2 MARKS & 16 MARKS

2 Mark Question

UNIT – I

1. Define Computer graphics.

Computer graphics remains one of the most existing and rapidly growing computer fields. Computer graphics may be defined as a pictorial representation or graphical representation of objects in a computer.

2. What is meant by scan code?

When a key is pressed on the keyboard, the keyboard controller places a code carry to the key pressed into a part of the memory called as the keyboard buffer. This code is called as the scan code.

3. What is meant by refreshing of the screen?

Some method is needed for maintaining the picture on the screen. Refreshing of screen is done by keeping the phosphorus glowing to redraw the picture repeatedly. (i.e.)By quickly directing the electronic beam back to the same points.

4. Define Random scan/Raster scan displays?

Random scan is a method in which the display is made by the electronic beam which is directed only to the points or part of the screen where the picture is to be drawn.

The Raster scan system is a scanning technique in which the electrons sweep from top to bottom and from left to right. The intensity is turned on or off to light and unlight the pixel.

5. List out the merits and demerits of Penetration techniques?

The merits and demerits of the Penetration techniques are as follows

• It is an inexpensive technique
• It has only four colors
• The quality of the picture is not good when it is compared to other techniques
• It can display color scans in monitors
• Poor limitation etc.

6. List out the merits and demerits of DVST?

The merits and demerits of direct view storage tubes [DVST] are as follows

• It has a flat screen
• Refreshing of screen is not required
• Selective or part erasing of screen is not possible
• It has poor contrast
• Performance is inferior to the refresh CRT.

7. What do you mean by emissive and non-emissive displays?
   a. The emissive display converts electrical energy into light energy. The plasma panels, thin film electro-luminescent displays are the examples.
   b. The Non emissive are optical effects to convert the sunlight or light from any other source to graphic form. Liquid crystal display is an example.

8. List out the merits and demerits of Plasma panel display?
Merits
• Refreshing is not required
• Produce a very steady image free of Flicker
• Less bulky than a CRT.
Demerits
• Poor resolution of up to 60 d.p.i
• It requires complex addressing and wiring
• It is costlier than CRT.

9. What is persistence?
The time it takes the emitted light from the screen to decay one tenth of its original intensity is called as persistence.

10. What is resolution?
The maximum number of points that can be displayed without an overlap on a CRT is called as resolution.

11. What is Aspect ratio?
The ratio of vertical points to the horizontal points necessary to produce length of lines in both directions of the screen is called the Aspect ratio. Usually the aspect ratio is ¾.

12. What is meant by Addressability?
The Addressability is the number of individual dots per inch (d.p.i) that can be created. If the address of the current dot is (x, y) then the next dot will be (x+y), (x+y+1) etc.

13. What is a dot size?
Dot size may be defined as the diameter of a single dot on the devices output. Dot size is also called as the Spot size.

14. What is interdot distance?
Interdot distance is the reciprocal of addressability. If the addressability is large, the interdot distance will be less. The interdot distance should be less to get smooth shapes.

15. What is the difference between impact and non-impact printers?
a. Impact printer press formed character faces against an inked ribbon on to the paper.
   Examples are line printer and dot-matrix printer.
b. Non-impact printer and plotters use Laser techniques, inkjet sprays, Xerographic process, electrostatic methods and electro thermal methods to get images onto the papers.
   Examples are Inkjet/Laser printers.

16. What are the features of Inkjet printers?
• They can print 2 to 4 pages/minutes.
• Resolution is about 360d.p.i. Therefore better print quality is achieved.

• The operating cost is very low. The only part that requires replacement is ink cartridge.
• 4 colors cyane, yellow, majenta, black are available.

17. What are the advantages of laser printer
• High speed, precision and economy.
• Cheap to maintain.
• Quality printers.
• Lasts for longer time.
• Toner power is very cheap.

18. What are the advantages of electrostatic plotters?
• They are faster than pen plotters and very high quality printers.
• Recent electrostatic plotters include a scan-conversion capability.
• Color electrostatic plotters are available. They make multiple passes over the paper to plot color pictures.

19. Define pixel?
Pixel is shortened forms of picture element. Each screen point is referred to as pixel or pel.

20. What is frame buffer?
Picture definition is stored in a memory area called frame buffer or refresh buffer.

21. What is bitmap and what is pixmap?
The frame buffer used in the black and white system is known as bitmap which take one bit per pixel. For systems with multiple bits per pixel, the frame buffer is often referred to as a pixmap.

22. What is a Vector display or stroke writing or calligraphic display?
Random scan monitors draw a picture one line at a time and for this reason are also referred as vector displays.

23. Where the video controller is used?
A special purpose processor, which is used to control the operation of the display device, is known as video controller or display controller.

24. What do you mean by scan conversion?
A major task of the display processor is digitizing a picture definition given in an application program into a set of pixel-intensity values for storage in the frame buffer. This digitization process is called scan conversion.

25. What is run length encoding?
Run length encoding is a compression technique used to store the intensity values in the frame buffer, which stores each scan line as a set of integer pairs. One number each pair indicates an intensity value, and second number specifies the number of adjacent pixels on the scan line that are to have that intensity value

UNIT – II

1. What is an output primitive?
Graphics programming packages provide function to describe a scene in terms of these basic geometric structures, referred to as output primitives.

2. What do you mean by 'jaggies'?
Line with stair step appearance is known as jaggies.

3. What is point in the computer graphics system?
The point is a most basic graphical element & is completely defined by a pair of user coordinates (x , y).

