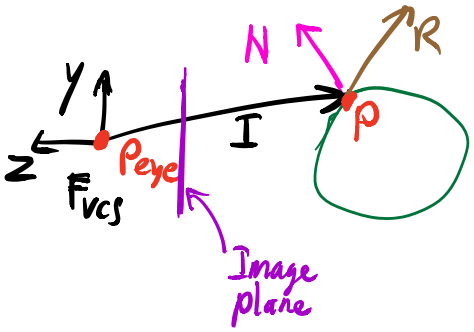
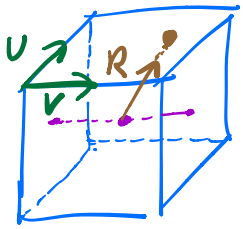
Environment Mapping

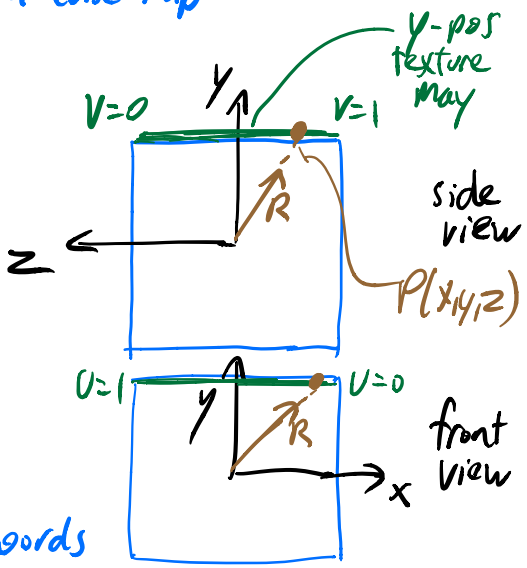
- models reflective surfaces





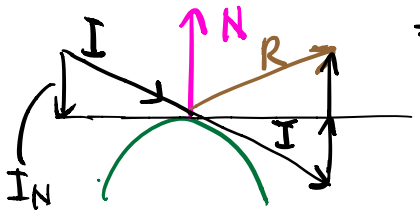
cube map: set of 6 texture maps

- lookup what is seen in direction $\vec{R}$ using a cube-map



① Compute $\vec{R} = \vec{I} - 2\vec{I}_N$

$= \vec{I} - 2(\vec{I}\cdot\vec{N})\vec{N}$



GLSL: $\vec{R} = \text{reflect}(\vec{I}, \vec{N})$

② Compute exiting face and (U,V) coords

$\vec{R}$ exits top face if R_y is the largest component:

if $R.y \geq abs(R.x)$ && $R.y \geq abs(R.z)$

Intersection point $P(x,y,z)$

Similar triangles $\frac{R_z}{R_y} = \frac{z}{y} \Rightarrow z = \frac{R_z}{R_y}$ ($y=1$)

Lastly, we require

$z=-1 \Leftrightarrow V=1$

$z=1 \Leftrightarrow V=0$

$\Rightarrow V = (-z+1)/2$

$V = \left(-\frac{R_z}{R_y} + 1\right)/2$

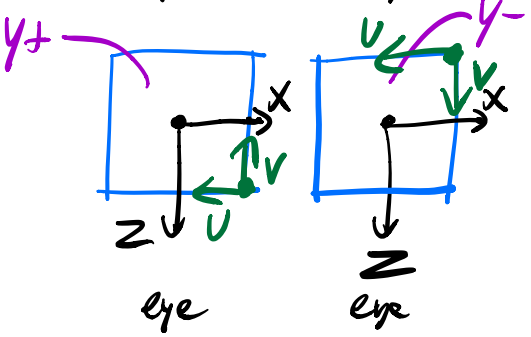
Similarly for U:

$U = \left(-\frac{R_x}{R_y} + 1\right)/2$

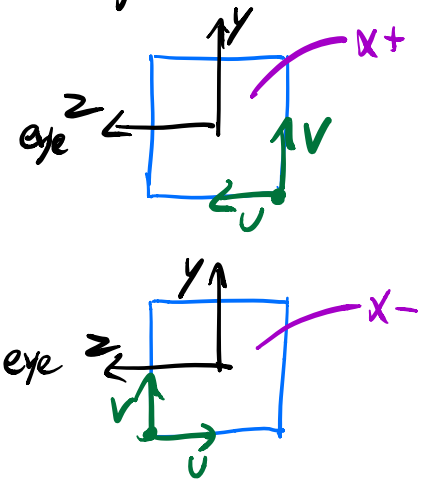
③ gl_FragColor = $I_{top}[U,V]$; // do texture map lookup

Cube map alignments for A5:

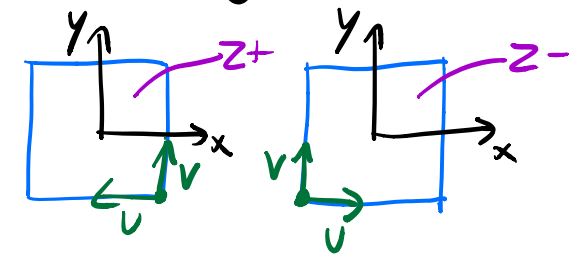
Top view: ⊙y



Right side view ⊙x



Front view ⊙z



Texture map