EN3160 Assignment 2 on Fitting and Alignment

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GitHub: https://github.com/UlinduP/EN3160\_Image\_Processing\_and\_Machine\_Vision.git

1. A screen shot of a computer code

   Description automatically generated

A computer screen with many colorful text

Description automatically generated

Generated Results

were used in the range of **3 to 27** with a step size of 3.

**Center of the largest circle: 358, 125**

**Radius of the largest circle: 23.978**

A field of sunflowers with red circles

Description automatically generatedA field of flowers with red circles

Description automatically generated

I apply the Laplacian of Gaussian operation to the image in the LoG\_convolve function. Then, the blobs are detected after applying a threshold, redundant blobs are removed using detect\_blob and redundancy functions, respectively.

1. A diagram of a line with colored dots

   Description automatically generated with medium confidenceA screenshot of a computer program

   Description automatically generated (a)

(b) Subtracting the consensus of the best line

The choice of threshold depends on your data's characteristics and the estimation's desired robustness. A suitable threshold should be set to balance between including true inliers and excluding outliers. The selected normal distance to the estimated line for this dataset is 1.

The number of expected points needs to be selected such that it is neither too restrictive nor lose. I have taken the number of points in the consensus to be 40 percent of all points. Then I am taking the line with the most number of such points.

outliers\_indices = np.where(np.logical\_not(best\_inliers\_line))[0]

outliers\_data = dataset[outliers\_indices, :]

I have set the threshold of error (Radial) to be 1/3rd of the radius and the number of points that must be in the consensus to be 40 percent of all points left after removing line inliers. Then, I am taking the circle with the most number of such inliers and estimating the best circle fitting the selected inliers.

RANSAC Circle Fitting

Code for the RANSAC circle

A diagram of a circle with dots

Description automatically generatedA screen shot of a computer program

Description automatically generated

A computer screen with many colorful text

Description automatically generated with medium confidenceA graph with colorful dots and lines

Description automatically generated(c)

A computer screen shot of text

Description automatically generated

(d) If you fit the circle first, you may miss the line inliers while fitting the circle, which can lead to an inaccurate estimation of the line. The order of fitting can impact the results, so it is generally a good practice to prioritize fitting the dominant model (line in this case) first and then removing its inliers before estimating the secondary model (circle).

1. A computer screen shot of text

   Description automatically generated

A large screen with a group of people on it

Description automatically generatedA flag on the side of a building

Description automatically generated

A flag with a lion and a sword

Description automatically generated

The Sri Lankan flag is blended to look like it is hanging on the wall. The 2014 cricket World Cup winning moment is placed to make it look like the match is telecasted on the giant screen. I am using the findHomography function to calculate the homography and warpPerspective to warp the image of the flag.

1. (a)

RANSAC

SIFT Feature Matching

A computer screen shot of a program

Description automatically generatedA screen shot of a computer program

Description automatically generated

The features were detected using SIFT feature detection. detectAndcompute and knnMatch functions are used. From testing 0.85 is used as the matching point. The matches are displayed in the image.

SIFT Features Between Images 1 and 5

A close-up of a graffiti

Description automatically generated

(b)

Calculated Homography

A screenshot of a computer code

Description automatically generatedA black background with white numbers

Description automatically generated

Calculated Homography before multiplication

Provided Homography

Homography Calculation

A black background with white numbers

Description automatically generatedA screen shot of a computer code

Description automatically generated

The homography between images was calculated using calculateHomography function. After calculation, it was realized that the calculated homography and the provided homography proved to be highly different compared to the calculated homography before multiplication and the actual homography. Therefore, I calculated homographies for five images separately and obtained the final homography between images one and five by multiplying them sequentially. By comparison of the above final calculated and provided homographies, we can say that the homography is similar.

(c)

A close-up of a graffiti wall

Description automatically generatedImage one and image five were stitched using the generated homography. Image 5 was positioned over the warped image 1. As mentioned above, the best matches between images 1 and 5 were scarce.