

# EE5175 - Lab 2

## Occlusion detection

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Given are two aerial images (IMG1.png, IMG2.png) of an airport parking bay. Those are attached below:



These images were captured using two cameras placed at different locations and at different instants of time but overlooking the same area.

It is known that the images are related by an in-plane rotation and translation.

The following point correspondences are given:

Correspondence	IMG1 (x; y)	IMG2 (x; y)
1	(29; 124)	(93; 248)
2	(157; 372)	(328; 399)

Our aim is to determine the changes in IMG2 with respect to IMG1 using bilinear interpolation during target-to-source mapping.

Coordinate convention followed to represent the above points (same as the standard Python convention),

1. Origin (0,0) at top left corner of the image
2. x-axis = along the rows of the image
3. y-axis = along the columns of the image

First we write out the homography equation and find out the H matrix.

Using the first set of coordinates we get two equations which are:

$$29*h_{11} + 124*h_{12} + h_{13} = 93 \quad \dots\dots\dots(1)$$

$$-29*h_{12} + 124*h_{11} + h_{23} = 248 \quad \dots\dots\dots(2)$$

Using the second set of coordinates we get two equations which are:

$$157*h_{11} + 372*h_{12} + h_{13} = 328 \quad \dots\dots\dots (3)$$

$$-157*h_{12} + 372*h_{11} + h_{23} = 399 \quad \dots\dots\dots(4)$$

Subtracting (3) and (1) we get:

$$128*h_{11} + 248*h_{12} = 235 \quad \dots (5)$$

Similarly Subtracting (4) and (2) we get

$$-128*h_{12} + 248*h_{11} + = 151 \quad \dots(6)$$

Now we can solve equations (5) and (6) and get

$$h_{11} = 0.8669$$

$$h_{12} = 0.5001$$

Substituting these values back we get :

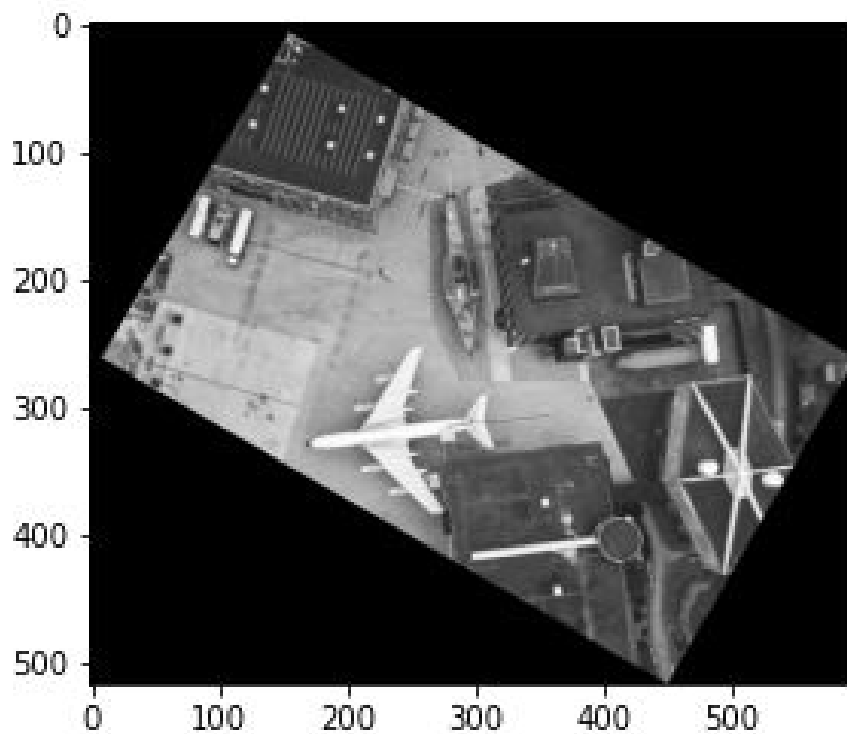
$$h_{13} = 5.8475$$

$$h_{23} = 155.0073$$

Thus we can see that Translation values are  $T_x = 5.8475$  and  $T_y = 155.0073$   
And rotation value (in deg) =  $\sin^{-1}(0.5001) = 30$  deg.

Thus we can obtain img2 by using this H matrix on img1.

The resultant img we get is :



The difference between this image and image2 is attached below:

