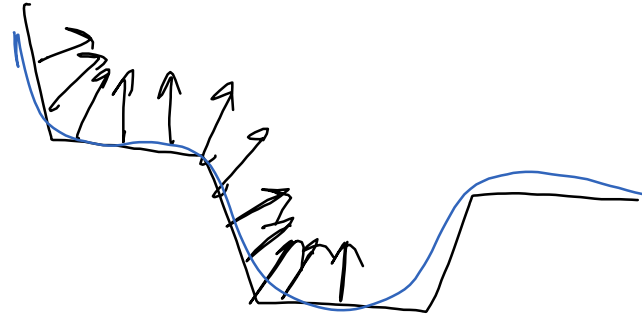
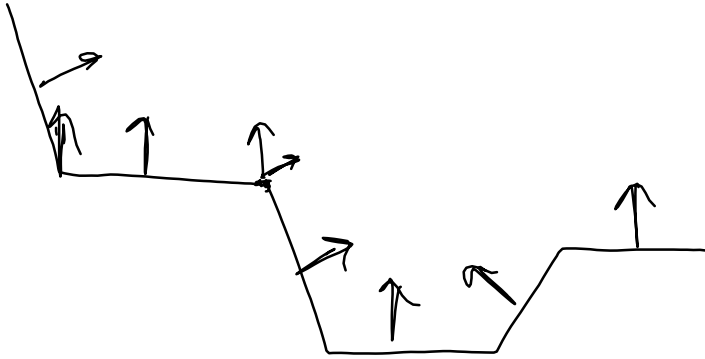
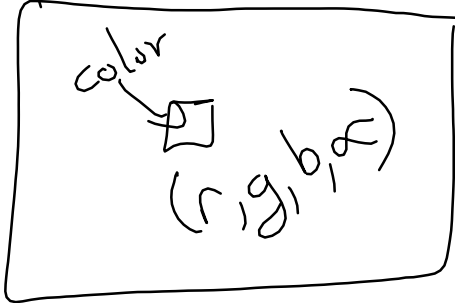


# Normals

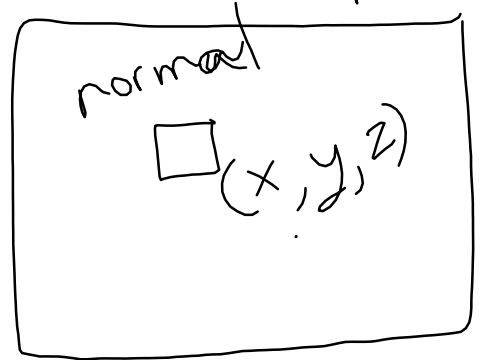


texture



$$0 \leq r \leq 1.0$$

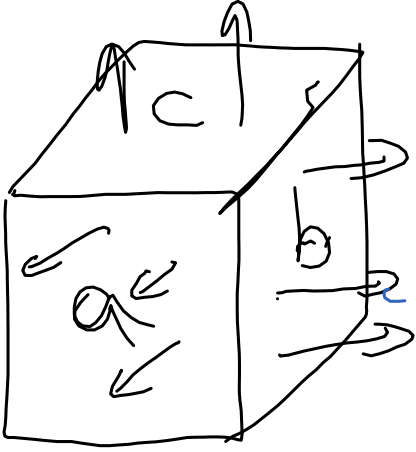
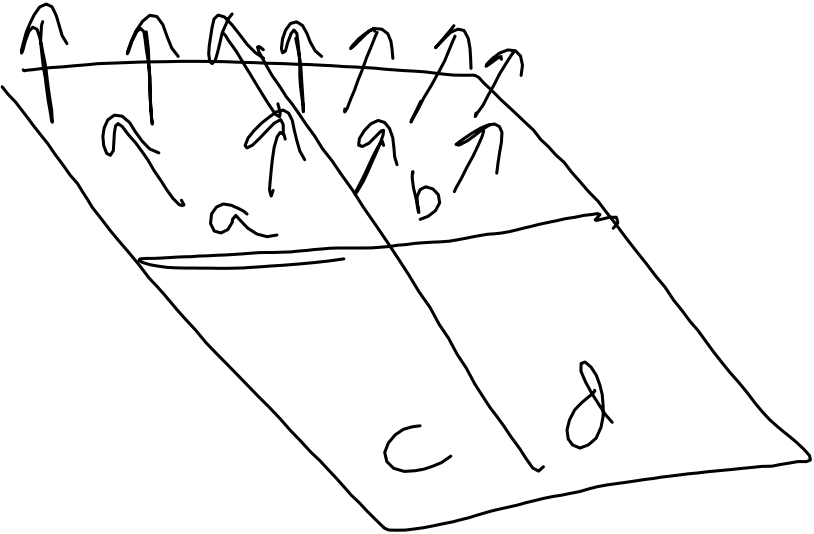
normal map



