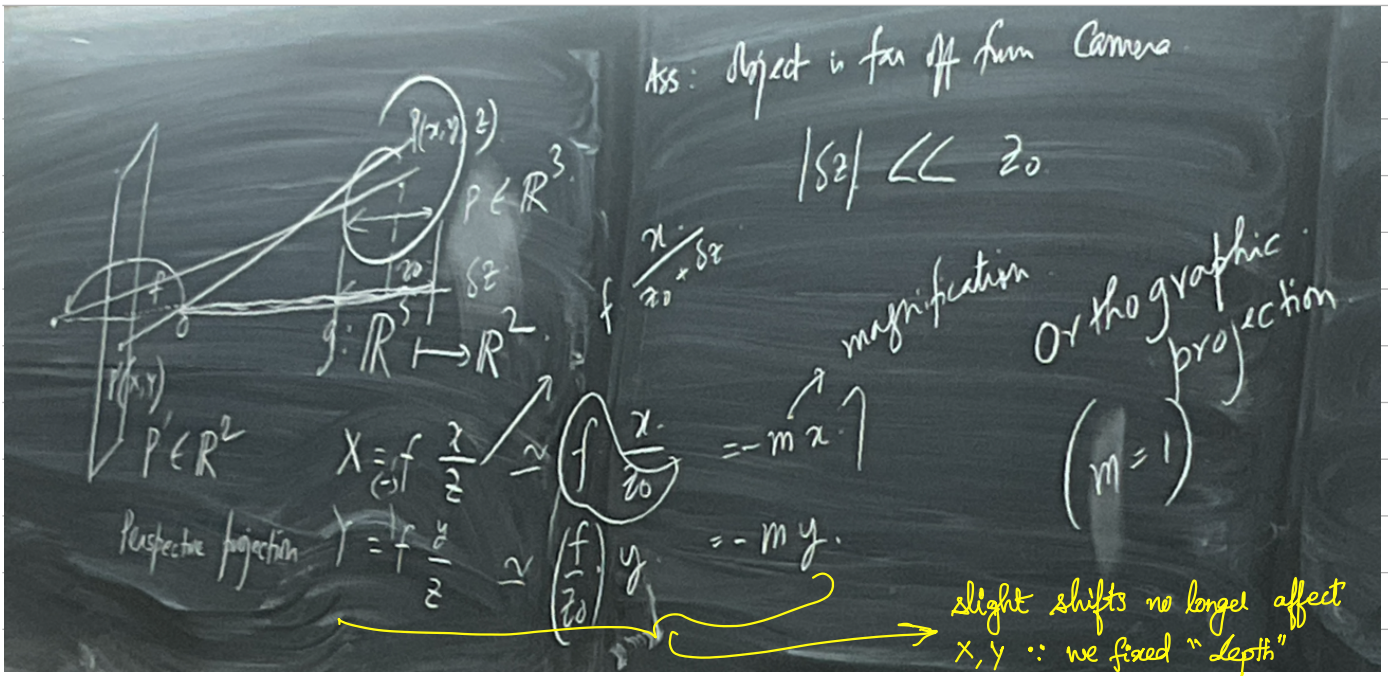
EE702: Lec-3 (15 Jan)



$\Rightarrow$ depth info is lost

$E(x,y) \longrightarrow$ over δI $\quad \frac{\delta P}{\delta I} \longrightarrow$ Image irradiance

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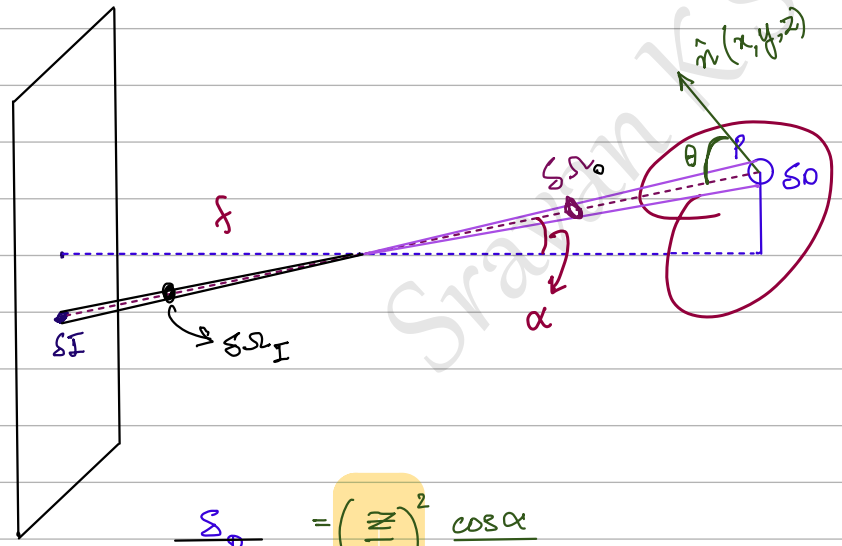

