CV: Lab 07 Writeup

Benedict Armstrong
benedict.armstrong@inf.ethz.ch

Assignment

For this assignment we were asked to implement a structure from motion (sfm) pipeline and the RANSAC algorithm.

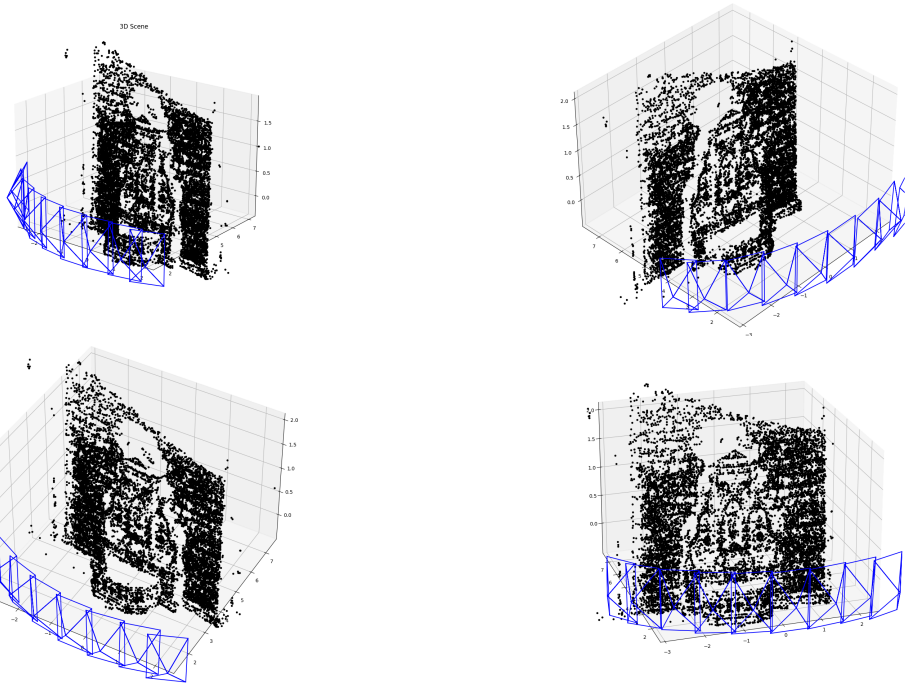
Structure from Motion

I started by implementing the `EstimateEssentialMatrix()` function. This article was very helpful for implementing the 8-point algorithm.

Next I used the `TriangulatePoints` method to determine the correct orientation for the first two cameras.

The final step was matching the keypoints of all the other images to build a 3D point cloud. After some initial trouble I discovered that it worked best when I excluded the image `0000.png`.

The following images were taken from the interactive 3D plot.



Random sample consensus fitting (RANSAC)

Compared to the first task implementing RANSAC was pretty straightforward.

The implementation can roughly be split into four parts:

1. Randomly select a subset of the data. I used `np.random.choice` (without repeating samples) to select the indices of the data points.
2. Find a linear least squares solution to the subset of the data. I used `np.linalg.lstsq` to find the solution.
3. Calculate the outliers and a mask.

```
distances = x * k + b - y
mask = np.where(distances < thres_dist, True, False)
```

4. If the number of inliers (`mask.sum()`) is greater than the current best, update the best model.

My results for k, b:

	k	**b**
ground truth	1	10
last-squares	0.62	8.96
RANSAC	0.99	10.10

Table 1: Results for k and b.

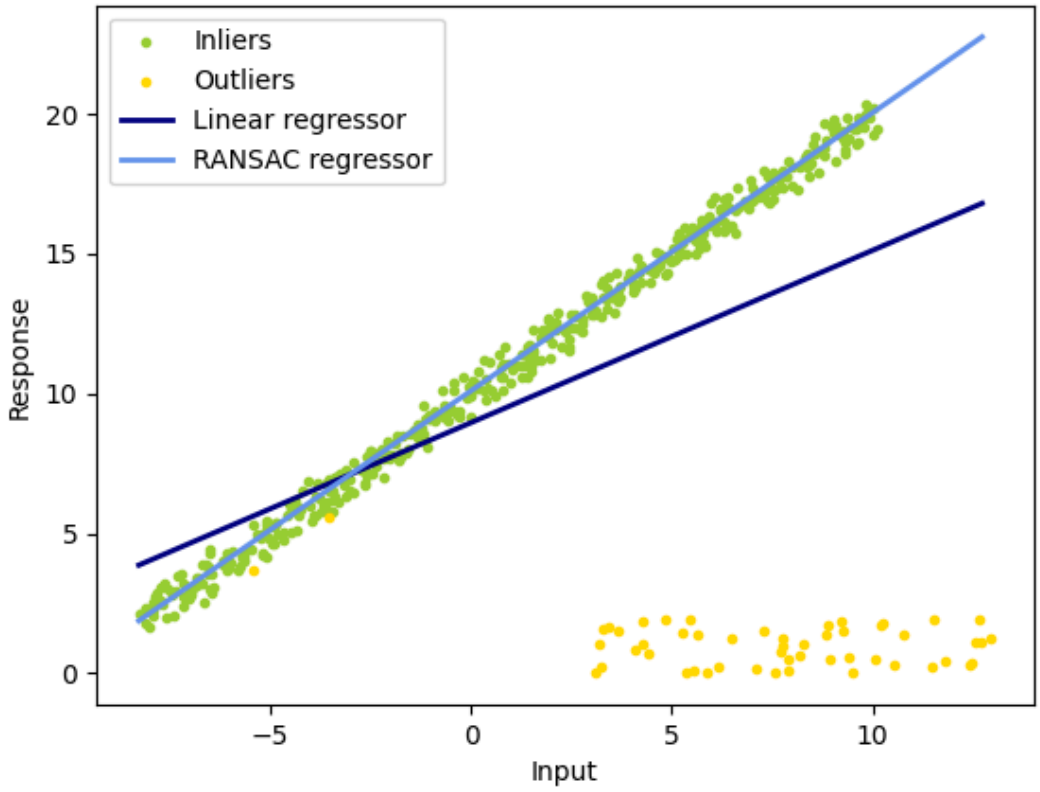


Figure 5: Result of RANSAC on the provided data.