Homework1: AutoCalib

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Using 1 late day

***Abstract*—This report outlines the steps taken to calibrate a camera using Zhengyou Zhang's seminal work on camera calibration. [1]**

I. Initial Camera Calibration Matrix Estimate(K)

Initial estimate is computed using the formulation presented in section 3.1 in [1]. The following was the initial estimate according that

$$K = \begin{bmatrix} 2053.86 & -0.557111 & 762.31 \\ 0 & 2037.98 & 1351.61 \\ 0 & 0 & 1 \end{bmatrix}$$

II. Computing Camera Extrinsics

Using these initial parameters camera extrinsincs, i.e rotation R and translation t have been calculated

III. Non Linear optimization

Using the above estimated R and t, non linear optimization has been performed. Following is the final camera calibration matrix and camera distortion parameters

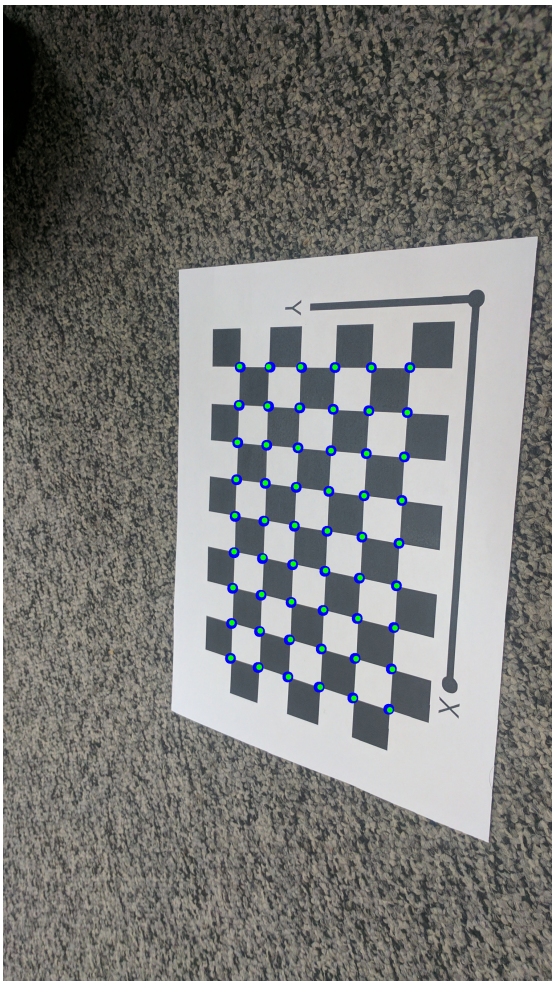
$$K = \begin{bmatrix} 2053.84 & -0.557111 & 762.86 \\ 0 & 2037.98 & 1351.20 \\ 0 & 0 & 1 \end{bmatrix}$$

$$k = \begin{bmatrix} 0.020 \\ -0.166 \end{bmatrix}$$

IV. Results

Following are the reprojection error for each image

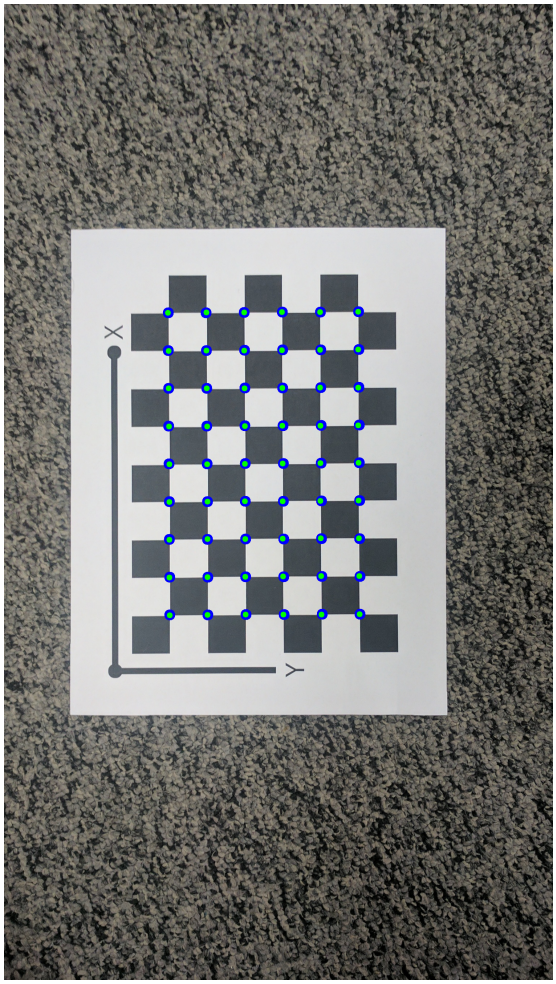
$$reprojection\_error = \begin{bmatrix} 104.9017 \\ 77.4634 \\ 119.5921 \\ 48.4596 \\ 99.6453 \\ 52.3463 \\ 289.500 \\ 47.8076 \\ 120.504 \\ 81.9897 \\ 99.7413 \\ 150.874 \\ 82.8820 \end{bmatrix}$$



