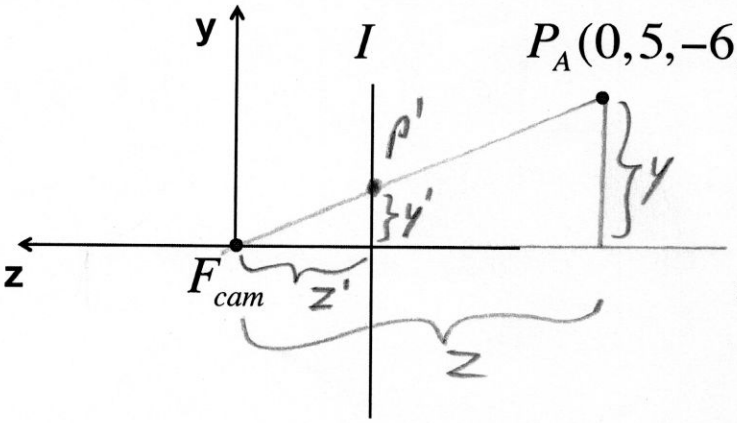
Name Solutions

Perspective Projection -- example



$$\frac{y'}{z'} = \frac{y}{z}$$

$$\Rightarrow y' = \frac{y}{z} \cdot z'$$

$$= \frac{5}{-6}(-2) = \frac{5}{3}$$

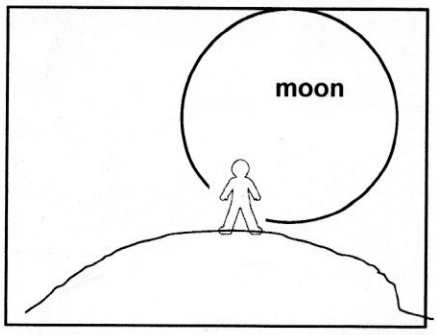
Compute the projected coordinates of the given points for a perspective projection. The image plane is located at z = -2.

In which direction should we move the image plane in order to obtain a larger image?

Transform P_A by M_{proj} and then $/h$, i.e. $P_A \rightarrow [M_{proj}] \rightarrow [/h] \rightarrow P_A'$

$$\begin{bmatrix} 0 \\ 5 \\ -6 \\ 3 \end{bmatrix}_{CCS} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & -\frac{1}{2} & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 5 \\ -6 \\ 1 \end{bmatrix}_A \quad /h \Rightarrow \quad \begin{bmatrix} 0 \\ 5/3 \\ -2 \end{bmatrix} \quad A' \text{ in NDCS}$$

Impossible Photography?



How could we take a photograph like the one on the left?

In reality the moon is of course much larger and effectively at infinite distance. Thus we can make the person small with respect to the moon by moving far away, and then using a zoom lens to magnify the scene.

The edges of the building on the left are parallel, despite the viewer standing on the ground while taking the photograph. How is this possible?

This photograph could be taken with a "tilt-shift" camera. The lens plane remains vertical. With a regular camera, we would only see the bottom of the building. With a "shift" of the image plane, we can effectively select the right area of the image plane to capture the full building.