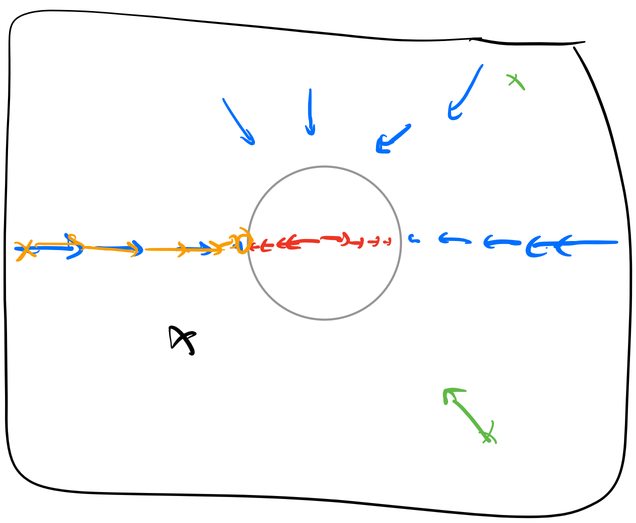
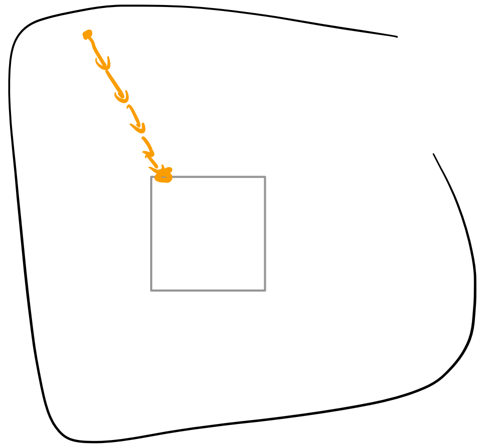
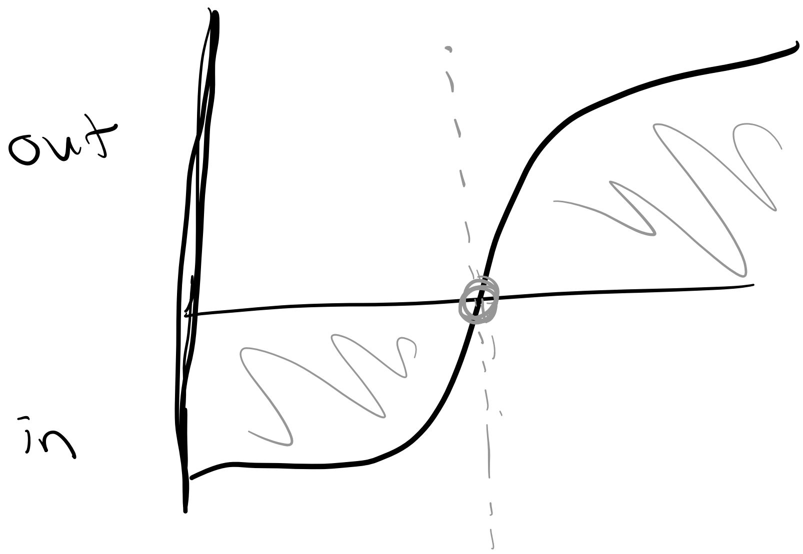
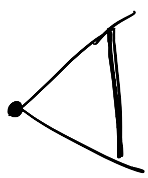
Lecture 15 - 3D Representations and NeRF

