Assignment 3

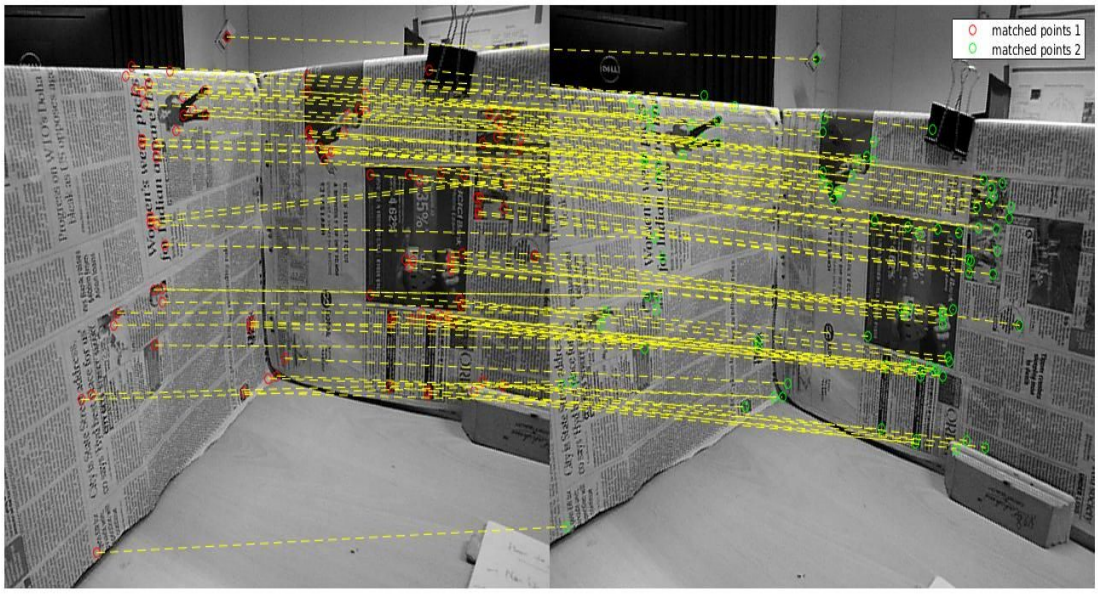
Steps followed:

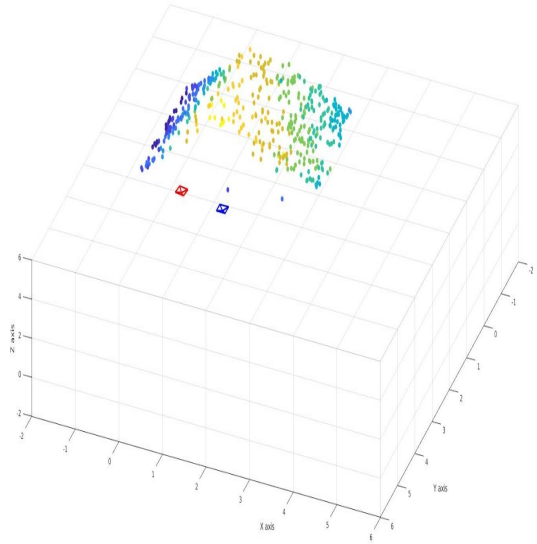
1. Extracting corresponding points from the two images. The ‘MetricThreshold’ parameter used is 10. We get 562 correspondences from this.
2. Next we perform the normalization to reduce the numerical instability of the further computation of the Fundamental Matrix.
3. Two functions are defined: “estimate_fundamental_matrix” and “estimateFundamentalMatrixRANSAC” to calculate the Fundamental Matrix F. The first one calculates the fundamental matrix for any 8 points using the 8-point algorithm covered in class. The second uses RANSAC to sample 8 points iteratively to find the best one for which we are able to get maximum number of inliers subject to a threshold defined as eth.
4. As we know the calibration matrix the fundamental matrix F can be easily converted into the Essential Matrix E.
5. Next we decompose the Essential Matrix into R and t (which are the relative rotation and translation between the two cameras) using the given function “decomposeEssentialMatrix” which tries to find out the solution for which maximum number of points are infront of the two cameras.
6. Next we write the code for algebraic triangulation, which is just an iterative computation of the 3D points from the Projection matrices and the 2D points.
7. Results are plotted which consists of a Montage plot with both images and the 3D reconstruction plot.

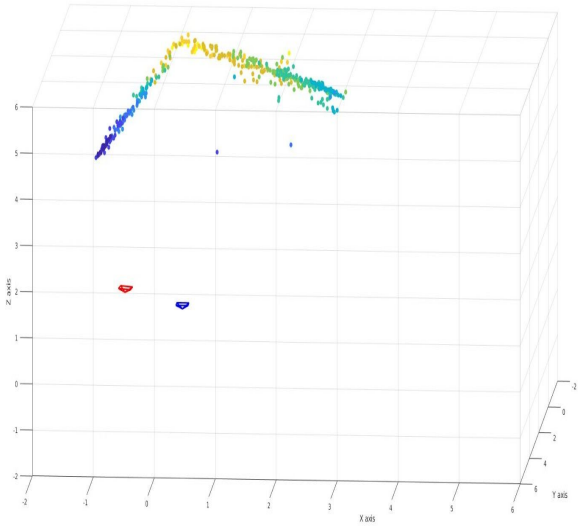
$$F = \begin{bmatrix} 0.0000 & 0.0000 & -0.0009 \\ -0.0000 & 0.0000 & -0.0049 \\ 0.0011 & 0.0042 & 0.0689 \end{bmatrix}$$

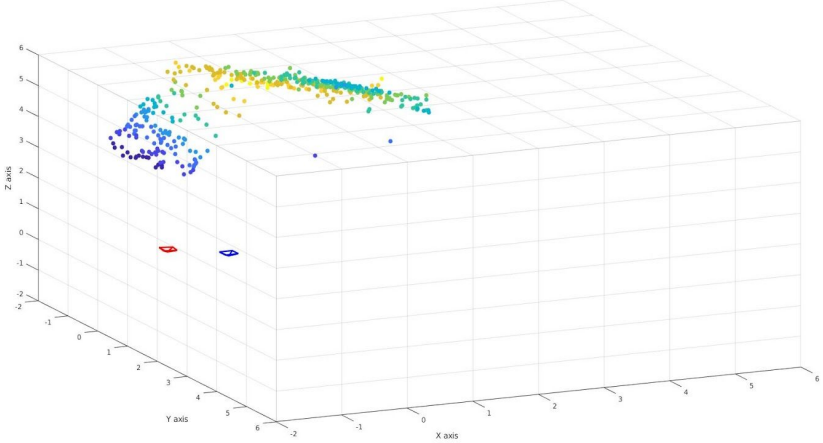
$$E = \begin{bmatrix} 0.1281 & 1.0863 & 0.0039 \\ -0.8157 & 0.2003 & -3.0985 \\ 0.3787 & 2.9929 & 0.1056 \end{bmatrix}$$

$$R = \begin{bmatrix} 0.9895 & -0.1170 & 0.0848 \\ 0.1145 & 0.9928 & 0.0340 \\ -0.0882 & -0.0240 & 0.9958 \end{bmatrix} \qquad t = [-0.9402 \;\; 0.0104 \;\; 0.3405]^T$$


matched points 1
matched points 2


Z axis
X axis
Y axis


Z axis
X axis
Y axis


Z axis
Y axis
X axis