# **8 – Point Algorithm**

### Code Explanation

The algorithm receives key points from 2 corresponding images. These points are then normalized and used to construct the coefficient matrix. Eigenvalues and Eigenvectors of this matrix are computed, and the eigenvector corresponding to the smallest eigenvalues is selected. This eigenvector is then reshaped to construct the F matrix. We then calculate the svd of our matrix F to determine its singular values, and set the last singular value to 0, in order reduce the rank of F to 2. We then reconstruct F with the new singular values. Finally we unnormalize F, compute F/F[2,2] and return this value as our Fundamental matrix. The F the algorithm computes is identical to the one given by the inbuilt function.

The following figures display the image outputs:

A picture containing text, indoor, shelf

Description automatically generated

Figure : 8-point algorithm output – picture 1

Chart

Description automatically generated

Figure : 8-point algorithm output – picture 2a

Chart

Description automatically generated with medium confidence

Figure : 8-point algorithm output – picture 2b

Graphical user interface

Description automatically generated

Figure : 8-point algorithm output – picture 3

# **RANSAC + 8 - point**

## Code Explanation

A threshold value of .04 and 1000 iterations are set, based on trial and error as well as literature review. In each iteration the algorithm samples 8 random points from the list of corresponding points that is input and constructs a F matrix based on these 8 points. A distance error is computed using the fundamental matrix based on the formula: p2transpose \* F \*p1. In an ideal scenario this formula is 0. The value of this formula gives us the distance error, which is then compared to the threshold value. If the error is less than the threshold value, this point is assumed to be an inlier and the mask is updated. If the total number of inliers in the current iteration, using the current F matrix exceeds the previous number of max inliers, the current F matrix is chosen as the best matrix. The F matrix is now re-calculated using all inlier points. At the end of all iteration we will return the last best F, along with a mask of inliers.

The following figures display the image outputs:

A picture containing graphical user interface

Description automatically generated

Figure : RANSAC + 8-point algorithm output – picture 1

Chart

Description automatically generated

Figure : RANSAC + 8-point algorithm output – picture 2a

Graphical user interface, chart

Description automatically generated

Figure : RANSAC + 8-point algorithm output – picture 2b

Graphical user interface

Description automatically generated with medium confidence

Figure : RANSAC + 8-point algorithm output – picture 3