

CMSC733

Homework 1

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I. INITIAL PARAMETER ESTIMATION

Initial intrinsic and extrinsic parameters were estimated as described in Section 3.3 of [1]. One interesting fact I noted during this process was how much of a difference it made which corresponding points were selected to estimate the initial homography between reference and sample images. Initially I would select four random point pairs for each homography estimation, and the resulting \mathbf{K} values would vary greatly. Ultimately I switched to using the outermost corners as the reference points for all homographies.

The resulting \mathbf{K} matrix for camera internals is shown in Figure 1.

```
[[ 9.38901225e-03 -8.25700163e-03  8.67512458e-03]
 [ 0.00000000e+00  1.20188916e-04  1.08575229e-04]
 [ 0.00000000e+00  0.00000000e+00  1.00000000e+00]]
```

Fig. 1. Initial camera-internal matrix \mathbf{K} estimated analytically

II. ERROR MINIMIZATION

Error minimization was attempted but not achieved by this author. I still do not fully understand how `scipy`'s optimization functions work—my code as written throws an error, complaining that there are more parameters to optimize than data points to optimize from. As a result of this setback I was unable to produce rectified images. So it goes.

REFERENCES

- [1] ZHANG, Z. A flexible new technique for camera calibration. *IEEE Transactions on pattern analysis and machine intelligence* 22 (2000).