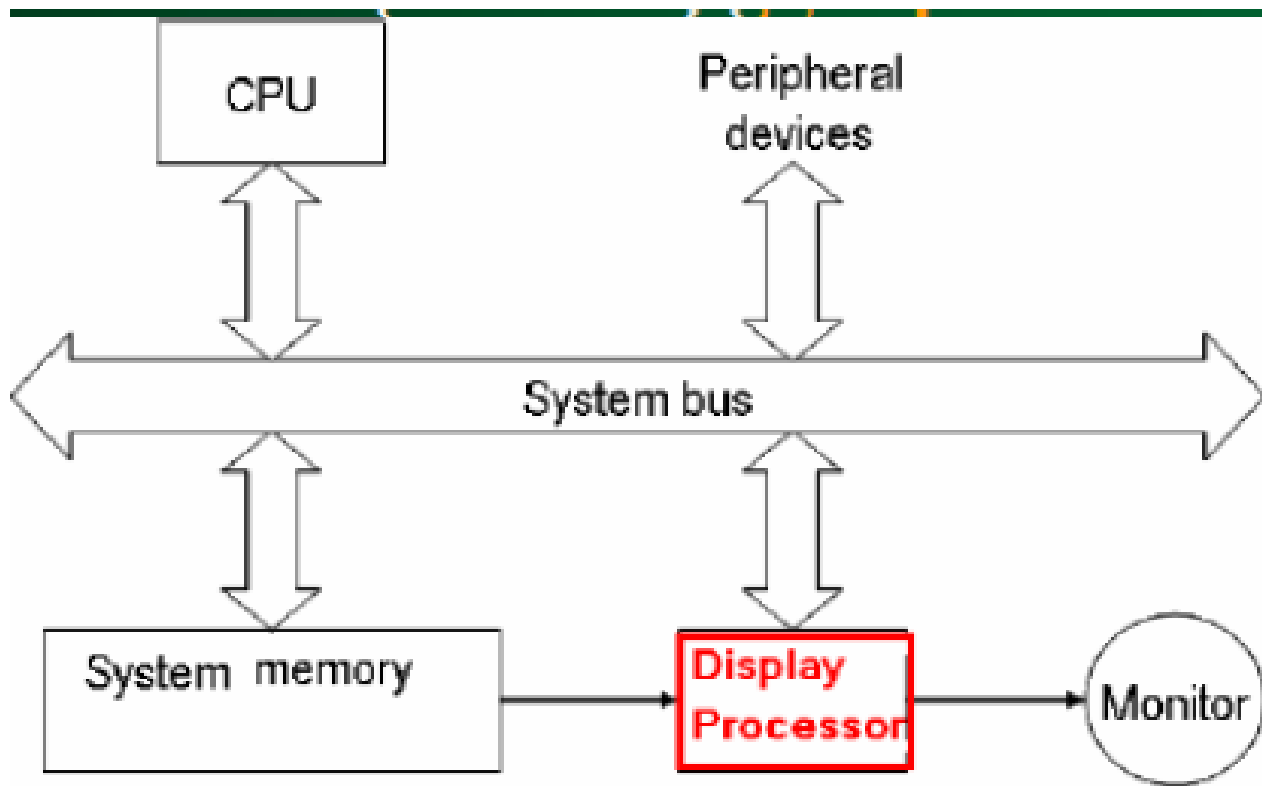The architecture od Random Scan System is shown in Figure 6.

