⊙ Assignment-1

Q.1 Explain Computer Graphics. Explain Applications of Computer Graphics.

Computer graphics involves technology to access. The process transforms and presents information in a visual form. The roll of computer graphics intensible. In to day life computer graphics has now become a common element in user interface, commercial motion pictures.

Computer graphics is the creation of picture with the help of a computer. The end product of the computer graphics is picture it may be business graph, drawing an engineering.

In computer graphics two or three dimensional pictures can be created that are used for research. Many hardware devices algorithm has been developing for improving the speed of picture generation with the passes of time. It includes the creation storage of models and image of objects. These models for various fields like engg. mathematical and soon.

Defination -

It is the use of computers to create and manipulate pictures on display device. It comprises of software techniques to create, store, modify represents pictures.

Computer Graphics Applications

1) Computer Art :-

Using computer graphics we can create fine and commercial art which include animation packages Point packages. These packages provide facilities for designing object shapes and specifying object motion, cartoon drawing, paintings, Logo design can also be done.

2) Computer Aided Drawing :

Designing of building automobiles, aircraft is done with the help of computer aided drawing. this helps in providing minute details to the drawing and producing more accurate and sharp drawings with better specification.

3) Presentation Graphics :

For the preparation of reports or summarisin the financial, statistical, mathematical, scient economic data for research reports, managerial reports, creation of bar graphs, pie charts, time chart can be done using the tools prese in computer graphics.

4) Entertainment

Computer Graphics finds a major part of i utility in the movie industry and game ind used for creating motion pictures, music vid television shows, cartoon animation films in the game industry where focus and interac

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4) Entertainment

Computer Graphics finds a major part of its utility in the movie industry and game industry used for creating motion pictures, music video television shows, cartoon animation films in the game industry where focus and interactivity

are the key players. Computer Graphics helps in providing such features in the efficient way.

5) Education:
Computer generated models are extremely useful for teaching huge number of concepts and fundamentals in an easy to understand and learn manner. Using computer graphics many educational model can be created through which more interested can be generated among students regarding the subject.

6) Training:
Specialised system for training like simulators can be used for training the computers in a way that can be grasped in a short spam of time with better understanding creation of training modules using computer graphics in simple and very useful.

7) Visualisation:
Today the need of visualise things have increased drastically, the need of visualisation can be seen in many advance technologies data visualisation helps in finding insights of the data

8) Image Processing:
Various kinds of photographs or images required editing in order to be used in different places proce-

cessing existing images into refined ones for better interpretation is one of the many application

9) Machine Drawing :-
Main reason behind using CG for machine drawing purpose is the precision and clearity we get from such a drawing is ultimate and extremely desired for the safe manufacturing of machine using these drawings.

10) Graphical User Interface :
The use of picture, images icons, pop-up menus, graphical objects helps in creating a user friendly environment where working is easy and pleasant. Using CG we can create such an atomo sphere where everything can be automated and anyone can get the desired action performed in an easy fashion.

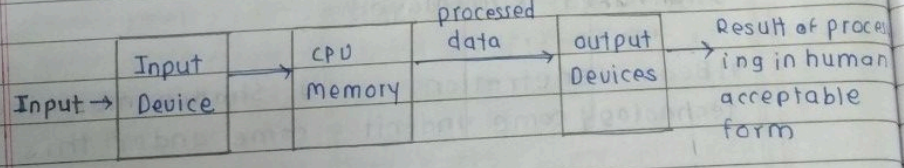
2) Differntiate between Random and Raster scan display system.

Random Scan	Raster scan
1. It has high resolution	1. Its resolution is low.
2. It is more expensive	2. It is less expensive
3. ~~Any~~ Modification is ~~Not~~ easy	3. Modification is tough.