1 to 13 show the rectified and reprojected corners

References

[1] Z. Zhang, "A flexible new technique for camera calibration," in IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 22, no. 11, pp. 1330-1334, Nov. 2000, doi: 10.1109/34.888718.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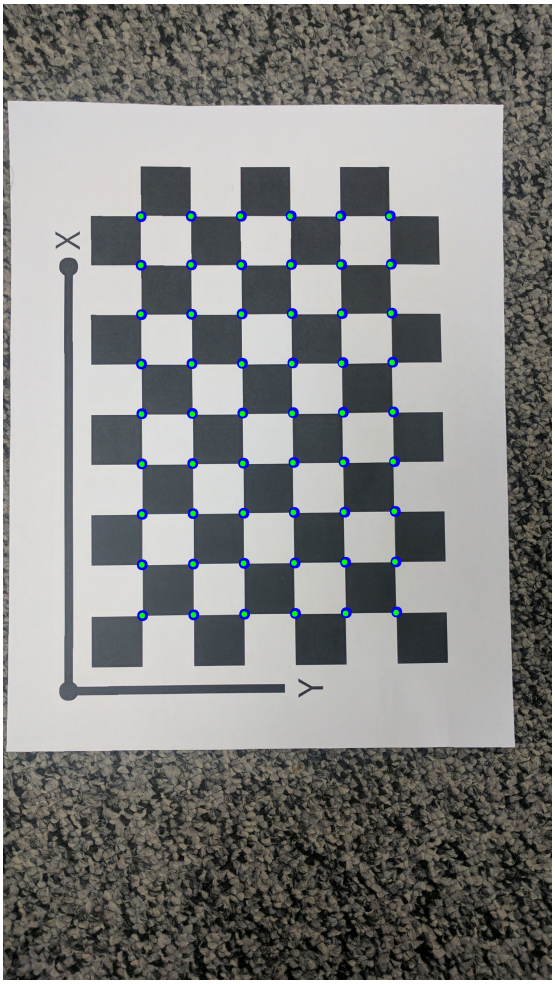
Y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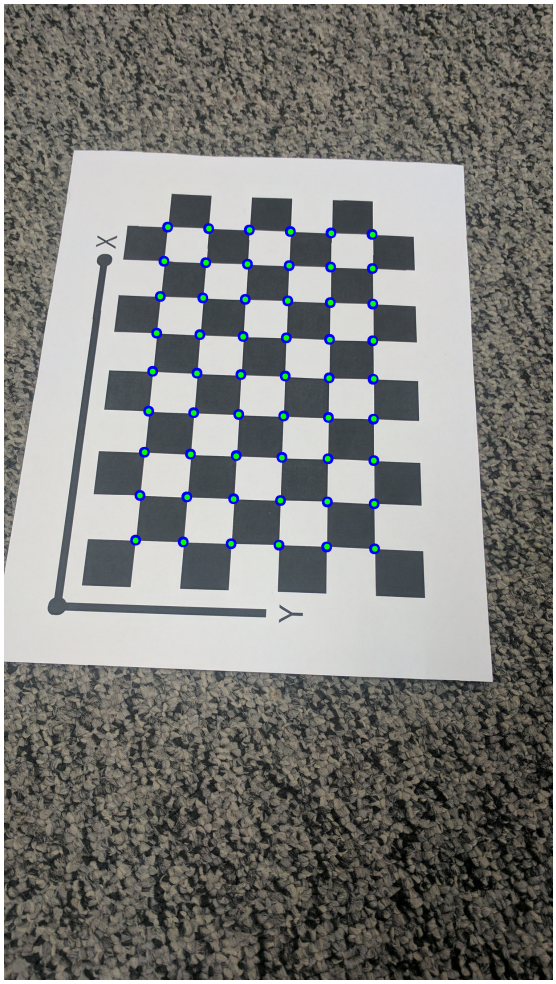
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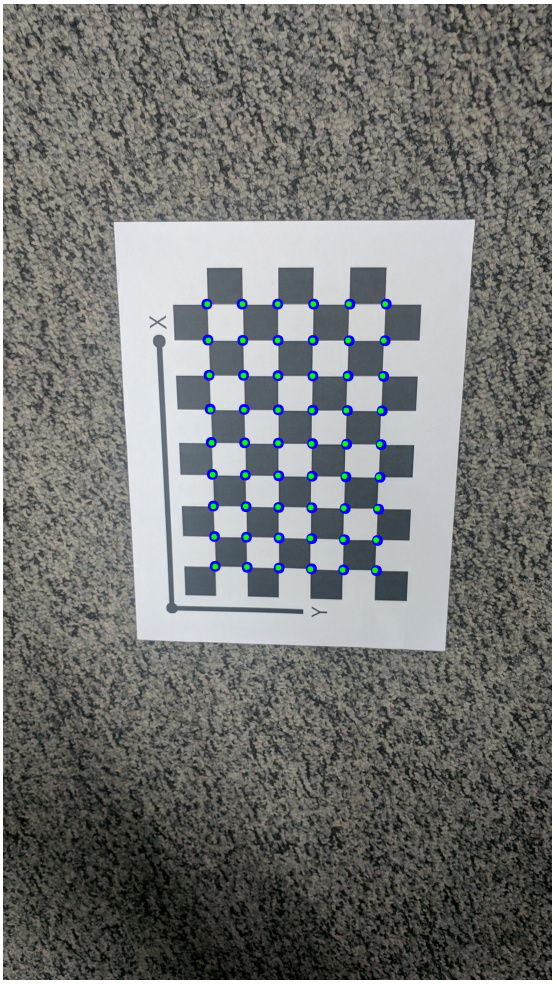
