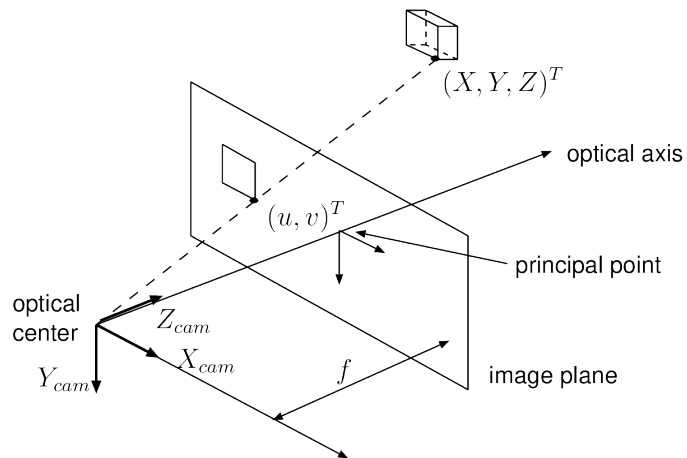


Discussion 6

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6.1 Question 1: Pinhole Model



Using the image above, find the relationship between the 3D point $(X, Y, Z)^T$ to its corresponding 2D projection (u, v) on to the imaging plane.

Hint: Use Law of Similar Triangles.

6.2 Question 2: Camera Intrinsic Matrix

The camera intrinsic parameter matrix K is represented as

$$\begin{bmatrix} f s_x & s_\theta & o_x \\ 0 & f s_y & o_y \\ 0 & 0 & 1 \end{bmatrix}$$

What do these terms represent?

6.3 Question 3: Vanishing Points

A straight line in the 3D world becomes a straight line in the image. However, two parallel lines in the 3D world will often intersect in the image. The point of intersection is called the vanishing point.

1. Given two parallel lines, how do you compute the vanishing point?
2. When does the vanishing point not exist (the two lines do not intersect)?
3. Show that the vanishing points of lines on a plane lie on the vanishing line of the plane.