4. Solid Pattern is tough to fill	4. Solid pattern is easy to fill
5) Refresh rate is depends on resolution or picture	5. Refresh rate doesnot depend on picture
6) Only screen with view on an area is displayed	6. Whole screen is scanned
7) Beam penetration technology come underit.	7. Shadow mark technology come under this
8) It does not use interlacing method	8. It uses interlacing
9) It is restricted to line drawing applica-tion	9. It is suitable for realistic display.
10) It stores picture definition as a set of line command in a refresh buffer.	10) It stores picture definition as a set of intensityvalues of the pixel in the frame buffer
11) Refresh rate is 30-60 times per second.	11) Refresh rate 60-80 frames per second.
12) The concept of interweaving is not used	12) The concept of inter-weaving is used
13) A mathematical fun^n is used to render an image or picture	13) To render image or picture pixels are used
14) Example: Pen Plotter	14) Example: TV set

9) Explain Input Devices

The input Devices are the hardware is used to transfer input to the computer. The data can be in form of text, image, sound and text. Output device display data from the memory of the computer Output can be text numeric data, line, polygon



Input Devices are -

1) keyboard
2) mouse
3) trackball
4) Joystick
5) light pen
6) Touch screen
7) Digitizer
8) Touch panels
9) Image scanner
10) Voice Recognition
11) vision input system

1) Keyboard -

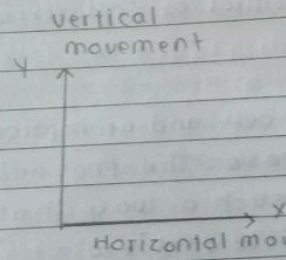
The most commonly used input device is a keyboard the data is entered by pressing set of keys. All keys are labelled a keyboard 101 keys is called Qwerty keyboard.

The keyboard has alphabetic as well as numeric keys. Some special keys are also available.

2) Mouse :-

A mouse is a pointing device and used to position the pointer on the screen. It is a small palm size box. There are two or three depression switches

on the top. The movement of the mouse along the x axis helps in the horizontal movement of the cursor and the movement along with y axis helps in vertical movement of the cursor on the screen. The mouse cannot be used to enter text. Therefore they are used in conjunction with a keyboard.



3) Track Ball -

A track ball is a pointing device similar to mechanical mouse its roller ball is on the top along with the buttons to move the graphic cursor on the screen we have to roll the ball with hand. As we do not need to move the whole device for moving the graphics cursor, a track ball required less space then mouse for operation and is often attacked to or built into the keyboard.

Trackball comes in various shapes and form with some functionality. Three commonly used shapes are ball, button, square.

To move the graphics cursor at a desired position on the terminal screen we have to roll the ball with fingers or push the button with fingers or simply move a finger on the square platform.

Joystick -

A joystick is a pointing device that marks on the same principle As a trackball. To make the movement of the spherical ball easier it is placed in a socket with a stick mounted on it. We use of- joystick include video games, flight simulator, training simulators and remote control of industrial robots

Light Pen -

It use a photoelectric cell and an optical lens mounted in a pen-shaped case. The photoelectric cell and lens assembly is in such a way that it focuses on to it any light in its field of view.

Computer aided design (CAD) applications use Light pen.

Touch screen -

Touch screen is the most simple intative and easiest to use of all input devices.

Computer with touch screen facility use optical sensers which can detect the touch of a finger on the screen.

Data Scanning Devices :-

DSD are input device that allow data entry from source document directly.

Commonly used types of data scanning devices are :

1) Image Scanner
2) Optical character Recognition Device (OCR)
3) Optical Mark Reader (OMR)

4) Bar-code Reader
5) Magnetic Ink Character Recognition (MICR)

Digitizer:
A digitizer is a input device used for converting picture, maps and drawings into digital form for input to computers.

Speech Recognization Device:
SRD are input devices that allow a person to input data to a computer system by spealling.

Vision Input System:
VIs allows a computer to accept input by seeing on object.
eg. Camera.

