ECEn 631
Assignment 3 – Stereo Calibration and Rectification
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Task 1

$$intrinsic\ left = \begin{bmatrix} 1694.39 & 0 & 339.75 \\ 0 & 1696.15 & 228.91 \\ 0 & 0 & 1 \end{bmatrix}$$

$$distCoeffs\ left = \begin{bmatrix} -0.48164 & -0.56906 & 0.00250 & -0.00214 & 0.91593 \end{bmatrix}$$

$$intrinsic\ right = \begin{bmatrix} 1702.43 & 0 & 339.79 \\ 0 & 1705.73 & 221.54 \\ 0 & 0 & 1 \end{bmatrix}$$

$$distCoeffs\ right = \begin{bmatrix} -0.53933 & 2.02477 & 0.00150 & 0.00152 & -27.82696 \end{bmatrix}$$

Intrinsic parameters seem reasonable since both cameras are identical. I originally got a huge number for the last number on distortion coefficient of the right camera, but as I adjusted the number of images used for calibration, -27.82696 was the lowest number I could get with images I had available.

Task 2

$$R = \begin{bmatrix} 0.99998 & 0.00672 & 0.00131 \\ -0.00673 & 0.99995 & 0.00699 \\ -0.00126 & -0.00700 & 0.99997 \end{bmatrix}$$

$$T = \begin{bmatrix} -20.20723 & -0.000045 & 0.71653 \end{bmatrix}$$

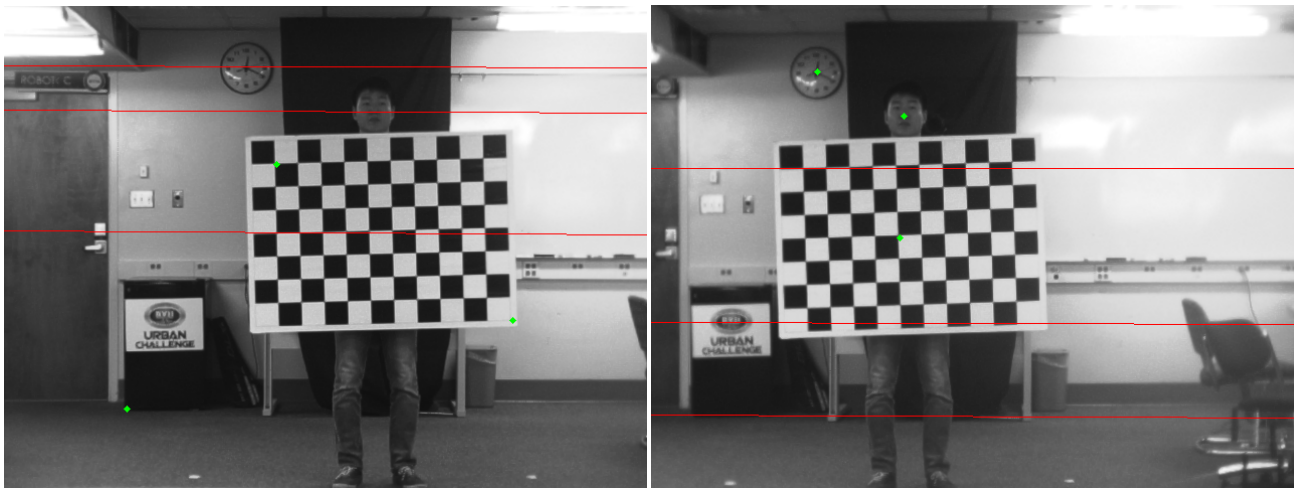
$$essential = \begin{bmatrix} 0.00482 & -0.71650 & -0.00506 \\ 0.69109 & -0.13665 & 20.20765 \\ 0.13598 & -20.20627 & -0.14128 \end{bmatrix}$$

$$fundamental = \begin{bmatrix} -2.43331e^{-8} & 3.61320e^{-6} & -0.00078 \\ -3.48191e^{-6} & 6.87746e^{-7} & -0.17148 \\ -0.00039 & 0.17209 & 1 \end{bmatrix}$$

The translation matrix(T) looks good after several failures. It tells that there is displacement only along X axis. The fundamental matrix contained very small numbers.

