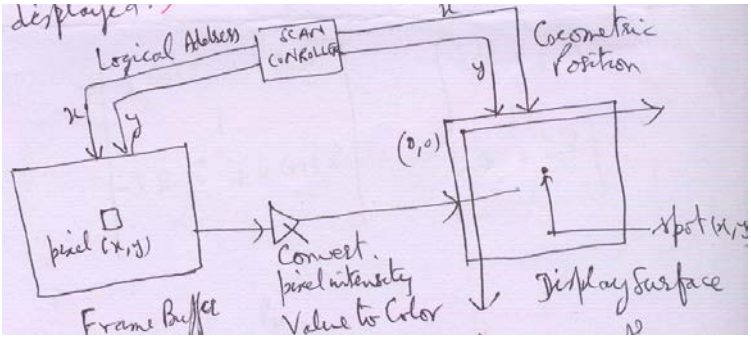
Q2 (a) What do you mean by frame buffer ? Draw a block diagram showing the technique for scanning out an image from frame buffer to display surface

Answer

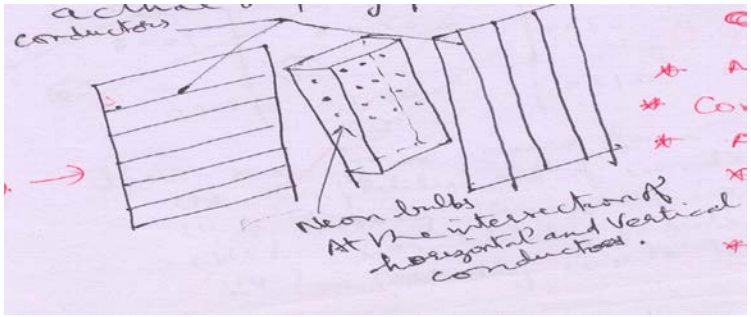
Region of memory large enough to hold all the pixel value for the display or Region memory large enough to store the definition of the image to be displayed.



Scan controller takes are of actual display process.

Q2(b) Describe the structure of plasma panel display.

Answer



Q2 (c) Write about any two applications that uses computer graphics.

Answer

- Applications
- Art, entertainment
- Computer Games
- Animation on
- www
- Books, magazines
- Image Processing

Q3 (a) Write the name of three main open GL libraries.

Answer

(i) Base GL
(ii) GLUT
(iii) GLUI

Q3 (b) Explain in detail "window to the viewport" mapping.

Answer Page Number 381 of Text-Book

Q3 (c) Explain the most general form of the format of open GL command. Also explain open GL data types.

Answer Page Number 214 Text-Book

Q4 (a) Explain the Cohen – sutherland polygon clipping algorithm with an example.

Answer Page Number 126-127 Text-Book

Q4 (b) Write the pseudocode for the Cyrus Beck algorithm.

Answer Page Number 201-202 Text-Book

Q5 (a) Give the composite transformation matrix in homogenous co-ordinate system to rotate a line about the point (30, 40) through an angle of 45º.

Answer

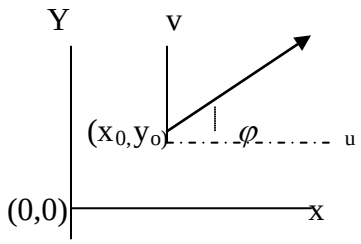
Table any point (x, y, 1) on the line

$$\begin{bmatrix} x^1 \\ y^1 \\ 1 \end{bmatrix} \begin{bmatrix} \cos 45^o & -\sin 45^o & 0 \\ \sin 45^o & \cos 45^o & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -30 \\ 0 & 1 & -40 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1/\sqrt{2} & -1/\sqrt{2} & 10/\sqrt{2} \\ 1/\sqrt{2} & 1/\sqrt{2} & -10/\sqrt{2} \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Q5 (b) Explain how can we change the usual co-ordinate system for performing rotation after translation of an object.

Answer



Changing the XY Co-ordinate system to UV Co-ordinate system will do be job.
This will transform the object form XY to XUV Co-ordinate system doing translation and solution P the object.

$$\begin{bmatrix} U \\ V \\ I \end{bmatrix} = \begin{bmatrix} \cos\varphi & -\sin\varphi & 0 \\ \sin\varphi & \cos\varphi & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & -x_0 \\ 0 & 1 & -y_0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Q5 (c) What are the co-ordinate of the point (3,1,4) after it has been rotated by 30º about y – Axis.