4. Write short notes on lines?
A line is of infinite extent can be defined by an angle of slope θ and one point on the line P=P(x,y). This can also be defined as Y=mx+C where C is the Y- intercept.

5. Define Circle?
Circle is defined by its center xc, yc and its radius in user coordinate units. The equation of the circle is $(x-xc) + (y-yc) = r^2$.

6. Define Ellipse?
An ellipse can use the same parameters xc, yc ,r as a circle, in addition to the eccentricity e. the eqn of an ellipse is:
$(x-xc)2/a^2 + (y-yc)2/b^2 = 1$

7. Define polygon?
A polygon is any closed continues sequence of line segments ie, a polyline whose last node point is same as that of its first node point. The line segments form the sides of the polygon and their intersecting points form the vertices of the polygon.

8. Distinguish between convex and concave polygons?
If the line joining any two points in the polygon lies completely inside the polygon then, they are known as convex polygons. If the line joining any two points in the polygon lies outside the polygon then, they are known as concave polygons.

9. What is seed fill?
One way to fill a polygon is to start from a given point (seed) known to be inside the polygon and highlight outward from this point i.e neighboring pixels until encounter the boundary pixels, this approach is called seed fill.

10. What is scan line algorithm?
One way to fill the polygon is to apply the inside test. i.e to check whether the pixel is inside the polygon or outside the polygon and then highlight the pixel which lie inside the polygon. This approach is known as scan-line algorithm.

11. Define coherence properties?
A coherence property of a scene is apart of a scene by which relate one part of the scene with the other parts of the scene.

12. What is an active edge list in the scan line algorithm?

The active edge list for a scan line contains all edges crossed by that scan line.

13. What is a winding number?

Winding number method is used to check whether a given point is inside or outside the polygon. In this method give a direction number to all the edges which cross the scan line. If the edge starts below the line and ends above scan line give direction as -1 . otherwise1. For polygons or two dimensional objects, the point is said to be inside when the value of winding number is nonzero.

14. What is cell array?

The cell array is a primitive that allows users to display an arbitrary shape defined as a two dimensional grid pattern.

15. What is type face?

Letters, numbers and other characters can be displayed in a variety of sizes and styles. The overall design style for a set of characters is called a type face.

16. What do you mean by font?

The term font referred to a set of cast metal character forms in a particular size and format, such as 10-point courier italic.

17. What is a bitmapped font?

A simple method for representing the character shapes in a particular typeface is to use rectangular grid patterns. The set of characters are then referred to as a bitmap font.

18. What is an outline font?

A flexible scheme is to describe character shapes using straight-line and curve sections. In this case, the set of character is called an out line font.

19. What is an attribute parameter?

Any parameter that affects the way a primitive is to be displayed is referred to as an attribute parameter.

20. What are the various attributes of a line?

The line type, width and color are the attributes of the line. The line type includes solid line, dashed lines, and dotted lines.

21. What is pixel mask?

Pixel mask is a string containing the digits 1 and 0 to indicate which positions to plot along the line path. The mask 1111000, could be used to display a dashed line with a dash length of 4 and inter dot spacing of three.

22. What is a Line cap?

Line caps can be used to adjust the shape of the line ends to give a better appearance. There are three types of line caps. Butt cap which has a square end, round cap which has a semi circle end, projecting square cap which has one half of the line width beyond the specified end points.

23. List out the methods used for smoothly joining two line segments?
. Mitter join-by extending the outer boundaries of each of the two lines until they meet.
. Round join – by capping the connection between the two segments with a circular boundary whose diameter is equal to the line width.
. Bevel join – by displaying the line segments with butt caps and filling in the triangular gap where the segment meet.

24. What is Color Look up table?
In color displays, 24 bits per pixel are commonly used, where 8 bits represent 256 level for each color. It is necessary to read 24-bit for each pixel from frame buffer. This is very time consuming. To avoid this video controller uses look up table to store many entries to pixel values in RGB format. This look up table is commonly known as colour table.

25. What is tiling patterns?
The process of filling an area with rectangular pattern is called tiling and rectangular fill patterns are sometimes referred to as tiling patterns.

26. What is soft fill?
Soft fill is a filling method in which fill color is combined with the background colors.

27. What is kerned character?
The characters which extend beyond the character body limits is known as kerned character. Example f and j.

28. What is character up vector?
The orientation for a displayed character string is set according to the direction of the character up vector.

29. Define bundled attributes?
Individual attribute commands provide a simple and direct method for specifying attributes when a single output device is used. When several kinds of output device are available at a graphics installation, it is convenient to set up a table for each output device that lists set of attribute values that are to be used on that device to display each primitive type. Attribute specified in this manner is known as bundled attribute.

30. What is aliasing?
In the line drawing algorithms, all rasterzed locations do not match with the true line and have to represent a straight line. This problem is severe in low resolution screens. In such screens line appears like a stair-step. This effect is known as aliasing.

31. What is antialiasing?
The process of adjusting intensities of the pixels along the line to minimize the effect of aliasing is called antialiasing.

32. What is pixel phasing?
Pixel phasing is an antialiasing technique, stair steps are smoothed out by moving the electron beam to more nearly approximate positions specified by the object geometry.

UNIT – III

1. What is Transformation?

Transformation is the process of introducing changes in the shape size and orientation of the object using scaling rotation reflection shearing & translation etc.