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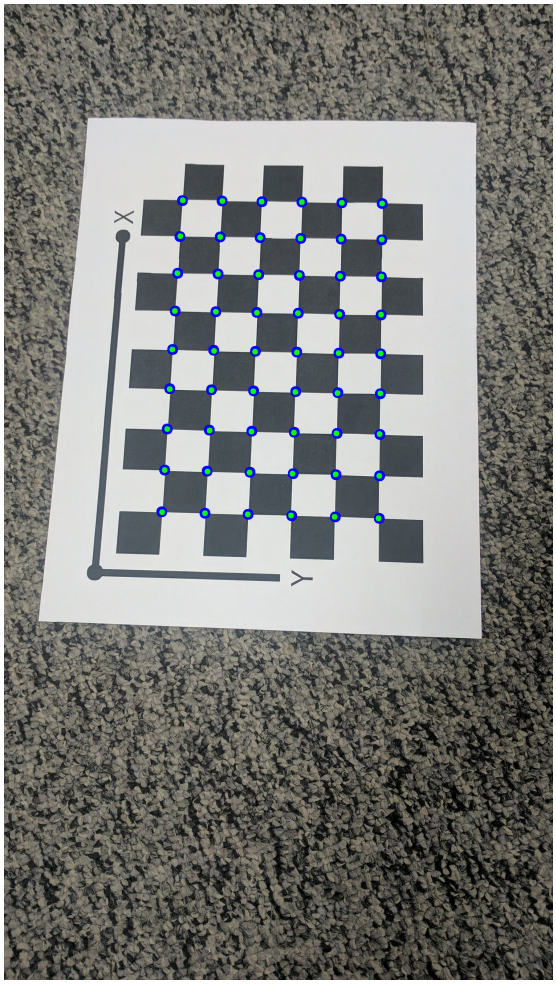
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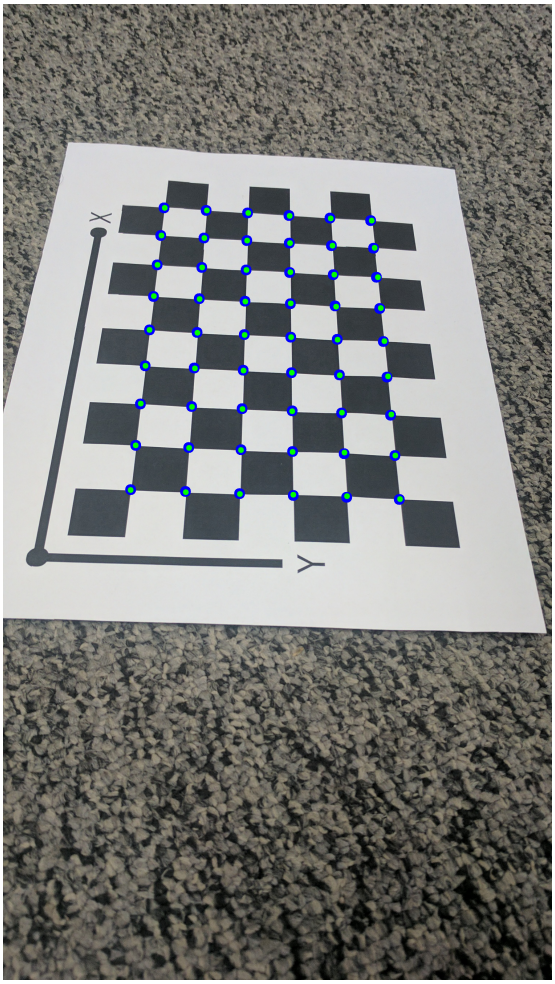
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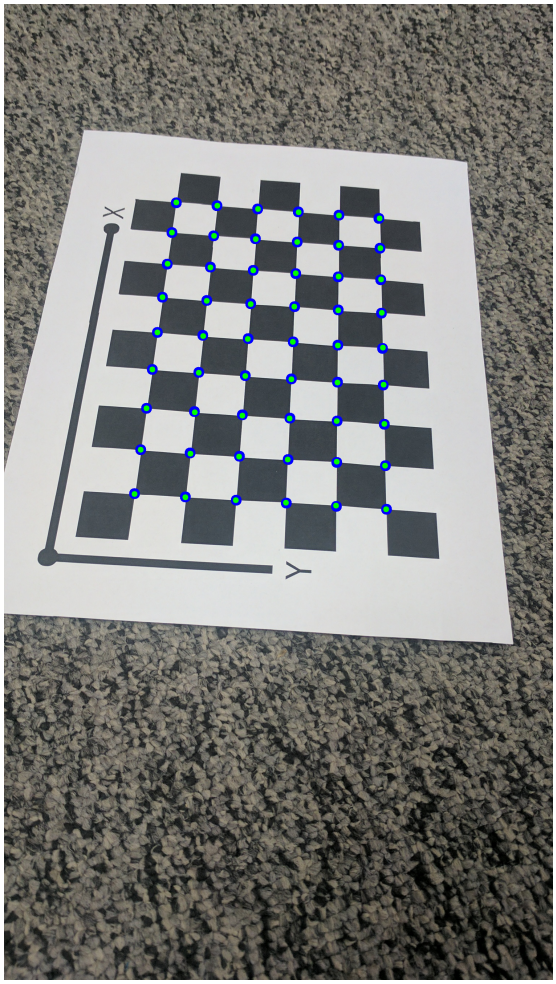
