

Problem Set1 PartB

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Q1: calculate the focal length

I took the image parallel the road, so in the world coordinates I assume a long the road as the z-axis, perpendicular to the road as the x-axis, and y-axis is perpendicular to the ground plane which is parallel the buildings.

For the camera coordinate system, because the rotate angle is 0 and the origin is moved to the camera, so the only different is the translation of the y-axis.

The origin of the image coordinates is the center of the image. Using the vanishing point to compute the focal length. Marked the vanishing point as p_1, p_2, p_3 , in the pixel coordinate $p_1 = (58.5, 3652), p_2 = (208, -587), p_3 = (250, -680)$. The pixel focal length equation is $f = \sqrt{-p_1.x * p_2.x - p_1.y * p_2.y}$, and use the average of the data to compute the focal length. So the pixel focal length is 1686.

The pixel focal length that I calculated is very close to the real focal length.

Q2: calculate the camera height of the image

For calculate the height of the camera, we first need a reference object and the vanishing line. We have known the man's height is 1.75m. Then create a scale on the picture. The vanishing line is equal to the man's line, so the camera height of the iamge is 1.75m.