2. Write short notes on active and passive transformations?

In the active transformation

the points x and x^1 represent different coordinates of the same coordinate system. Here all the points are acted upon by the same transformation and hence the shape of the object is not distorted.

In a passive transformation

the points x and x^1 represent same points in the space but in a different coordinate system. Here the change in the coordinates is merely due to the change in the type of the user coordinate system.

3. What is translation?

Translation is the process of changing the position of an object in a straight-line path from one coordinate location to another. Every point (x,y) in the object must under go a displacement to (x^1,y^1). the transformation is: $x^1 = x + tx$; $y^1 = y + ty$

4. What is rotation?

A 2-D rotation is done by repositioning the coordinates along a circular path, in the x-y plane by making an angle with the axes. The transformation is given by:
$X^1 = r\cos(\theta + \varphi)$ and $Y^1 = r\sin(\theta + \varphi)$.

5. What is scaling?

The scaling transformations changes the shape of an object and can be carried out by multiplying each vertex (x,y) by scaling factor Sx,Sy where Sx is the scaling factor of x and Sy is the scaling factor of y.

6. What is shearing?

The shearing transformation actually slants the object along the X direction or the Y direction as required.ie; this transformation slants the shape of an object along a required plane.

7. What is reflection?

The reflection is actually the transformation that produces a mirror image of an object. For this use some angles and lines of reflection.

8. Distinguish between window port & view port?

A portion of a picture that is to be displayed by a window is known as window port. The display area of the part selected or the form in which the selected part is viewed is known as view port.

9. Define clipping?

Clipping is the method of cutting a graphics display to neatly fit a predefined graphics region or the view port.

10. What is covering (exterior clipping)?
This is just opposite to clipping. This removes the lines coming inside the windows and displays the remaining. Covering is mainly used to make labels on the complex pictures.

11. What is the need of homogeneous coordinates?
To perform more than one transformation at a time, use homogeneous coordinates or matrixes. They reduce unwanted calculations intermediate steps saves time and memory and produce a sequence of transformations.

12. Distinguish between uniform scaling and differential scaling?
When the scaling factors sx and sy are assigned to the same value, a uniform scaling is produced that maintains relative object proportions. Unequal values for sx and sy result in a differential scaling that is often used in design application.

13. What is fixed point scaling?
The location of a scaled object can be controlled by a position called the fixed point that is to remain unchanged after the scaling transformation.

14. Define Affine transformation?
A coordinate transformation of the form
$X = a_{xx}x + a_{xy}y + b_x$, $Y = a_{yx}x + a_{yy}y + b_y$
is called a two-dimensional affine transformation. Each of the transformed coordinates x '
and y ' is a linear function of the original coordinates x and y , and parameters aij and bk are constants determined by the transformation type.

15. Distinguish between bitBlt and pixBlt?
Raster functions that manipulate rectangular pixel arrays are generally referred to as raster ops. Moving a block of pixels from one location to another is also called a block transfer of pixel values. On a bilevel system, this operation is called a bitBlt (bit-block transfer), on multilevel system t is called pixBlt.

16. List out the various Text clipping?
. All-or-none string clipping -if all of the string is inside a clip window, keep it otherwise discards.
. All-or-none character clipping – discard only those characters that are not completely inside the window. Any character that either overlaps or is outside a window boundary is clipped.
. Individual characters – if an individual character overlaps a clip window boundary, clip off the parts of the character that are outside the window.

UNIT – IV

1. What are the various representation schemes used in three dimensional objects?
. Boundary representation (B-res) – describe the 3 dimensional object as a set of surfaces that separate the object interior from the environment.
. Space-portioning representation – describe interior properties, by partitioning the spatial region containing an object into a set of small, no overlapping, contiguous solids.

2. What is Polygon mesh?
Polygon mesh is a method to represent the polygon, when the object surfaces are tiled, it is more convenient to specify the surface facets with a mesh function. The various meshes are

      Triangle strip – (n-2) connected triangles
      Quadrilateral mesh – generates (n-1)(m-1) Quadrilateral

3. What is Bezier Basis Function?
Bezier Basis functions are a set of polynomials, which can be used instead of the primitive polynomial basis, and have some useful properties for interactive curve design.

4. What is surface patch?
A single surface element can be defined as the surface traced out as two parameters (u, v) take all possible values between 0 and 1 in a two-parameter representation. Such a single surface element is known as a surface patch.

5. Write short notes on rendering bi-cubic surface patches of constant u and v method?
The simple way is to draw the iso-parmetric lines of the surface. Discrete approximations to curves on the surface are produced by holding one parameter constant and allowing the other to vary at discrete intervals over its whole range. This produce curves of constant u and constant v.

6. What are the advantages of rendering polygons by scan line method?
i. The max and min values of the scan were easily found.
ii. The intersection of scan lines with edges is easily calculated by a simple incremental method.
iii. The depth of the polygon at each pixel is easily calculated by an incremental method.

7. What are the advantages of rendering by patch splitting?
i. It is fast-especially on workstations with a hardware polygon-rendering pipeline.
ii. It's speed can be varied by altering the depth of sub-division.

8. Define B-Spline curve?
A B-Spline curve is a set of piecewise(usually cubic) polynomial segments that pass close to a set of control points. However the curve does not pass through these control points, it only passes close to them.

9. What is a spline?
To produce a smooth curve through a designed set of points, a flexible strip called spline is used. Such a spline curve can be mathematically described with a piecewise cubic polynomial function whose first and second derivatives are continuous across various curve section.