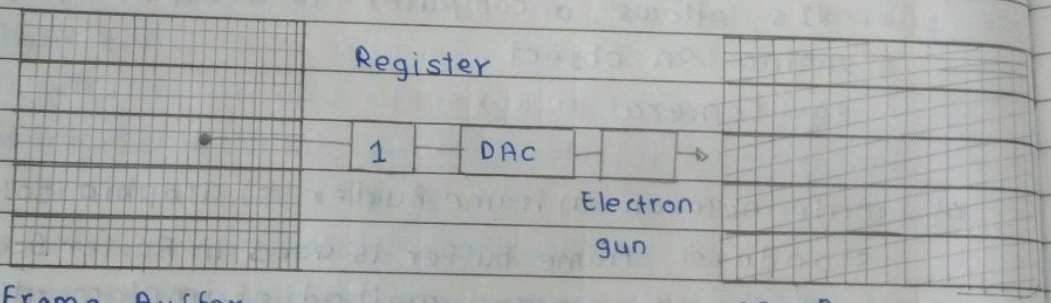
4) Write note on a) Frame Buffer b) Graphic software and standard. Frame buffer is used in Raster Scan Display
The most common method of implementing a raster CRT graphics device uses a frame Buffer.
A frame buffer is large, contiguous peice of compute memory. At a minimum there is one memory bit for each pixel (picture element) in the raster. this amount of memory is called as bit plane. The picture is buttur in the frame buffer one bit at a time.
A 1024 X 1024 element square raster requires 2^{20} ($2^{10} = 1024$, $2^{20} = 1024 \times 1024$) or 1.048.576 memory bits at a single bit plane.

Monochromatic

The picture is built up in frame buffer one bit at a time. Because a memory bit has only two states (binary 0 or 1) a single bit plane yields a block and white (monochrome) display Because the frame buffer is the digital device while the CRT is an analog device. Conversion from a digital representation to an analog signal must taken place when information is read from frame buffer and displayed of raster CRT graphics device.

This is accomplished by digital to analog converter (DAc).

Each pixel in the frame buffer must be accessed and converted before it is visible on CRT.



A single-bit-plane black and white frame buffer raster CRT graphics device

N-bit plane Colour frame buffer -

Color or gray levels are incorporated into a frame buffer raster graphics device by using additional bit plans

The intensity of each pixel on CRT is controlled by a corresponding pixel location in each of the N-bit plane

The binary values from each of N-bit plans is loaded into corresponding register positions the resulting binary number is interpreted as an intensity level between 0 (dark) $2^n - 1$ (full intensity).

This is converted into analog voltage between 0 and maximum voltage of electron gun by DAC. A total of 2^4 intensity levels are possible.

Given below illustrate a system with 3 bit planes for a total of 8 (2^3) intensity levels. Each bit plane requires a full complement of memory for a given raster resolution.

Ex. a 3 bit plane frame buffer for a 1024 x 1024 raster requires 3.145.728 (3 x 1024 x 1024) memory bits.

In increase in the number of available intensity levels is achieved for a modest in required memory by using a lookup table. Upon reading bit planes in the frame buffer resulting a number is used as an index into the lookup table.

The lookup table must contain 2^N entries each entry in the lookup table is w bit wise w may be greater than N

when this occurs 2^w intensities are available but only 2^N differnt intensities are available at one time.

Complex RGB :-

A simple color frame Buffer -

There are 3 primary colors a simple colour frame buffer is implemented with 3 bit plane drives an individual color gun for each primary color used in color video. This three primaries (red green & bl
are combined in CRT to yield eight colors.