Answer

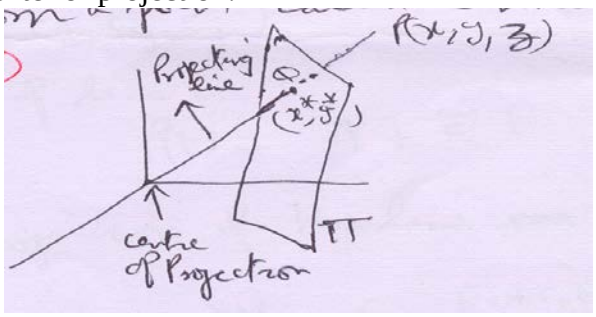
$$\begin{bmatrix} \cos 30^0 & 0 & \sin 30^0 & 0 \\ -\sin 30^0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ 1 \\ 4 \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} 3\cos 30^0 + 4\ \sin 30^0 \\ 1 \\ -3\sin 30^0 + 4\cos 30^0 \\ 1 \end{bmatrix} = \begin{bmatrix} \frac{3\sqrt{3}}{2} + \frac{4}{2} \\ 1 \\ \frac{-3}{2} + \frac{4\sqrt{3}}{2} \\ 1 \end{bmatrix}$$

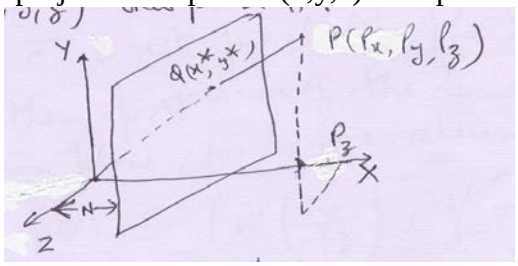
Q6 (a) What do you mean by perspective projection? Derive an expression for finding perspective projection of a point onto a plain surface.

Answer

Projection of point in 3D on to a plane in 2D when projecting lines start from a point called center of projection.



Q(x*, y*) is perspective projection of point P(x,y,z) onto plane π



From similarity of $\Delta s \dfrac{X^*}{P_x} = \dfrac{N}{-p_z}$

$$Y^* = \frac{Npy}{-p_z} \quad X^* = \frac{Npx}{-p_z}$$

Q6 (b) Let $P_i\ (x_i, y_i, z_i)$ i = 1....., N be the vertices of a polygon not perfectly planar. Give the components of the normal vector $\vec{m}\ (m_x, m_y, m_z)$ to the polygon.

Answer

$$m_x = \sum_{i=0}^{N-1} (y : -y_{next(i)})(Z_i + Z_{next(i)})$$

$$m_y = \sum_{i=0}^{N-1} (Z_i + Z_{next(i)})(x_i + x_{next(i)})$$

$$m_z = \sum_{i=0}^{N-1} (x_i + x_{next(i)})(y_i + y_{next(i)})$$

Where next(i) = (I+1) modN
This ensure that vertex after the vertex number (N-1) is vertex number 0.

Q6 (c) What do you mean by vanishing points? Explain.

Answer

Let us suppose a line in 3D passes through the point $A(A_x, A_y, A_z)$ and has the dissection vector $\bar{C}(c_x, c_y, c_z)$.

∴ Equation of line is

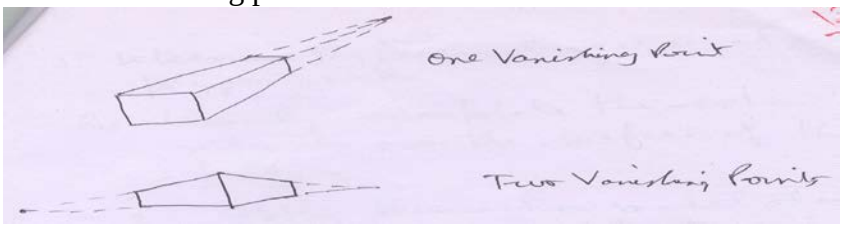
$$p(t) = A + \bar{c}t$$
$$0 \le t \le 1$$

Now the projection of the line on two view a plane is

$$p(t) = \left(N\frac{A_x + C_x t}{-A_z - C_z t}, N\frac{Ay + Cyt}{-Az - Czt} \right)$$

If the $\bar{c}$ is not parallel to the 2D view plane then projection of the line onto the view plane , for large value of t is $p(\infty) = \left(N\left(\frac{c_x}{-c_z}\right), N\left(\frac{c_y}{-c_z}\right) \right)$

This point is called vaneshing point.