10. What is the use of control points?
Spline curve can be specified by giving a set of coordinate positions called control points, which indicates the general shape of the curve, can specify spline curve.

11. What are the different ways of specifying spline curve?
• Using a set of boundary conditions that are imposed on the spline.
• Using the state matrix that characteristics the spline
• Using a set of blending functions that calculate the positions along the curve path by specifying combination of geometric constraints on the curve

12. What are the important properties of Bezier Curve?
•It needs only four control points
•It always passes through the first and last control points
•The curve lies entirely within the convex half formed by four control points.

13. Differentiate between interpolation spline and approximation spline?
When the spline curve passes through all the control points then it is called interpolate. When the curve is not passing through all the control points then that curve is called approximation spline.

14. What do you mean by parabolic splines?
For parabolic splines a parabola is fitted through the first three points p1,p2,p3 of the data array of kot points. Then a second parabolic arc is found to fit the sequence of points p2, p3, p4. This continues in this way until a parabolic arc is found to fit through points pn-2, pn-1 and pn. The final plotted curve is a meshing together of all these parabolic arcs.

15. What is cubic spline?
Cubic splines are a straight forward extension of the concepts underlying parabolic spline. The total curve in this case is a sequence of arcs of cubic rather than parabolic curves .
Each cubic satisfies :$ax^3 + bx^2 + cx + d$.

16. What is a Blobby object?
Some objects do not maintain a fixed shape, but change their surface characteristics in certain motions or when in proximity to other objects. That is known as blobby objects. Example – molecular structures, water droplets.

17. Define Octrees?
Hierarchical tree structures called octrees, are used to represent solid objects in some graphics systems. Medical imaging and other applications that require displays of object cross sections commonly use octree representation.

18. Define Projection?
The process of displaying 3D into a 2D display unit is known as projection. The projection transforms 3D objects into a 2D projection plane.

19. What are the steps involved in 3D transformation?
• Modeling Transformation
• Viewing Transformation
• Projection Transformation
• Workstation Transformation

20. What do you mean by view plane?
A view plane is nothing but the film plane in camera which is positioned and oriented for a particular shot of the scene.

21. What is view-plane normal vector?
This normal vector is the direction perpendicular to the view plane and it is called as [DXN DYN DZN]

22. What is view distance?
The view plane normal vector is a directed line segment from the view plane to the view reference point. The length of this directed line segment is referred to as view distance

23. Define projection?
The process of converting the description of objects from world coordinates to viewing coordinates is known as projection

24. What you mean by parallel projection?
Parallel projection is one in which z coordinates is discarded and parallel lines from each vertex on the object are extended until they intersect the view plane.

25. What do you mean by Perspective projection?
Perspective projection is one in which the lines of projection are not parallel. Instead, they all converge at a single point called the center of projection.

26. What is Projection reference point?
In Perspective projection, the lines of projection are not parallel. Instead, they all converge at a single point called Projection reference point.

27. What is the use of Projection reference point?
In Perspective projection, the object positions are transformed to the view plane along these converged projection line and the projected view of an object is determined by calculating the intersection of the converged projection lines with the view plane.

28. What are the different types of parallel projections?
The parallel projections are basically categorized into two types, depending on the relation between the direction of projection and the normal to the view plane. They are orthographic parallel projection and oblique projection.

29. What is orthographic parallel projection?
When the direction of the projection is normal (perpendicular) to the view plane then the projection is known as orthographic parallel projection

30. What is orthographic oblique projection?
When the direction of the projection is not normal (not perpendicular) to the view plane then the projection is known as oblique projection.

31. What is an axonometric orthographic projection?
The orthographic projection can display more than one face of an object. Such an orthographic projection is called axonometric orthographic projection.

32. What is cavalier projection?

The cavalier projection is one type of oblique projection, in which the direction of projection makes a 45-degree angle with the view plane.

33. What is cabinet projection?

The cabinet projection is one type of oblique projection, in which the direction of projection makes a n angle of arctan (2)=63.4- with the view plane.

34. What is vanishing point?

The perspective projections of any set of parallel lines that are not parallel to the projection plane converge to appoint known as vanishing point.

35. What do you mean by principle vanishing point.

The vanishing point of any set of lines that are parallel to one of the three principle axes of an object is referred to as a principle vanishing point or axis vanishing point.

36. What is view reference point?

The view reference point is the center of the viewing coordinate system. It is often chosen to be close to or on the surface of the some object in the scene.

UNIT – V

1. Define computer graphics animation?
Computer graphics animation is the use of computer graphics equipment where the graphics output presentation dynamically changes in real time. This is often also called real time animation.

2. What is tweening?
It is the process, which is applicable to animation objects defined by a sequence of points, and that change shape from frame to frame.

3. Define frame?
One of the shape photographs that a film or video is made of is known as frame.

4. What is key frame?
One of the shape photographs that a film or video is made of the shape of an object is known initially and for a small no of other frames called keyframe.

5. What is pseudo animation?
Pseudo animation is creating a sequence of stills, photographing or video graphing each still as one frame, and then later playing back the frames at a faster speed.

6. What is the normal speed of a visual animation?
Visual animation requires a playback of at least 25 frames per second.

7. What are the different tricks used in computer graphics animation?
a. Color look Up Table manipulation
b. Bit plane manipulation
c. Use of UDCS
d. Special drawing modes
e. Sprites
f. Bit blitting

8. What is color look up table?
In color display unit it is necessary to read 44-bit for each pixel from buffer. This very time consuming process. To avoid this video controller uses look up table to store many entries of pixel vales in RGB format. This look up table is commonly known as color look up table.