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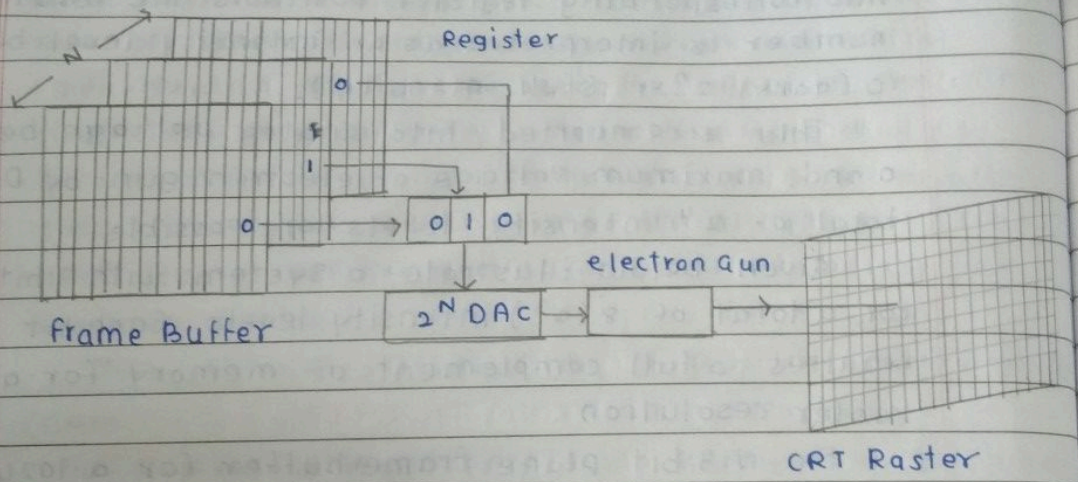
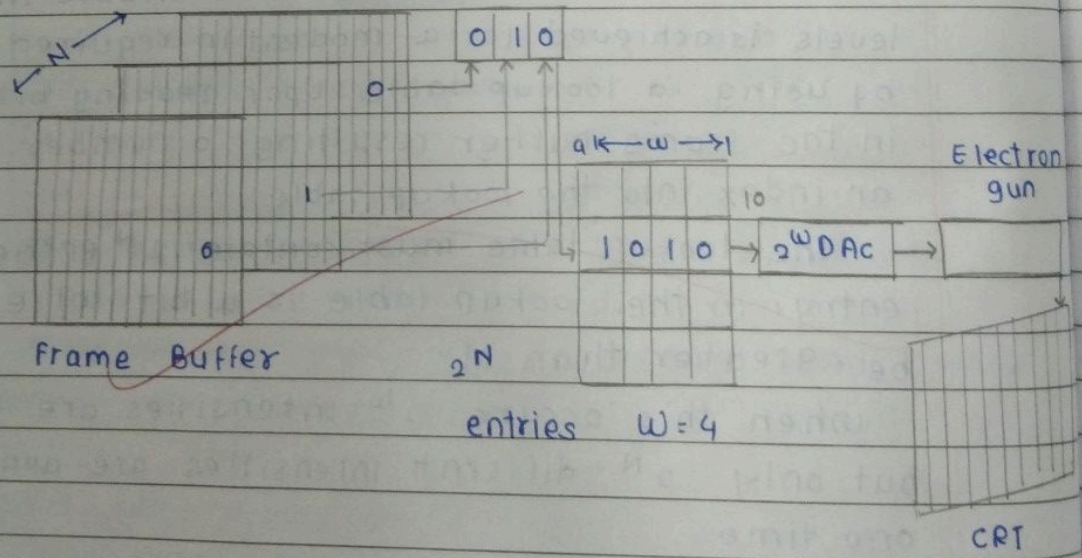
N - bit plane gray level frame buffer.



N bit plan gray level frame buffer with W bit wide lookup table.



2) Computer Graphics s/w and standards.

Graphics s/w is a type of computer program that is used to create and edit images. There is a wide range of graphics software available on the market. ranging from simple program that allow users to create and edit basic images to complex tools that can be used to create detailed 3D models and animation some of the most popular graphics software includes adobe photoshop cerel pointer and autodesk Maya

Characterstics

→ A graphics s/w program is a computer application used to create digital images

→ Graphics s/w program can be used to create both vector and raster images

→ Common features are create, edit save image

→ examples - photoshop, GIMP corel Draw

Graphics Standards -

There are various graphics standards. There of which plays and still plays on important role in Graphics

1) GKS
2) GKS - 3D
3) PHIGS
4) DMIS
5) IGFS

1) GKS (Graphical kernel system)

It is used by various programming languages like C FORTN, Pascal, Basic etc

GKS was adopted as first graphics s/w standard

by Iso and by National standard organization includin ANSI.

Q.5

Main objectives-

To control all type of graphics devices such as platter and display devices in a consistant manner

To be small enough for a variety of programs

To provide complete range of graphical facilities in 2D including the interactive capabilities

2) PHIGS - (Programmers Hierarchical Interactive Graphics standard)

PHIGS was the extension of GSK which provides 3D package.

PHIGS includes additional functions for object modeling color specification, surface rendering picture manipulation.

PHIGS + is advance version of PHIGS having additional functionalities.

