

# ME8135 - State Estimation - Assignment 4

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Due: Jun 16, 4 PM. Write a PDF file, commit it to your Github project repo, named State Estimation, and submit the link, with the PDF attached. In your report, repeat the question statement. The code must be committed to the Github.

The objective of this course is to learn how to distinguish inliers from outliers in statistical inference. For more information, refer to ‘Ch 5.3 Handling Outliers’ of your textbook.

Given the source and destination 2d points below, compute a homography that maps the source points to the destination. a minimum of 10 inliers needed to be detected by the RANSAC algorithm. The re-projection error of the inliers need to be less than 0.005.

To learn about homography, see

<https://www.cs.toronto.edu/~lindell/teaching/420/slides/lecture8.pdf>

or read ‘Multiple View Geometry in Computer Vision’ textbook.

Report your normalized homography transformation. Write your code in Python, do not use OpenCV. Plot a scatter plot, showing inliers (marked by o) and outliers (marked by x), where inliers of source and destination are connected via a line. Include the plot in your report. You should only use the following modules:

```
import numpy as np
import random
import matplotlib.pyplot as plt
```

# 1 Report

The algorithm was implemented by following the outline and details in the linked lecture slides. I omit merely repeating here. As required, the minimum inliers is 10 and the re-projection error threshold is set to 0.005. At each iteration, the minimum of four points is randomly chosen to compute the homography. While more points could be used each iteration, four is sufficient here.

The resulting normalized transform is:

$$\begin{bmatrix} 0.70917868 & 0.43442468 & 0.129146 \\ 0.28310411 & 0.17443173 & 0.42877658 \\ 0.15491603 & 0.01687054 & 1. \end{bmatrix}$$

Figure 1 shows a plot of the given points. The source points are blue and the destinations are red. Inliers are shown as boldly colored circles and outliers as lightly colored x's. Gray lines connect corresponding points.

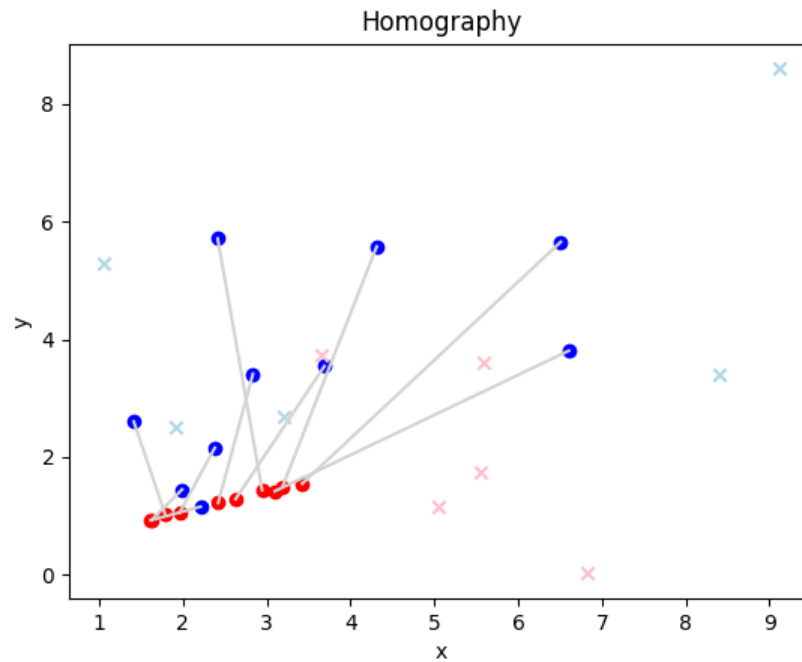


Figure 1: Plot of the given points.