9. What is solid modeling?
The construction of 3 dimensional objects for graphics display is often referred to as solid modeling.

10. What is an intuitive interface?
The intuitive interface is one, which simulates the way a person would perform a corresponding operation on real object rather than have menu command.

11. What is Sprite?
A Sprite is graphics shape in animation and games programs. Each sprite provided in the system has its own memory area similar to but smaller than pixel RAM.

12. What is the UDC technique?

UDC stands for User Defined Character set. It is graphics animation trick, which is used in early microcomputer system.

13. What is the use of hidden line removing algorithm?

The hidden line removal algorithm determines the lines, edges, surfaces or volumes that are visible or invisible to an observer located at a specific point in space.

14. What is computer graphics realism?

The creation of realistic picture in computer graphics is known as realism. It is important in fields such as simulation, design, entertainments, advertising, research, education, command, and control.

15. How realistic pictures are created in computer graphics?

To create a realistic picture, it must be process the scene or picture through viewing-coordinate transformations and projection that transform three-dimensional viewing coordinates onto two-dimensional device coordinates.

16. What is Fractals?

A Fractal is an object whose shape is irregular at all scales.

17. What is a Fractal Dimension?

Fractal has infinite detail and fractal dimension. A fractal imbedded in n-dimensional space could have any fractional dimension between 0 and n.

The Fractal Dimension D= LogN / Log S

Where N is the No of Pieces and S is the Scaling Factor.

18. What is random fractal?

The patterns in the random fractals are no longer perfect and the random defects at all scale.

19. What is geometric fractal?

A geometric fractal is a fractal that repeats self-similar patterns over all scales.

20. What is Koch curve?

The Koch curve can be drawn by dividing line into 4 equal segments with scaling factor 1/3. and middle 2 segments are so adjusted that they form adjustment sides of an equilateral triangle.

21. What is turtle graphics program?

The turtle program is a Robert that can move in 2 dimensions and it has a pencil for drawing. The turtle is defined by the following parameters.
   a) Position of the turtle (x, y)
   b) Heading of the turtle 0 the angle from the x axis.

22. What is graftals?

Graftals are applicable to represent realistic rendering plants and trees. A tree is represented by a String of symbols 0, 1, [,]

23. What is a Particle system?

A particle system is a method for modeling natural objects, or other irregularly shaped objects, that exhibit "fluid-like" properties. Particle systems are suitable for realistic rendering of fuzzy objects, smoke, sea and grass.

24. Give some examples for computer graphics standards?

- CORE – The Core graphics standard
- GKS -- The Graphics Kernel system
- PHIGS – The Programmers Hierarchical Interactive Graphics System.
- GSX – The Graphics system extension
- NAPLPS – The North American presentation level protocol syntax.

16 Marks Question

UNIT I

1. Explain refresh cathode ray tube?
   - A beam of electrons, emitted by an electron gun, passes through focusing and deflection systems that direct the beam toward specified positions on the phosphor coated area.
   - The phosphor that emits a small spot of light at each position contacted by the electron beam
   - One way to keep phosphor glowing is to redraw the picture repeatedly by quickly directing the electron beam back over the same points. This type of display is called is called refresh CRT
   - Primary components of electron gun are:
   - 1.Heated metal cathode
     Heat is supplied to the cathode by directing the beam through a coil of wire called the filament inside the cylindrical cathode structure.
   - 2.Control grid
     Intensity of the electron beam is controlled by setting the voltage levels on the control grid, which is a metal cylinder that fits to the cathode.
   - Different kinds of phosphorus are available
   - Besides color the major difference between phosphors is their persistence
   - The maximum number of points that can be displayed without overlap on a CRT is referred to as resolution.
   - Another property is aspect ratio

2.Explain color CRT monitors?
   - A CRT monitor displays color pictures by using a combination of phosphors that emit different colored light.
   - By combining the emitted light from the different phosphors, arange of colors can be generated

   - Two techniques
     . Beam penetration method
     . Shadow mask method
     . Display color pictures
     . Beam penetration method
   - Two layers of phosphors, usually red and green
     .A beam of slow electrons excites the outer red layer
     .Fast electron penetrates through the red layer and excites the inner green layer
     . An intermediate beam speeds, combinations of red and green light.
   - Shadow mask method
     . They produce a wider range of colors
     . Has three phosphor color dots at each pixel position

. One emits red light, another emits green light, and the third emits a blue light

. The three beams are deflected and focused as a group on to the shadow mask, which contains a series of holes aligned with a phosphor dot patterns.

. When the three beams passes through a hole in the shadow mask, they activate a dot triangle, which appears as a small color spot on the screen.

3.Explain direct view storage tubes and liquid crystal displays?

Liquid crystal displays

• Refers to the compounds having crystalline arrangement of molecules flow of liquid
• Two plates each glass plate contains a light polarized that are right angles to each other
• Two types

      Passive matrix LCD
      Active matrix LCD

Direct view storage tubes

• Alternative method for maintaining a screen image
• Stores picture information as a charge distribution
• Very complex pictures can be displayed at very high resolutions
• To eliminate the picture section the entire screen must be erased
• The erasing and redrawing process can take several seconds for a picture

4.Explain Raster scan systems?