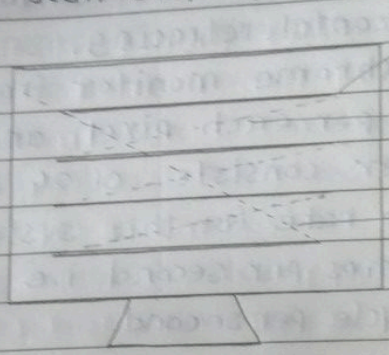
3) DMIS - (Dimensional Measurement Interface Specification)

DMIS provides new standard in communication being established by CAM-I for manufacturing.

4) IGFS (Initial Graphics Exchange Specification)

IGE is the most comprehensive standard and is designed to transmit the entire product defination including that of manufacturing of any other associated information.

7 Explain Raster Scan Display



A rectangular image of pattern capture in television is known as raster scan. It is one of the most popular and standard type of graphics monitor which operates CRT Through the raster scan we can display real life image with a variety of shades also it comprises a massive colour range.

It is the most common type of computer graphics monitor based on television technology. In a raster scan system the electron beam is swept across the screen one row at a time from top to bottom. When electron beam moves across each row the beam intensity is turned ON or off to create a pattern of illuminated spots.

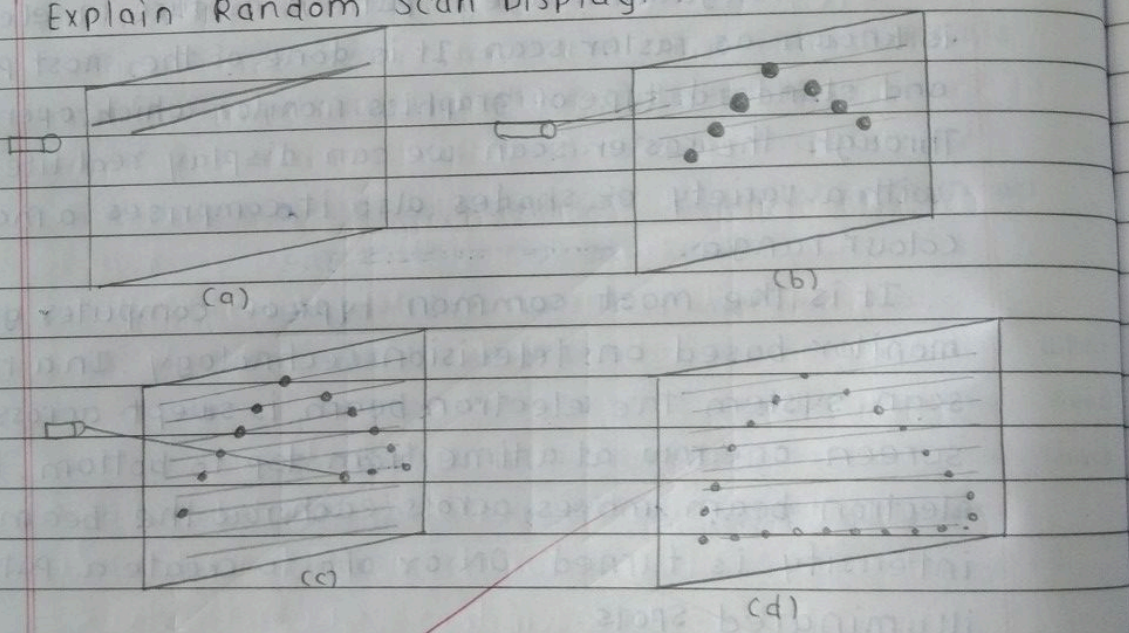
The picture defination is stored in the memory called frame buffer. Frame Buffer is also known as Raster or bit map. In frame buffer the positions are called picture elements or pixels. Beam refreshing is of- two types. first is horizontal retracing and second is verticle retracing.

When the beam starts from the top left corner and reaches bottom right scale it will again return to top left side called at verticle retrace.

Then it will again more horizontally from top to Bottom call as horizontal retracing

In monochrome monitor frame buffer consist of one bit per each pixel and for color monitor frame buffer consists of 24 bit for each pixel. The refresh rate for this system is at the rate of 60 to 80 frames per second i.e refresh rate are describe in units of cycle per second.

Q 8 Explain Random scan Display.