Q7 (a) What is depth buffer algorithm? What are its limitations? How do you instruct OpenGL to create a depth buffer?

Answer Page Number 426,427,428 of Text-Book

Q7 (b) Explain the Gourand shading method.

Answer Page Number 422,423,424 of Text-Book

Q8 (a) What do you mean by leasing? What are its disadvantages? Describe a method to remove leasing, using post filtering.

Answer

Let p(t)=(x(t),y(t) $a \le t \le b$

Be a curve and $p^1(t) = (x^1(t), y^1(t)$

P(t) is k^h order parametric continuity every where is [a,b].We call it k- smooth curve .

Geometric continuity require that are derivative vectors have continues derectors even though they might have discontinuing in speed , Therefore, the Geometric containing requires that size of derivative vectors have continuous direction even though they might have dis-continuity in speed .

Therefore, the Geometric continuity rogueries the size of velocity vectors to be continuous.

Geometric continuity of order I in [a, b] means

$p^i(c-) = k_i p^i(c+)$

for

There $c \in [a, b]$

k_i

Is a constant p^i is i^m order derivative of p(t)
i.e. The velocity vector may jump but is continuous.

Q8 (b) How can you copy a Pixmap from one place to another? Write two OpenGL functions for performing these copying operation.

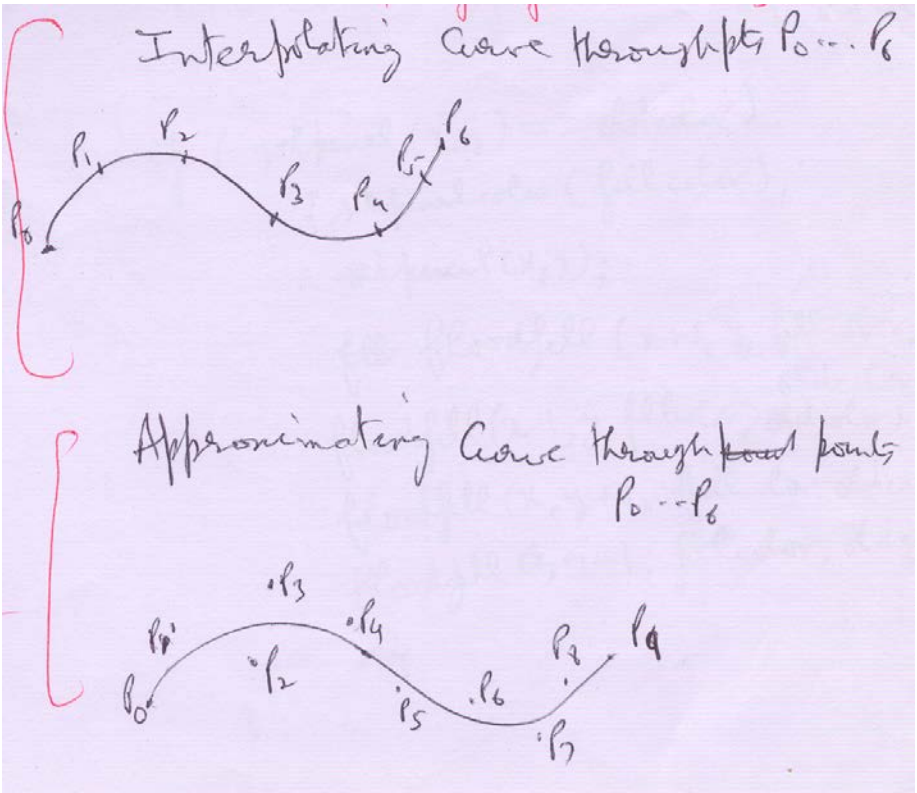
Answer Page Number 442 of Text-Book

Q9 (a) Explain parametric and geometric continuity of a curve.

Answer Page Number 514 of Text-Book

Q9 (c) Show by a diagram the distinction between interpolating and approximating curve generation methods.

Answer



Text Book

Computer Graphics using openGL, F.S. Hill, Jr., Second Edition, PHI/Pearson Education, 2005