- Several processing units
- Contains a special purpose processor, called video controller or display controller
- Video controller

  • A fixed area of the system memory is reserved for the frame buffer, and the video controller is given access to the frame-buffer memory

  • Tow registers are used to store the coordinates of the screen pixels

  • The value is stored in the frame buffer for this pixel position is then retrieved and used to set the intensity of the CRT beam

  • Initially the x register is set to 0 and the y register is set to ymax

  • Then the x register is incremented by 1, and the process repeated for the next pixel on the top scan line

  • This process is repeated for each pixel along the scan line

  • After the last pixels on the top scan line has been processed, the x register is reset to 0 and the yregister is decremented by 1.

  • The procedure is repeated fro each successive line

- Frame buffer locations and the corresponding screen positions are referenced as Cartesian coordinates
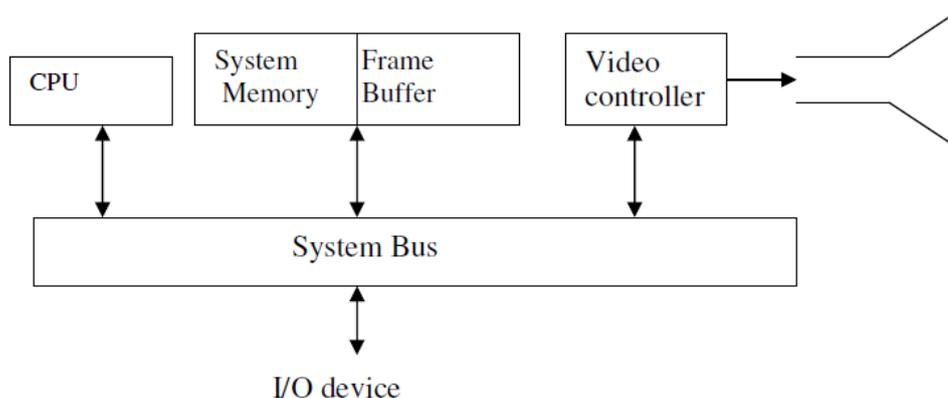
4. Explain the following?

1. Z-mouse
2. Joysticks
3. Touch panels
4. Image scanners
5. Data glove

Z-Mouse:

. Include three buttons

. A thumb wheel on the side, a track ball on the top, and a standard mouse ball underneath.

. This design provides six degrees of freedom to select an object from the spatial position.

. Wit this we can pickup an object, rotate it and we can move it in any direction

. Used in virtual reality and CAD systems

Joysticks

• Consists of small vertical liver mounted on a base

• Used to move the cursor around the screen

• The screen cursor is moved according to the distance

• One or two buttons is usually intended for signaling certain actions

Touch panels

•Three types

  •Optical touch panel
  •Electrical touch panel
  •Acoustical touch panel

•Allow selecting the screen position with the touch of finger. Touch input can be recorded using optical, electrical methods

Image scanners

. Drawings, color and black and white photos or text can be given as an input to the computer with an optical scanning mechanism.

. According to reflected light intensity the gradations of gray scale or color can be stored in an array

Data glove

. Constructed with a series of sensors that can detect hand and finger motions

. The transmitting and receiving antennas can be structured as a set of three mutually perpendicular cols, forming a three dimensional Cartesian coordinates system.

. Electromagnetic coupling between the three pairs of coil is used to provide information about the position and orientation of hand.

UNIT II

1. Explain in detail about the DDA scan conversion algorithm?

The digital differential analyzer is a scan conversion algorithm based on calculation either Δy or Δx using the following equations

$$\Delta y = m \Delta x$$

$$\Delta x = \Delta y / m$$

Sample the line at unit intervals in one coordinate and determine corresponding integer values nearest the line path for the coordinates

Sample at X intervals ($\Delta x = 1$) and compute each successive Y value as

$Yk+1 = Yk + m$

For lines with positive slope greater than 1, reverse the roles of X and Y. Sample at unit Y intervals (y = 1)and calculate each successive X value as

$Xk+1 = Xk+ 1/m$

Algorithm

Step 1: Input the line endpoints and store the left endpoint in (x1, y1) and right endpoint in (x2, y2)

Step 2: Calculate the values of Δx and Δy using $\Delta x = xb - xa$, $\Delta y = yb - ya$

Step 3: if the values of $\Delta x > \Delta y$ assign values of steps as Δx otherwise the values of steps as Δy

Step 4: Calculate the values of X increment and Y increment and assign the value x= xa and y = ya

Step 5: for k=1 to steps do

  X = X + X increment

  Y= Y + Y increment

  Putpixel(ceil(x), ceil(y),15)

Step 6: End

2. Explain Bresenhams line drawing algorithm?

In Bresenham's approach the pixel position along a line path are determined by sampling unit X intervals. Starting from the left end point(X0, Y0)of a given line we step to each successive columns and plot the pixel whose scan line Y-value is closest to the line path.Assuming the Kth step in process, determined that the pixel at (Xk, Yk)decide which pixel to plot in column Xk+1.The choices are (Xk+1, Yk) and (Xk+1, Yk+1)

Algorithm

Step 1: Input the line endpoints and store the left endpoint in (X_0, Y_0)
Step 2: Load (X_0, Y_0) in to the frame buffer
Step 3: Calculate constants Δx, Δy, $2\Delta y$, $-2\Delta x$, and obtain the decision parameters as
$$P0 = 2\Delta y - \Delta x$$
Step 4 : At each X_k along the line, starting at $k = 0$, perform the following test
   If $Pk < 0$, the next point to plot is (X_{k+1}, Y_k) and
$$P_{k+1} = P_k + 2\Delta y$$
   Otherwise, the next point to plot is (X_{k+1}, Y_{k+1}) and
$$P_{k+1} = P_k + 2\Delta y - 2\Delta x$$
Step 5: Repeat step 4 Δx times