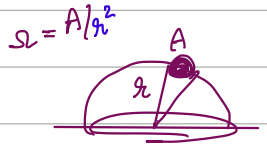

$$\delta\Omega_O = \frac{\delta_O \cos\theta}{(z/\cos\alpha)^2}$$

$$\delta\Omega_I = \frac{\delta_I \cos\alpha}{(f/\cos\alpha)^2}$$

$$\frac{\delta_O}{\delta_I} = \underbrace{\left(\frac{z}{f}\right)^2}_{m^2} \frac{\cos\alpha}{\cos\theta}$$

"Pinhole" $\longrightarrow$ no light passed through

allowed $\longrightarrow$ Geometric mapping

not allowed $\longrightarrow$ photometric mapping

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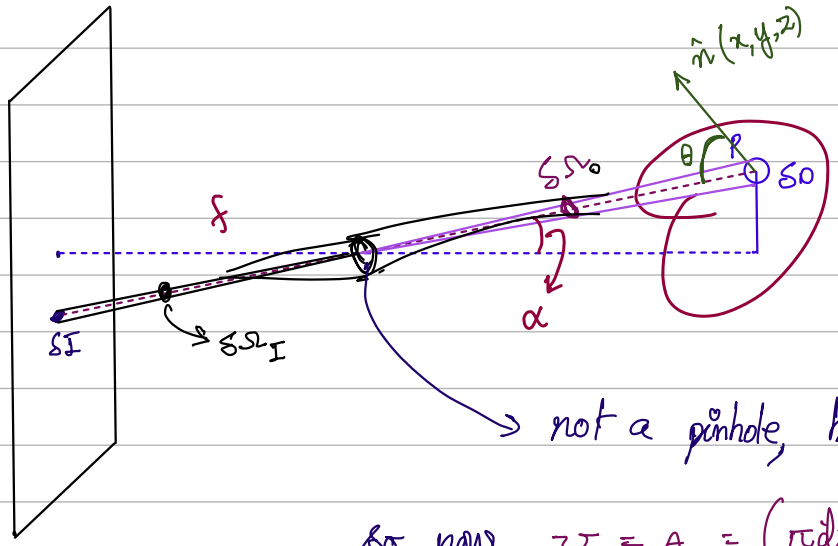

→ not a pinhole, but an aperture now of diameter d

So now, $\upsilon = \frac{A}{z^2} = \frac{(\pi d^2/4)\cdot\cos\alpha}{\left(\frac{z}{\cos\alpha}\right)^2}$ → (foreshortened)

$\therefore \delta P = L \cdot \upsilon \cdot \cos\theta \cdot \delta O$

- $\frac{\delta^2 P}{\delta O \delta\omega}$
- solid angle
- foreshortening
- area

but then as per our definitions, $\partial P = E\,\partial I$ $\left(E = \frac{\partial P}{\partial I}\right)$

$\therefore E = L \cdot \upsilon \cdot \cos\theta \cdot \left(\frac{\delta O}{\delta I}\right)$

RECOLLECT

$\frac{\delta_O}{\delta_I} = \left(\frac{z}{f}\right)^2 \frac{\cos\alpha}{\cos\theta}$

$= L\,\frac{\pi d^2}{4} \cdot \cos\alpha \cdot \frac{\cos^2\alpha}{z^2} \cdot \cos\theta \cdot \frac{z^2}{f^2} \cdot \frac{\cos\alpha}{\cos\theta}$

$$\boxed{E = L \cdot \frac{\pi}{4}\left(\frac{f}{d}\right)^2 \cos^4\alpha}$$

$\frac{f}{d}$ → "f-number" of camera

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