**Excercise 1 Projective Transformation:**

**Image alignment by estimation of a homography**

To start the process we have to read the images we have, and present it by (Imread, imshow). Then to be able to digitize the points, the user should select these points. In order to do so, we have to create a line or a polygon and take the head of the polygon, thus this could be done by the command (getline). The homogeneous matrix contains nine elements and each points we read the image would have two coordinates x and y, thus the min. number of points is four. We are dealing with homogeneous coordinates as I mentioned before, so we have to store our coordinates we had in a homogeneous matrix. To solve the problem correctly each point from the first image should have an identical point in the second image. So the number of points in the first image should be equal to the second one.

The relationship of the points between the two images is:

Present this equation in a different way it will be easier to work with and we will get a linear system. The first we know the two vectors are identical but in a different scale so the cross product would play a role in this case

After the computing the cross the system would be.

This representation is not completely true because we know that we should have two equations from one point. To correct that we have to neglect one of the rows which is just representing the scale.

The minimum number of points is four.

Now it’s a linear system and to solve that efficiently we would use Singular Value Decomposition (SVD) of the matrix A.