Task 3

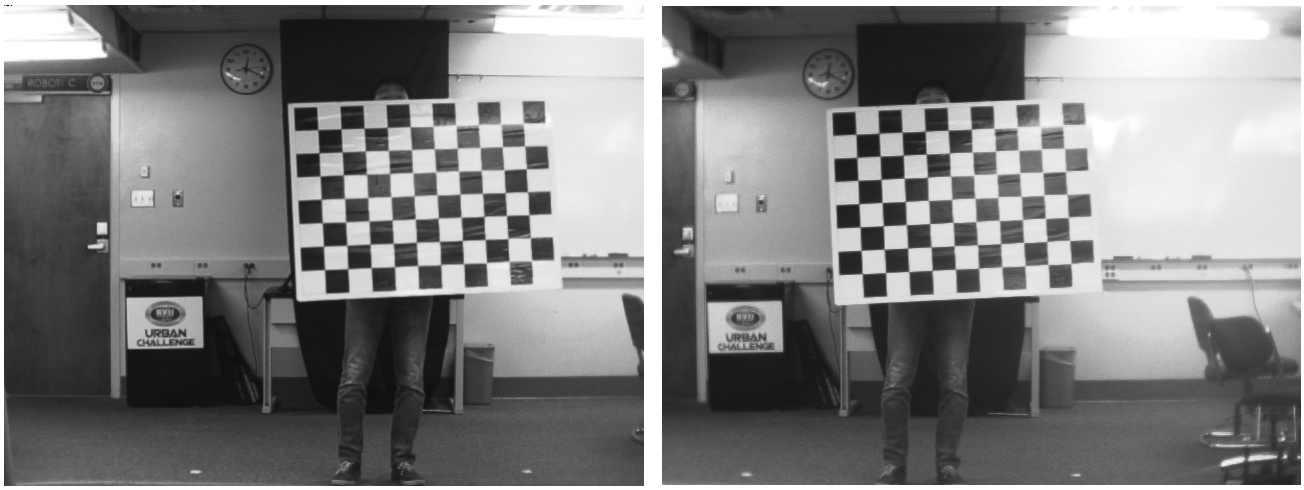
Epipolar line left and right



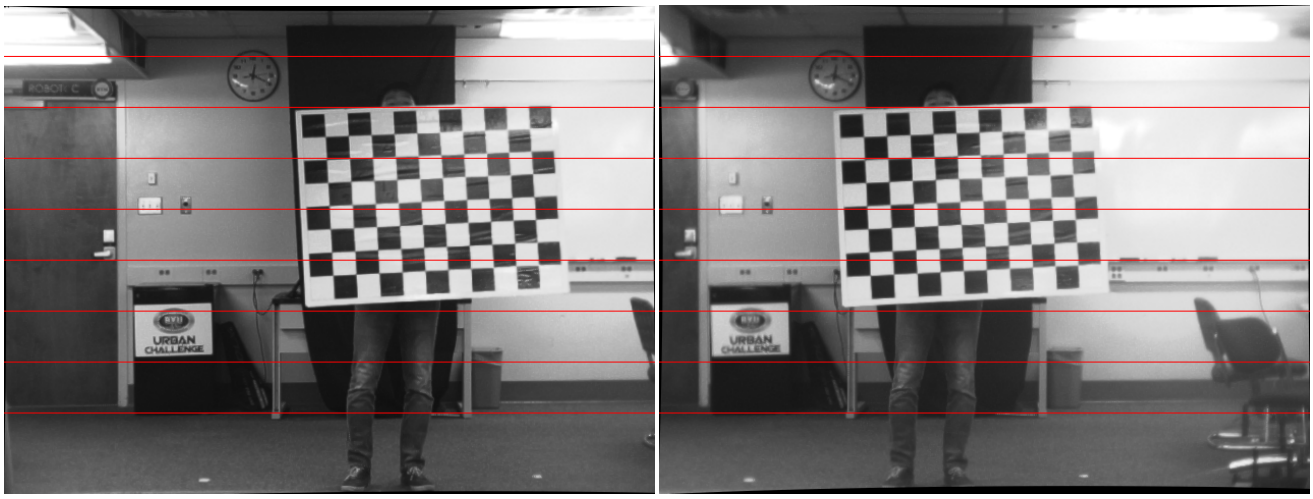
As shown above, several epipolar lines are drawn corresponding to the points on the other images.

Task 4

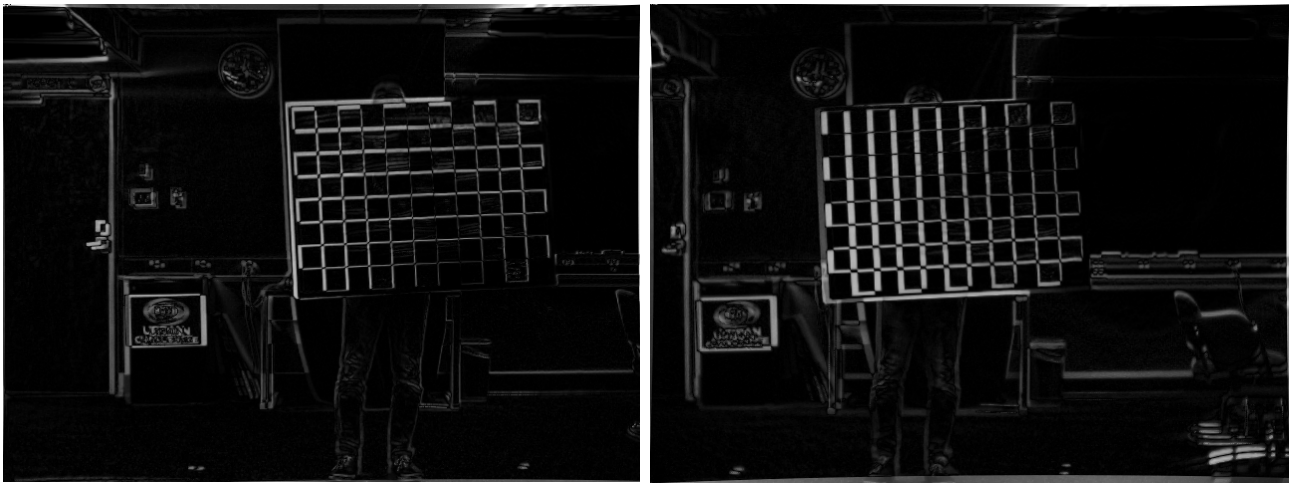
Original images



Rectified images



Difference images



As expected, after image rectification, images from left camera and right camera are aligned horizontally.