**Lab3:** **Camera Calibration**

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1. Compute the projection matrix from a set of 2D-3D point correspondences by using the least-squares (eigenvector) method for each image.

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1. Decompose the two computed projection matrices from (A) into the camera intrinsic matrices K, rotation matrices R and translation vectors t by using the Gram-Schmidt process. Any QR decomposition functions are allowed. The bottom right corner of intrinsic matrix K should be normalized to 1. Also, the focal length in K should be positive.

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1. Re-project 2D points on each of the chessboard images by using the computed intrinsic matrix, rotation matrix and translation vector. Show the results (2 images) and compute the point re-projection root-mean-squared errors.

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| RMSE: 1.21 | RMSE:1.25 |

1. Plot camera poses for the computed extrinsic parameters (R, t) and then compute the angle between the two camera pose vectors.

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1. Print out two “chessboard.png” in the attached file and paste them on a box. Take two pictures from different angles. For each image, perform the steps above (A ~ D).

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| A |
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| B |
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|  |
| C |
| |  |  | | --- | --- | |  |  | | RMSE:1.93 | RMSE:2.98 | |
| D |
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1. Instead of mark the 2D points by hand, you can find the 2D points in your images automatically by using corner detection, houghtransform, etc.

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| Corner detection of image 1 | Corner detection of image 2 |
| Please run exc\_corner\_detection.py to generate corner detection results. | |