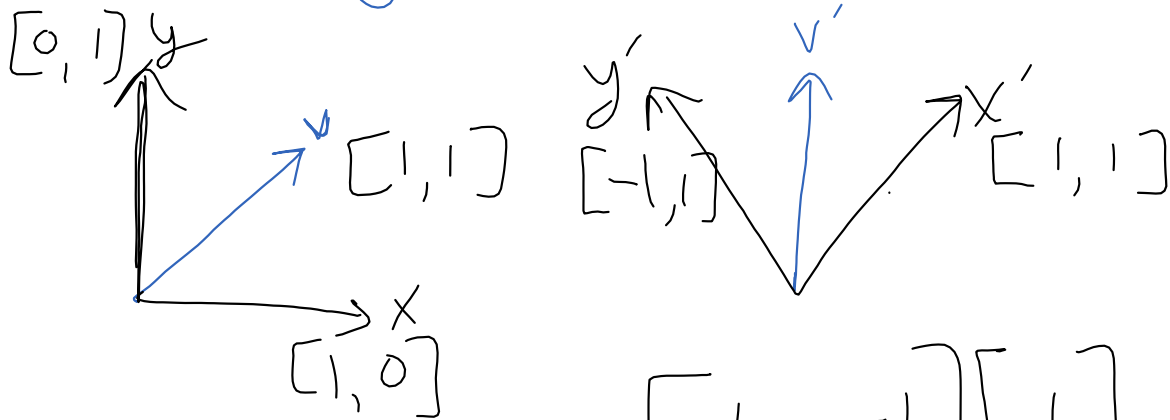
$$-1 \leq x \leq 1$$

$$r = \frac{1}{2}(x+1)$$

$$x = 2r - 1$$



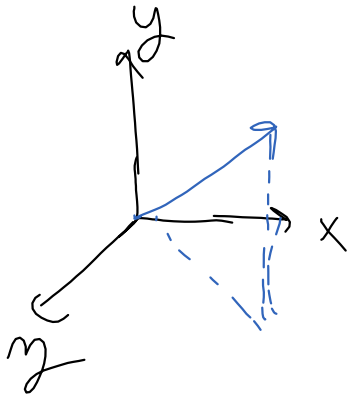
# Change of basis



$$\begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 2 \end{bmatrix}$$

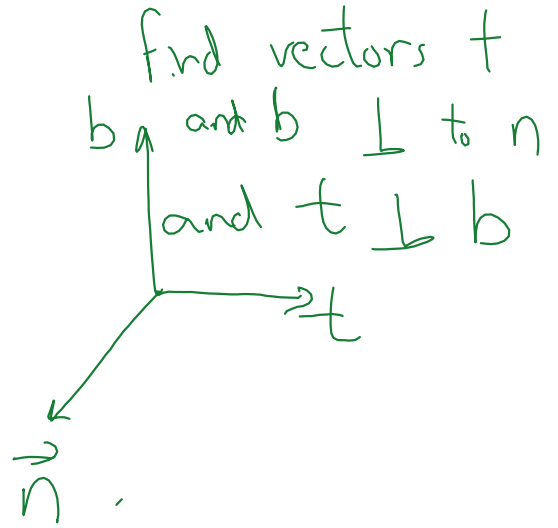
$x' \quad y' \quad v \quad v'$

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \end{bmatrix} \begin{bmatrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{bmatrix} = \begin{bmatrix} 0 \\ \frac{1}{2} + \frac{1}{2} = 1 \end{bmatrix}$$



transform  
to

surface  
normal



t: tangent

b: bitangent

$$b = n \times t \quad (\text{normalize})$$

t.x	b.x	n.x
t.y	b.y	n.y
t.z	b.z	n.z