The random scan is a technique in which the display is constructed through an electron beam which is directed to the only to specific areas of screen where the image to be sketched or drawn. The resolution of random scan display is high and thus it deliver smoothe image drawing.

Random scan display uses an electron beam which operate like a pencil to create a line image on the CRT screen. The picture is constructed out of a

sequence of straight line segments. Each line segment is drawn on screen by directing the beam to move from one point on the screen to the next.

After drawing picture. The system cycle back to the first line and all the lines of image 30 to 60 times each second.

The random scan system is also called vector display, stroke writing display or calligraphic display.

Basic working of random scan display

→ Random scan monitors are used to draw a picture in one line at a time and are thus also referred to as vector display.

→ The cathode Ray tube when operates as a random scan display device directs the beam of an electron only to those areas of the screen where display or a picture has to be drawn.

→ To draw a picture or display it on the screen the system goes through a line or set of commands & draws each of them one at a time in a line turn by turn.

Advantages:

1) CRT has electron beam directed only to parts of the screen where an image is to be drawn.
2) Produce smooth line drawings.
3) High Resolution.

Disadvantages. Random scan monitors cannot display realistic shades es scenes.

9. Explain RGB Color Model.

The RGB color model is one of the most widely used color representation method in computer graphics.

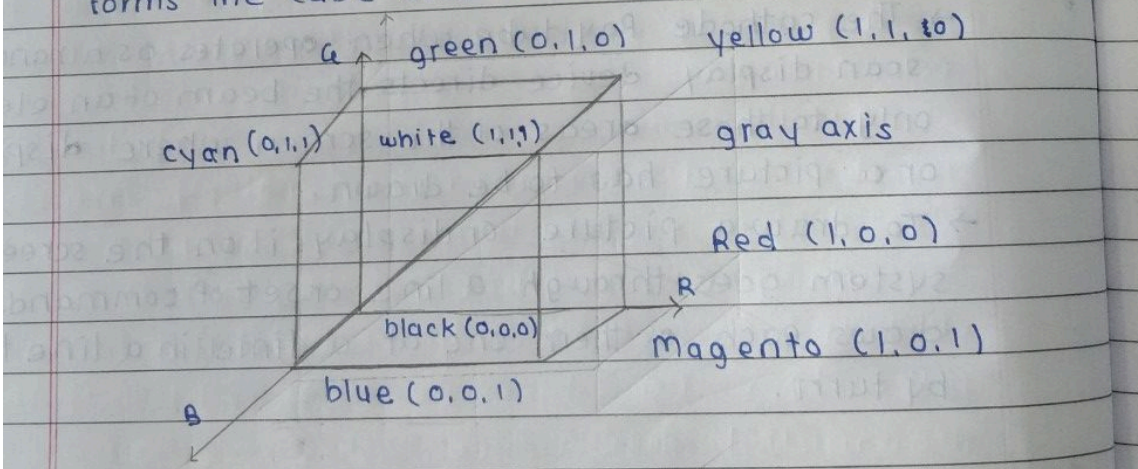
It uses a color coordinate system with three primary colors.

R (Red), G (Green), B (Blue)

Each primary color can take an intensity value ranging from 0 (lowest) to 1 (highest)

Mixing these three primary colors at different intensity levels produces a variety of colors.

The colors collection of all the colors obtained by such a linear combination of red, green, and blue forms the cube shaped RGB color space.



The corner of RGB color cube that is at the origin of the coordinates system corresponds to break, whereas the corner of the cube that is diagonally opposite to the origin represents white.

The diagonal line connecting black and white corresponds to all the gray colors between black and white also known as gray axis.

In the RGB color model, an orbitary color within the cubic color space can be specified by its color coordinates : (r, g, b)

Example:

If we substract red from white what remains consists of green and blue which is cyan. The coordinates system of CMY model use the three primaries complementary colors.

C (cray), M (magento) & Y (yellow)

The corner of the CMY color cube that is pt (0,0,0) corresponds to white whereas the corner of the cube that is at (1,1,1) represents black the following formulas summarize the conversion betⁿ two color models.

$$\begin{bmatrix} R \\ G \\ B \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} C \\ M \\ Y \end{bmatrix} \qquad \begin{bmatrix} C \\ M \\ Y \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$