Figure 6: Random Scan System's Architecture

Random Scan System

Random Scan Displays are designed to draw all the component lines of a picture 30 to 60 times each second.
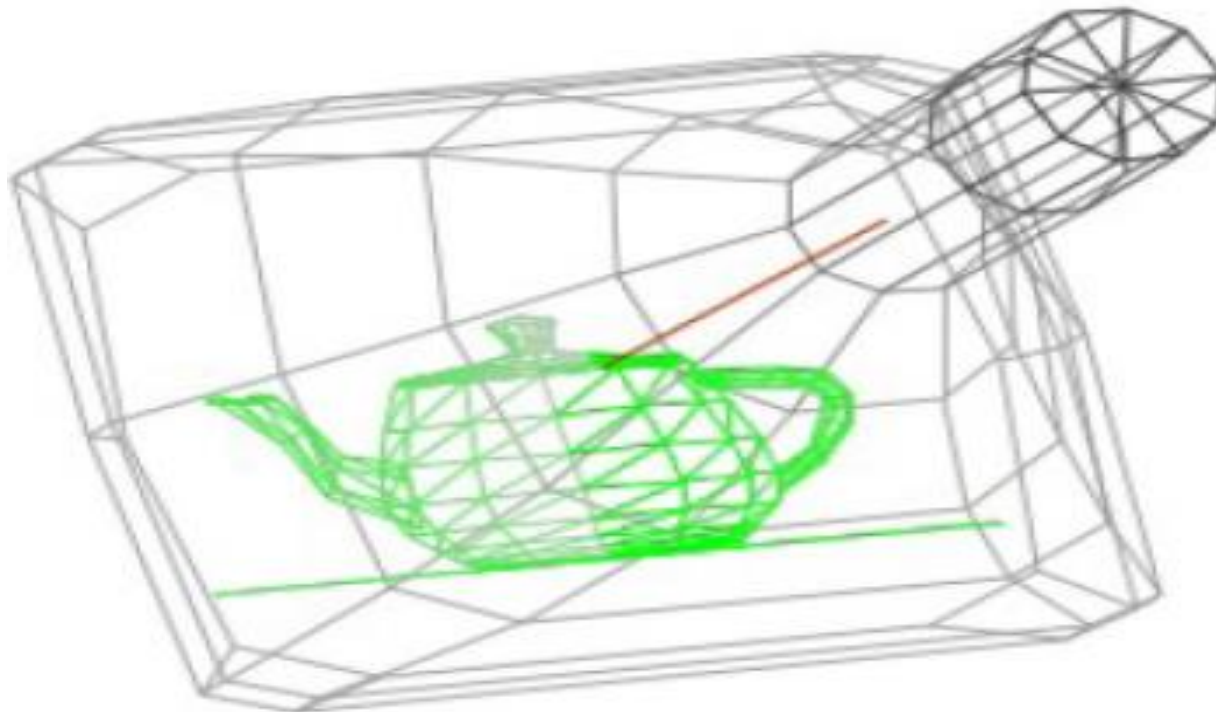

**Figure 6: Random Scan System's Display**

Raster vs Random Scan System

Difference	Raster Scan System	Random Scan System
Resolution	It has poor **or less Resolution** because picture definition is stored as a intensity value.	It has **High Resolution** because it stores picture definition as a set of line commands.
Electron Beam	It is directed from top to bottom and one row at a time on screen, but electron beam is directed to whole screen.	It is directed to only that part of screen where picture is required to be drawn, one line at a time so also called Vector Display.
Cost	It is **less expensive**	It is **Costlier** than Raster Scan System.
Refresh Rate	Refresh rate is 60 to 80 frame per second.	Refresh Rate depends on the number of lines to be displayed i.e 30 to 60/sec

Raster vs Random Scan System

Difference	Raster Scan System	Random Scan System
Picture Definition	It stores picture definition in **Refresh Buffer** also called **Frame Buffer**.	It stores picture definition as a set of line commands called **Refresh Display File**.
Line Drawing	**Zig–Zag line** is produced because plotted value are discrete.	**Smooth line** is produced because directly the line path is followed by electron beam
Realism in Display	It contains shadow, advance shading and hidden surface technique so gives the **realistic display** of scenes.	It does not contain shadow and hidden surface technique so it **can not** give **realistic display** of scenes.
Image Drawing	It uses **Pixels** along scan lines for drawing an image.	It is designed for **line drawing applications** and uses various mathematical function to draw.