3. Explain Midpoint Circle algorithm?

Algorithm

Step 1: Input radius r and circle center(Xc, Yc) and obtain the first point on
   the circumference of a circle centered on the origin as
   $(X0, Y0) = (0, r)$
Step 2: Calculate the initial values of the decision parameter as
$$P0 = 5/4 - r$$
Step 3: At each position starting at k perform the following test:
   If $Pk < 0$, the next point to plot is (X_{k+1}, Y_k) and
$$P_{k+1} = P_k + 2X_{k+1} + 1$$
   Otherwise the next point is (X_{k+1}, Y_{k+1}) and
$$P_{k+1} = P_k + 2X_{k+1} + 1 - 2Y_{k-1}$$
Step 4: Determine symmetry points in the other seven octants
Step 5: Move each pixel position(X, Y) onto the circular path centred on
(Xc, Yc) and plot the coordinate values as
$$X = X + X_c \qquad Y = Y + Y_c$$
Step 6: Repeat steps 3 through until X>=Y
$$P_k + 1 = P_k + 2\Delta Y$$
   Other wise, the next point is (X_{k+1}, Y_{k+1}) and
$$P_k + 1 = P_k + 2\Delta Y - 2\Delta X$$
Step 5: Repeat steps 4 ΔX times

4. Explain Ellipse generating Algorithm?

Algorithm

Step 1: Input radius r_x, r_y and ellipse center(X_c, Y_c) and obtain the first point on the circumference of a circle centered on the origin as

$$(X_0, Y_0) = (0, r_y)$$

Step 2: Calculate the initial values of the decision parameter in region 1 as

$$P1_0 = r_y^2 - r_x^2 \, r_y + 1/4 \, r_x^2$$

Step 3: At each position starting at X_k position in region 1, starting at $k = 0$, perform the following test:

If $P_k < 0$, the next point to plot is (X_{k+1}, Y_k) and

$$P1_{k+1} = P1_k + 2 \, r_y^2 X_{k+1} + r_y^2$$

Otherwise the next point is (X_{k+1}, Y_{k-1}) and

$$P1_{k+1} = P1_k + 2 \, r_y^2 X_{k+1} - 2r_y^2 \, Y_{k+1} + r_y^2$$

Step 4: Calculate the initial values of the decision parameter in region 2 as

$$P2_0 = r_y^2 \, (X_0+1/2)^2 + r_x^2 \, (Y_0 - 1)^2 - r_x^2 \, r_y^2$$

Step 5: At each position starting at Y_k position in region 2, starting at $k = 0$, perform the following test:

If $P_k > 0$, the next point to plot is (X_k, Y_{k-1}) and

$$P2_{k+1} = P2_k - 2 \, r_y^2 Y_{k+1} + r_x^2$$

Otherwise the next point is (X_{k+1}, Y_{k-1}) and

$$P2_{k+1} = P2_k - 2 \, r_y^2 Y_{k+1} - 2r_x^2 \, Y_{k+1} + r_x^2$$

Step 6: Determine symmetry points in the other three octants

Step 7: Move each pixel position(X, Y) onto the circular path centred on (Xc, Yc) and plot the coordinate values as

$$X = X + X_c \qquad Y = Y + Y_c$$

Step 8: Repeat steps for region 1 until $2 \, r_y^2 X >= 2 \, r_y^2 Y$

5.Explain Boundary fill Algorithm?

. If the boundary is specified in a single color, the fill algorithm proceeds outward pixel-by-pixel until the boundary color is encountered. This is called boundary fill algorithm
. The boundary fill procedure accepts as input the coordinates of an interior point (x, y), a fill color, and a boundary color.
. Starting from (x, y), the procedure tests the neighboring positions to determine whether they are boundary color.
. If not, they are painted with the fill color, and the neighbors are tested.
. This process continues until all pixels up to the boundary color for the area have been tested
. Two methods
4- connected
• 4 neighbouring points are conected
8-connected
•correctly fill the interior of the area defined

program

```
void boundaryfill( int x, int y, int fill, int boundary)
{
int current;

current = getpixel (x, y);
if ((current != boundary) &&(current != nil)
{
setColor ( fill);
setPixel ( x, y);
boundaryfill (x+1, y, fill, boundary);
boundaryfill (x-1, y, fill, boundary);
boundaryfill (x, y+1, fill, boundary);
boundaryfill (x, y-1, fill, boundary);
}
}
```

UNIT III

1. Explain reflection and shear?

Reflection - It is a mirror image of an object
•Rotating about 180 degree
•Flat object moving in the xy plane
•Reflection about y axis flips x coordinates
•Reflection point as pivot point is same as above
•To obtain the transformation matrix for reflection diagonal is y = -x
• Sequence
• Clockwise rotation by 45 degree
• Reflection about y axis
• Counter wise rotation by 45 degree

Shear - Internal layer cause to slide over each other called shear
• Transforms coordinate position as X '= x + shx . y' , Y' =y
• Shift in the position of objects relative to shearing reference lines are equivalent to translations