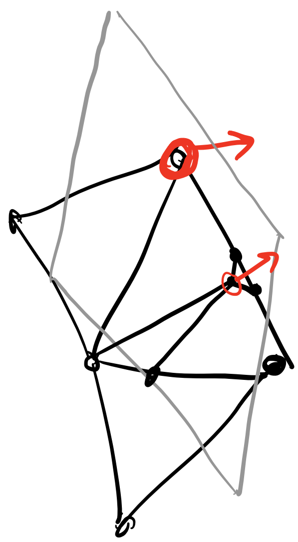
SDF

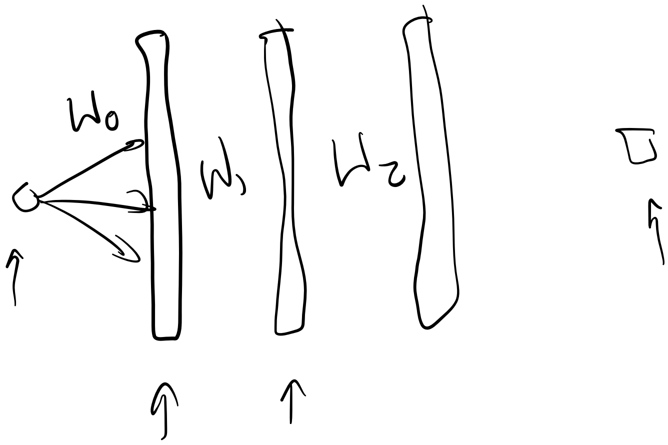












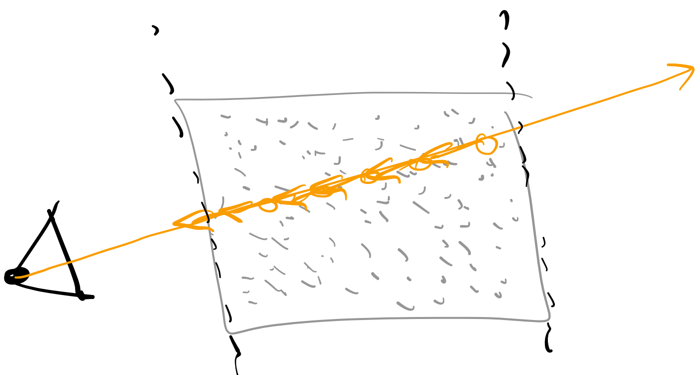
$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} \to \begin{bmatrix} \sin tx \\ \cos tx \\ \sin 2tx \\ \cos 2tx \\ \vdots \\ \vdots \end{bmatrix} \to \begin{matrix} r \\ g \\ b \\ \sigma \end{matrix}$$

$$C(r) = \int_{t_n}^{t_f} T(t)\, \sigma(r(t))\, c(r(t), d)$$

color

ray

transmittance



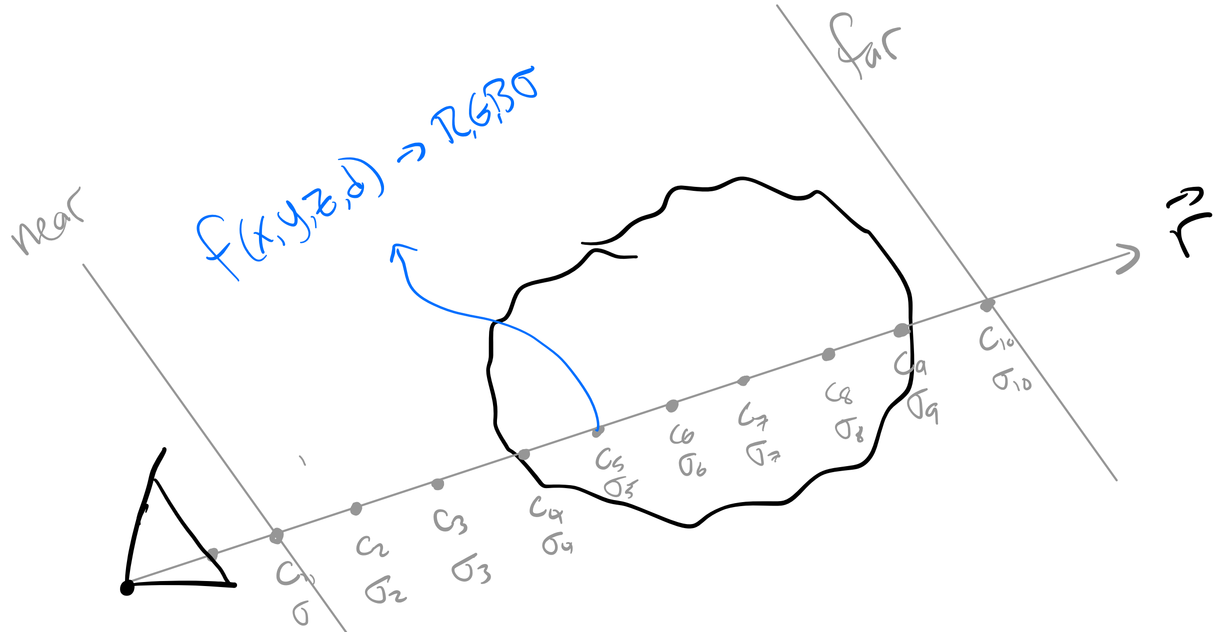
$$\hat{C}(r) = \sum_{i=1}^{N} w_i c_i$$

$$= \sum_{i=1}^{N} T_i \left(1 - \exp(-\sigma_i \delta_i)\right) c_i$$

t_n t_f

$\delta_i = t_{i+1} - t_i$

$T_i = \exp\left(\sum_{j=1}^{i-1} \sigma_i \delta_i\right)$



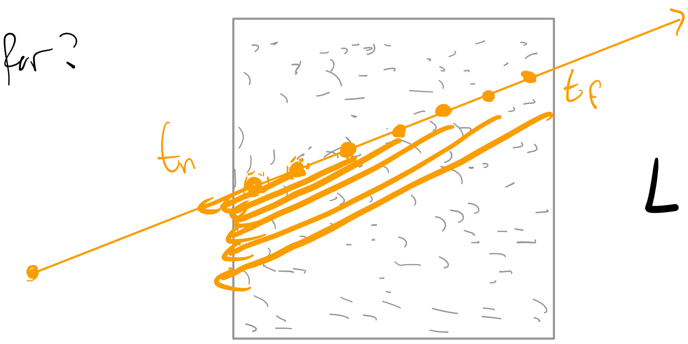
$$C(r) = \int_{t_n}^{t_f} T(t)\,\underbrace{\sigma(\vec{r}(t))}_{\text{density}}\,\underbrace{c(\vec{r}(t),\vec{d})}_{\text{Color}}\,dt$$

"transmittance"

Or, how much light make it this far?

$$T(t) = e^{-\sum_{j=1}^{i-1} \sigma_i \delta_i}$$

density distance traveled



$L \propto \frac{1}{t}$