1. Linear Algebra Review

dot product: $\hat{u} \cdot \hat{v} = u_1 v_1 + u_2 v_2$.

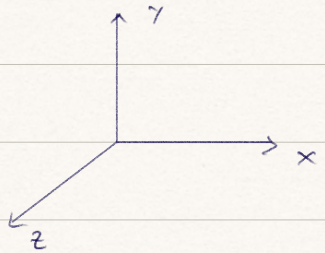
$$\hat{u} \cdot \hat{v} = \hat{v} \cdot \hat{u}$$

$$(\hat{u} + \hat{v}) \hat{w} = \hat{u} \cdot \hat{w} + \hat{v} \cdot \hat{w}$$

$$c(\hat{u} \cdot \hat{v}) = c \cdot (\hat{u} \cdot \hat{v})$$

$\hat{u} \times \hat{v}$: the vector perpendicular to both $\hat{u}$ and $\hat{v}$

1-Handedness:



right-handed sys

$$\begin{bmatrix} a_{11} & a_{21} \\ a_{12} & a_{22} \end{bmatrix} \times \begin{bmatrix} b_{11} & b_{21} \\ b_{12} & b_{22} \end{bmatrix} = \begin{bmatrix} a_{11}b_{11} + a_{21}b_{12} & a_{11}b_{21} + a_{21}b_{22} \\ a_{12}b_{11} + a_{22}b_{12} & a_{12}b_{21} + a_{22}b_{12} \end{bmatrix}.$$

For matrices, $ABC = A(BC) \neq ACB$. // accociate ✓ commmunitive ×

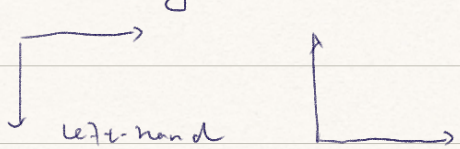
2 Display & Color

RGB16: 2^{16} 5+5+5+1 RGB24: 2^{24} 8+8+8 (true color)

2 GB A

RGB32: 2^{32} 8+8+8+8

3. Basic Building Blocks:



convex: polygon that has all angles less than or equal 180°.

immediate mode - the function calls function every frame.

retained mode:

4. Screen Space & 2D Transform.

NDC: normalized device coordinates

viewport (x_0, y_0, w, h) → in-screen position:

$x_s = (x+1)\left(\frac{w}{2}\right) + x_0$ $\quad$ glViewport(x_0, y_0, w, h).

$y_s = (y+1)\left(\frac{h}{2}\right) + y_0$

homogeneous: $\begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$ point $\quad \begin{bmatrix} x \\ y \\ 0 \end{bmatrix}$ direction

Reflection $V(V_x, V_y)$:

$$\begin{bmatrix} V_x^2 - V_y^2 & 2V_xV_y \\ 2V_xV_y & V_y^2 - V_x^2 \end{bmatrix}$$

TRSM right-to-left order.

Projection:

glfw.init()

window = glfw.create_window(w, h, name, none, none)

glMatrixMode(GL_PROJECTION)

glLoadIdentity()

glOrtho(left, right, bottom, top, near, far).