NO.

DATE . .

Camera Matrices

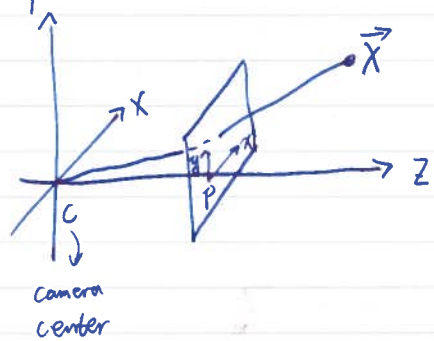
$$X_{cam} = \begin{pmatrix} R & -R\tilde{C}_w \\ 0 & 1 \end{pmatrix} X_w = KR(I \mid -\tilde{C}_w) X_w$$

$\mathbb{H}^3$ $\quad \mathbb{R}^{4\times4}$ $\quad \mathbb{H}^3$

$\tilde{C}_w \in \mathbb{R}^3$: camera coordinates in world frame

$$M_w^c = \begin{pmatrix} R & -R\tilde{C}_w \\ 0 & 1 \end{pmatrix} \Rightarrow M_c^w = (M_w^c)^{-1} = \begin{pmatrix} R^T & \tilde{C}_w \\ 0 & 1 \end{pmatrix}$$

Intrinsics ← world-to-cam



$$\begin{pmatrix} X \\ Y \\ Z \\ 1 \end{pmatrix} \mapsto \begin{pmatrix} fX \\ fY \\ fZ \end{pmatrix}$$

Note

$$R^T = \begin{pmatrix} | & | & | \\ \hat{X}_w^{cam} & \hat{Y}_w^{cam} & \hat{Z}_w^{cam} \\ | & | & | \end{pmatrix}$$

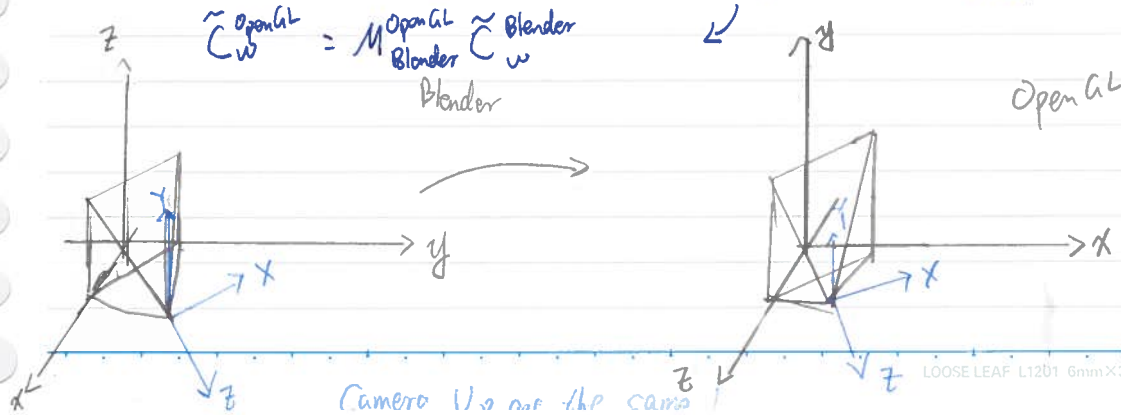
$\hat{X}_w^{cam}$ = "camera's x-axis in world frame"

Let $M_{Blender}^{OpenGL} \in \mathbb{R}^{3\times3}$ s.t.

$$X_w^{OpenGL} = M_{Blender}^{OpenGL} X_w^{Blender}$$

$$(R^{OpenGL})^T = M_{Blender}^{OpenGL} (R^{Blender})^T$$ ← camera-to-world

$$\tilde{C}_w^{OpenGL} = M_{Blender}^{OpenGL} \tilde{C}_w^{Blender}$$



Camera Use at the cams

NO.

DATE

Another Formulation

Note $X^{\text{OpenGL. camera}} = X^{\text{Blender. camera}}$

$X^{\text{OpenGL. world}} = M^{O,w}_{B,w} X^{B,w}$

$X^{O,c} = (R\ t)^{O,w} X^{O,w}$

$= (R\ t)^{O,w} M^{O,w}_{B,w} X^{B,w}$

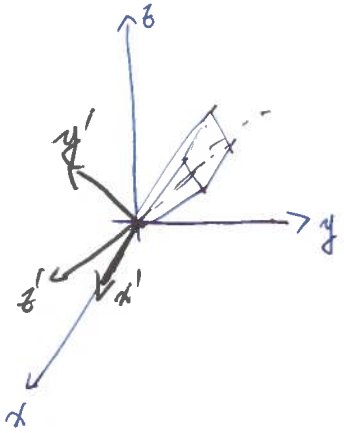
Also $X^{B,c} = (R\ t)^{B,w} X^{B,w}$

$\Rightarrow$ ~~$(R\ t)^{O,w} = (R\ t)$~~

$(R\ t)^{O,w} M^{O,w}_{B,w} = (R\ t)^{B,w}$

$(R\ t)^{O,w} = (R\ t)^{B,w} M^{B,w}_{O,w}$

Blender Cameras (Blender: z-up)



135° rotation ~~on x-t~~ along x

bpy.context.object.matrix_world =

$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -\frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ 0 & \frac{\sqrt{2}}{2} & -\frac{\sqrt{2}}{2} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Camera-to-world

Looking at $-z'$ direction

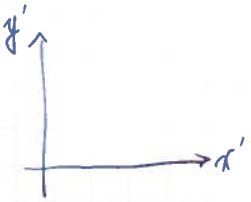
Intrinsics:

camera.lens = focal length (in mm)

camera.sensor_width (in mm)

$$\frac{\text{lens}}{\text{sensor width}} = \frac{f}{w} = \hat{f}$$

Image Plane



Import OBJ to Blender

"Blender uses y forward, z up; default for obj: y up, -z forward"