2. Explain Liang Barsky line clipping
• Faster line clipper of the parametric equation of a line segment
• Line parallel to one of the clipping boundaries
• Line intersects the extension of boundary k
• If u1 > u2 line is outside the clipping window
• Else inside the clipping window
• Clipping is done using the reflection in the clip window

3. Explain Sutherland Hodgeman polygon clipping
•Clipping polygon which lies inside the clipping window
•Four possible cases
•If the first vertex is outside the window boundary and the second vertex inside
• If the first vertex is inside the window boundary and the second vertex outside
• If both are outside
• If both are inside
• Repeat the process of algorithm
• Convex polygon are correctly clipped using this clipping
• Concave and convex polygon are also used

4. Explain about clipping operations
• Clip a picture from either outside or inside a region known as clipping
• Also called as clipping algorithm
• The region against the object is known as clip window
• Clipping operations on different types of objects
• Point clipping
• Polygon clipping
• Area clipping
• Line clipping
• Curve clipping
• Text clipping
• Polygon and line clipping are the standard clipping components

UNIT IV

1. Explain the three dimensional display methods?

Parallel projection

• The production of the 2D display of the 3D scene is called projection
• Project points on the object surface along the parallel lines on to the display plane
• Different 2D views of objects can be produced by projecting the visible points

Perspective projection

• Done by the projecting points to the display plane along the converging points
• Causes the objects farther from the viewing point should be smaller of the same sized object present here.
• Depth CUEING
• Basic problem for visualization techniques is called depth cueing
• Some 3D objects are without depth information
• Visible line and surface identification
• To highlight the visible lines
• Display visible lines as dashed lines
• Removing the invisible lines
• Surface rendering
• Lightening conditions in the screen
• Assigned characteristics
• Degree of transparency
• How rough or smooth the surfaces are to be
• Exploded and cutaway views
• Three dimensional and stereoscopic views

2. Explain spline representation

• It is referred to a curve drawn in a different manner
• Interpolation and approximation splines
• Set of coordinate points called control points
• Curve can be translated , rotated and scaled
• Enclosing a set of points called convex hull
• Set of connected points is often called control graph
• Parametric continuity condition
• Geometric continuity condition
• Spline specification

3. Explain Bezier curves and surfaces

• Have number of properties
• Can be fitted to any number of control points
• Polynomial functions between p0 and pn

$nP(u) = pk \ BEZ \ k,n(u)$

$K = 0$

• Calculated x(u), y(u), z(u)
• Properties of Bezier curves
• Cubic Bezier curves
• Design techniques in Bezier curves
• Bezier surfaces

4. Explain general three dimensional rotations
• Transformation sequences
• P' = T'.Rx (⸻⸻⸻⸻) .T.P
• Rotation in five steps
• Translate the object that rotates in parallel coordinate axis
• Rotate the object with one coordinate axis
• Apply inverse rotation to its original position
• Apply inverse translation to its original position
• V = p2 – p1
• After rotation to original position
R(⸻⸻⸻⸻) = T'.M.T

UNIT V

1. Explain Back face detection method and Depth buffer method

Backface Detection method
• Fast and simple object space method
• For identifying the back faces of a polyhedron
• Based ion inside outside test
• Plane parameters A, B, C, D

$Ax + By + Cz + D < 0$

• Inside point is along the line of sight to the surface

$V.N = Vz\ C$

• Polygon is back face if $C < 0$
• Polygon cannot see on any face if $C = 0$
• Z component value is $C <= 0$

Depth Buffer Method
• To compare the surface depths at each pixel position on the plane projection
• Also referred as z- buffer method
• Two buffer areas
    Depth buffer to store depth values
    Refresh buffer to store intensity values
• Depth value for a surface position (x, y)

$Z(-Ax - By - D)/C$

• Depth z' of next position (x + 1, y)

$Z'(-A(x + 1) - By - D)/C$

2. Explain area subdivision and A- Buffer method

A Buffer Method
• Extension idea of the depth buffer method
• It represents an antialiased, area averaged, accumulation-buffer method
• Only one visible surface
• Two fields
1. Depth field
Stores a positive or negative real number
2. Intensity field
Stores a surface intensity information or a pointer value
• Data for each surface in the linked list includes
• RGB intensity components
• Opacity parameters
• Depth
• Percent of area coverage
• Surface identifier
• Pointer to next surface

Area Sub Division Method
• Image space method
• The relative characteristic of surface are
• Surrounding surface
• Inside surface
• Outside surface

• Conditions for subdivision
• All surfaces are outside surfaces with respect to the area
• Only one inside
• A surrounding surface with in the area boundaries

3. Explain Depth sorting method
• Both image and object space operations]
• Perform the basic function
• Surface are sorted in order of decreasing depth
• Surface are scan converted in order, starting with the surface of greatest depth
• Often referred as painters algorithm
• Test listed in the order of increasing difficulty
• Surface do not overlap
• Projections of the two surfaces on to the view plane do not overlap

4. Explain key frame systems
Key frame systems
• Motion path can be given with a kinematics description
• Physically based on force acting object
• Frame in to individual component or object called cells
Morphing
• Transformation of object shapes from one form to another is called morphing
• Two key frames for an object transformation
• Preprocessing using vertex count Simulating accelerations
• Time interval between keyframe is divided in to n + 1
$t = (t2 - t1) / n = 1$
$tBj = t1 + jt, j = 1,2,3 ,……$
• Time for jth in- between is
$tBj = t1 + t[(1-cos[j$

/ (n + 1)]) / 2], j= 1, 2, 3, ….