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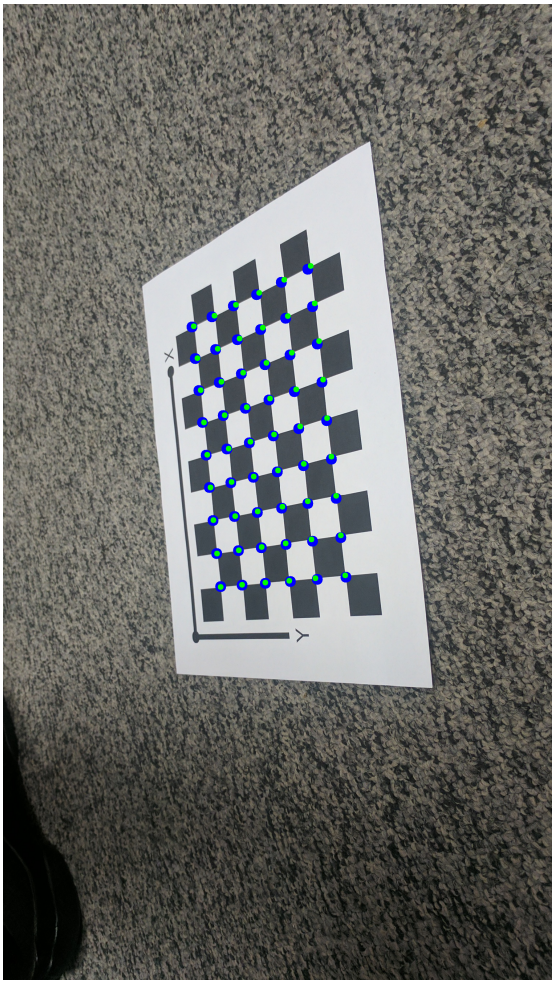
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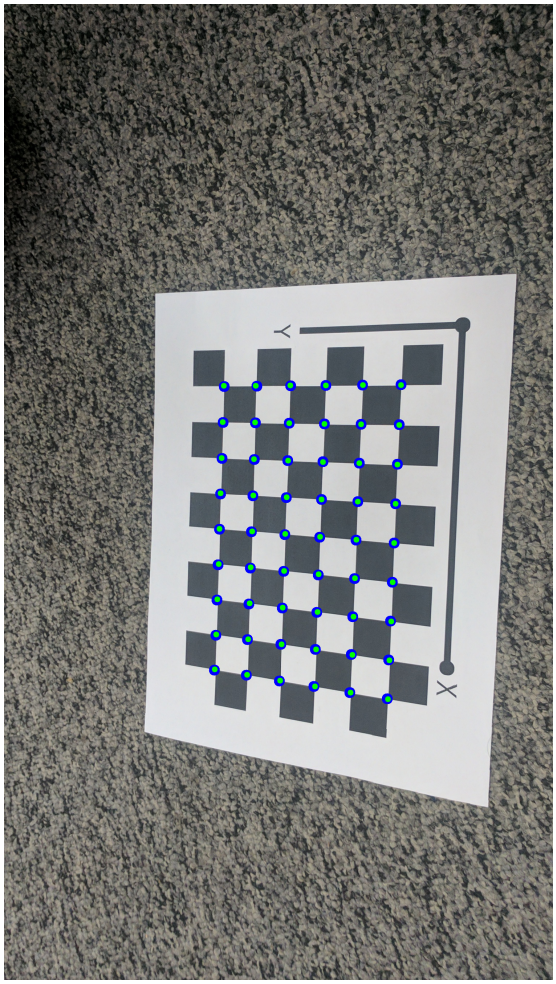
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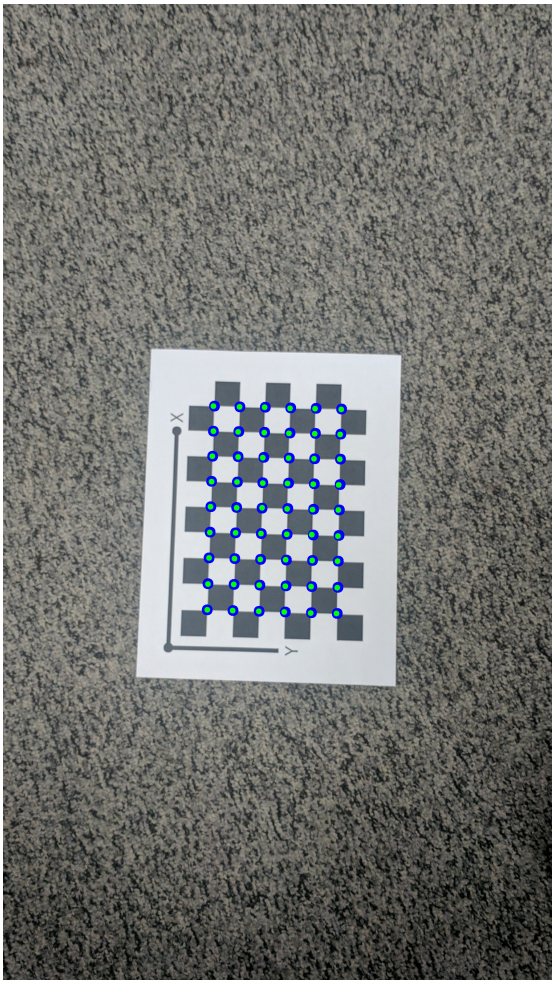