Raster vs Random Scan System
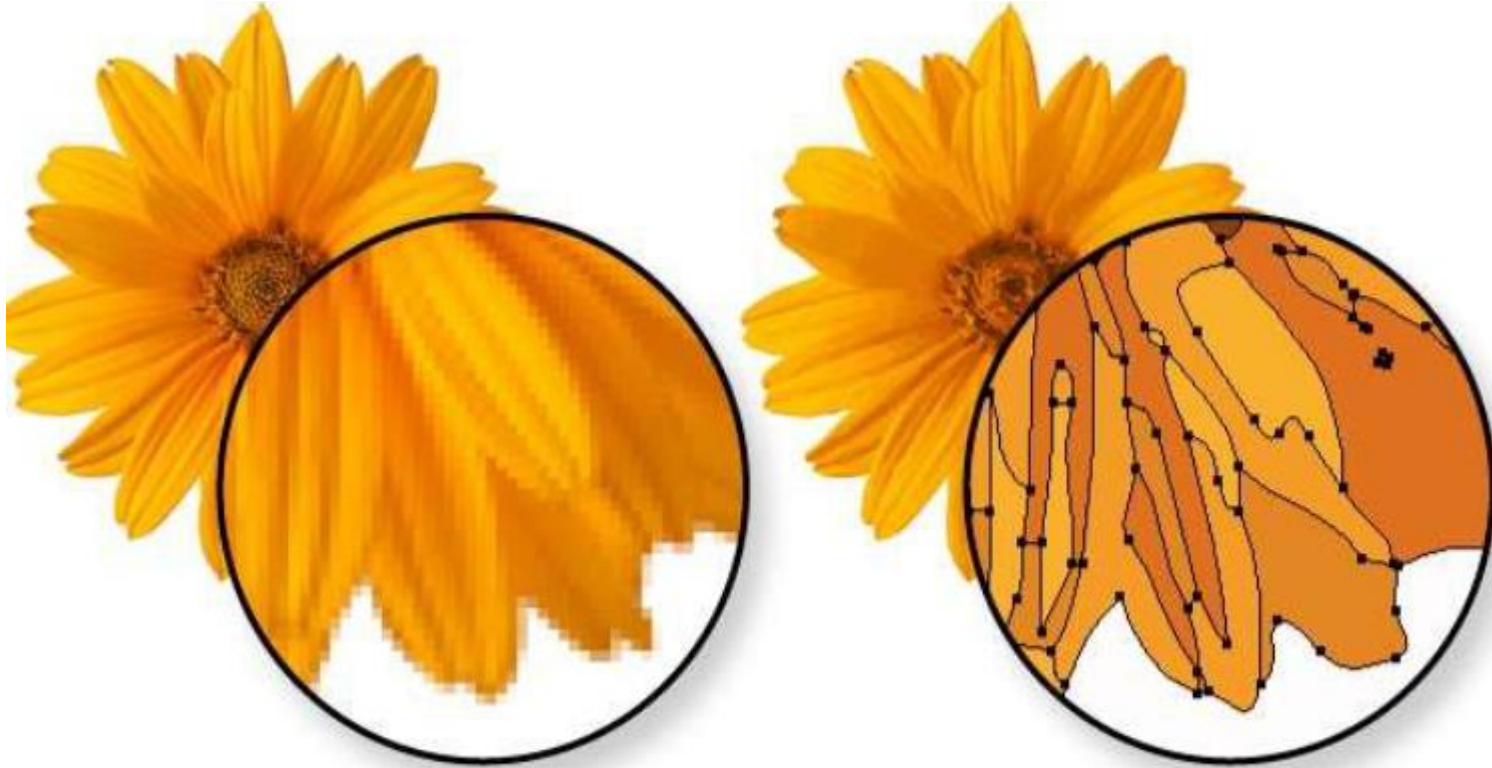
Figure 6: Raster vs Random Scan image

Recommended Books

Text books

- ❑ D. Hearn, P. Baker, "Computer Graphics - C Version", 2nd Edition, Pearson Education, 1997

Reference Book

- ❑ Heam Donald, Pauline Baker M: "Computer Graphics", PHI 2nd Edn. 1995.
- ❑ Harrington S: "Computer Graphics - A Programming Approach", 2nd Edn. Mc GrawHill.
- ❑ Shalini Govil-Pai, Principles of Computer Graphics, Springer, 2004

Additional online materials

- ❑ Coursera - https://www.coursera.org/learn/fundamentals-of-graphic-design
- ❑ https://www.youtube.com/watch?v=fwzYuhduME4&list=PLE4D97E3B8 DB8A590
- ❑ NPTEL - https://nptel.ac.in/courses/106/106/106106090/
- ❑ https://www.coursera.org/learn/research-methods
- ❑ https://www.coursera.org/browse/physical-science-and-engineering/research-methods

Thank You