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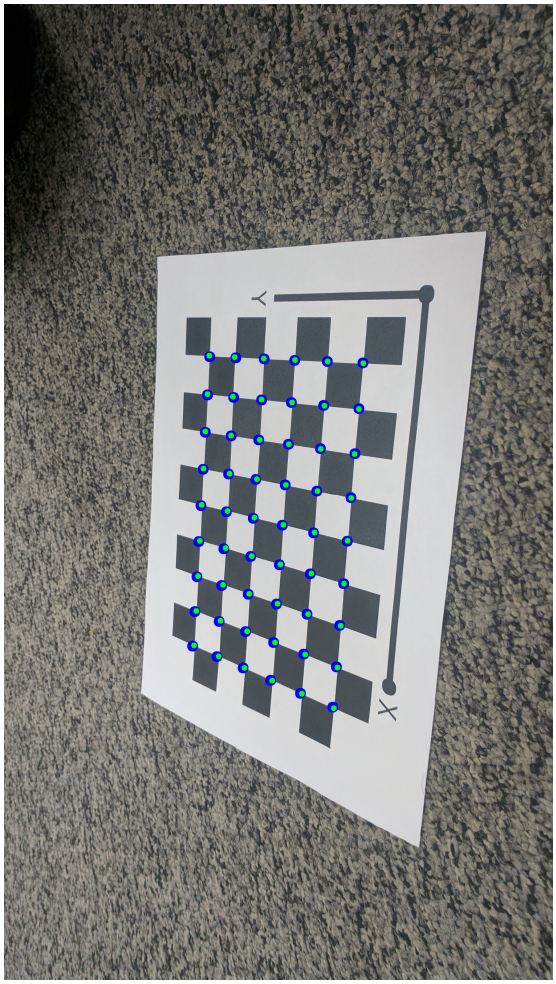
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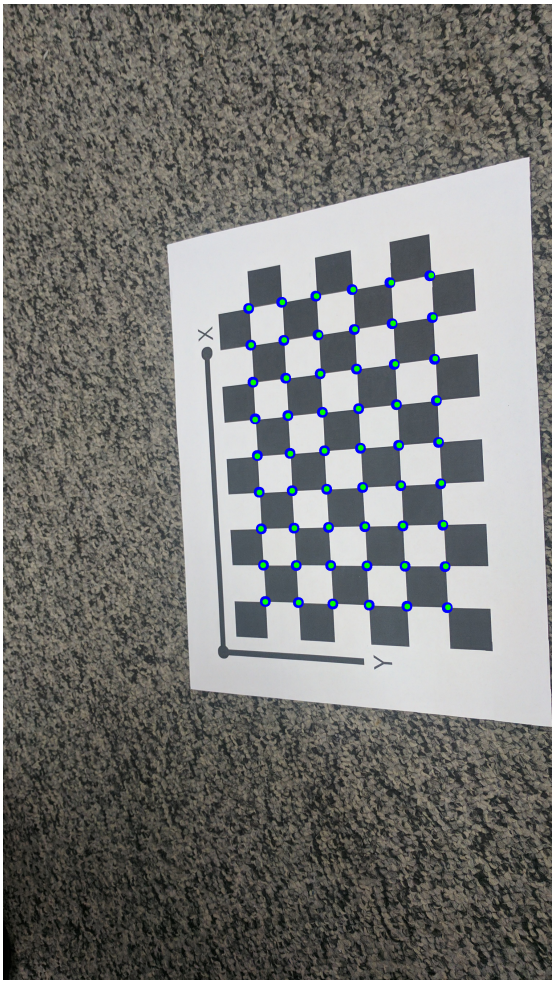
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