EN2550 – Fundamentals of Image Processing and Machine vision

Assignment 02

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Github Link:
https://github.com/WikumJCK/EN2550_Image_Processessing/tree/main/Asssignments/Assignment%2002

Question 01

(a) Estimate the circle using the RANSAC algorithm (must be coded on your own).

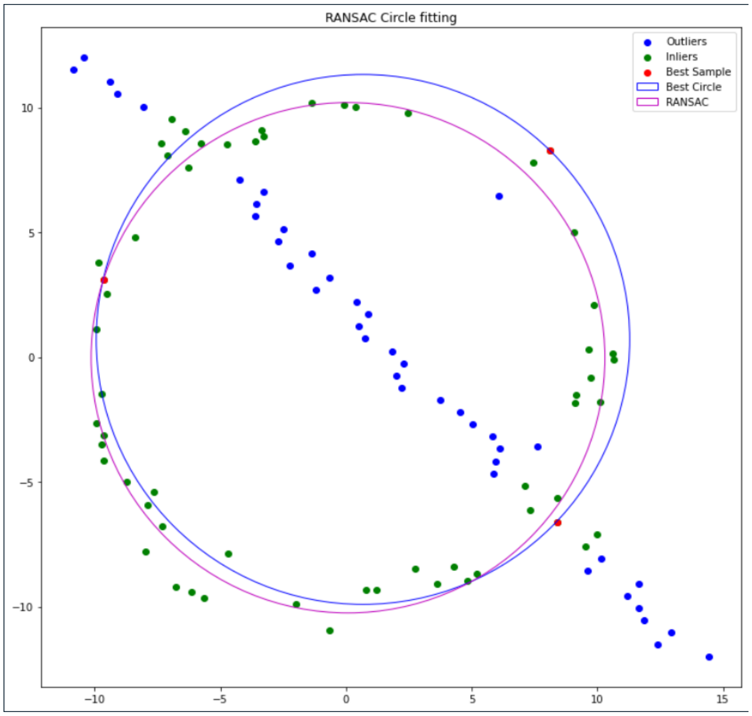
RANSAC Parameters:

- s : Minimum number of points needed to fit on to a circle is 3, Therefore s is taken as 3
- t : to capture all the inliers t should be 1.96 , since sigma =1
- p = 0.99
- N = Number of iterations of the hypothesize and verify loop, calculated using the Equation so that p = 0.99

  First, we define all the parameters for the RANSAC, then randomly select 3 samples and plot a circle such that those 3 samples lie on the circle. Then, we get circle parameters such as center coordinates and radius, using those parameters determine all the inliers that lies near to the circumference of the circle. Other samples are taken as outliers. This will be done for N times and select the best 3 samples that gives maximum amount of inlier count. Then using those inliers least square circle is drawn it is called the RANSAC circle.

```python
def RANSAC(X):
    s = 3  # Minimum number of points needed to fit to a circle is 3
    t = 1.96 # to capture 95% of all inliers
    d = 50
    p = 0.99
    N = int(np.ceil(np.log(1-p)/np.log(1-(1-0.5)**s)))

    max_inliers = 0;

    for i in range(N):
        c1,c2,c3 = X[np.random.randint(0,100)],X[np.random.randint(0,100)],X[np.random.randint(0,100)]
        radius, center = CircleCenter(c1,c2,c3)
        inliers, outliers, inlier_count = CheckPoints(X,radius,center,t)
        if max_inliers<inlier_count:
            max_inliers = inlier_count
            best_sample = np.array([list(c1),list(c2),list(c3)])
            best_inliers = np.array(inliers)
            best_outliers = np.array(outliers)
            best_radius = radius
            best_center = center

    # Calculate the best circle to fit all the inliers
    xr,yr ,R_Radius,k = cf.least_squares_circle(best_inliers)
    R_Center = (xr,yr)

    return best_inliers ,best_outliers, best_sample,best_center, best_radius, R_Center,R_Radius
```

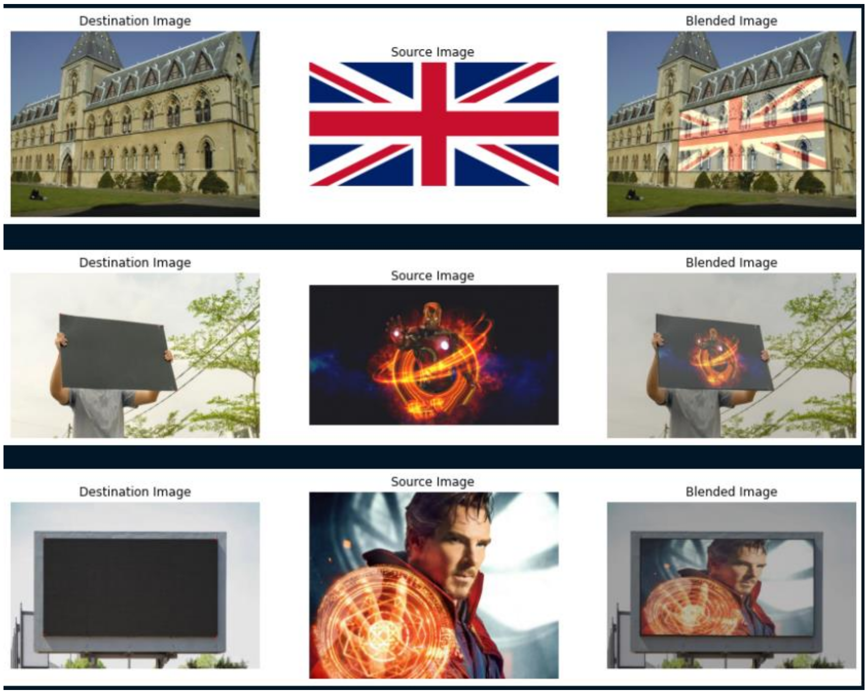
(b) Show in the same plot, the point set, the circle estimated from the sample leading to the best estimate, this sample of three points, inliers, and the best-fit circle. See Figure 1 for an example.



Above image shows the results of the RANSAC circle fitting for the generated data by the code.

Question 02

When run the code destination image is opened in a window and then 4 points should be selected orderly, then homography is calculated between selected points and the source image corners. Then the source image is transformed to fit into the destination image. Then transformed image and destination image is blended together to create the final image. Results of the code is given below.



01)British flag projected onto a building

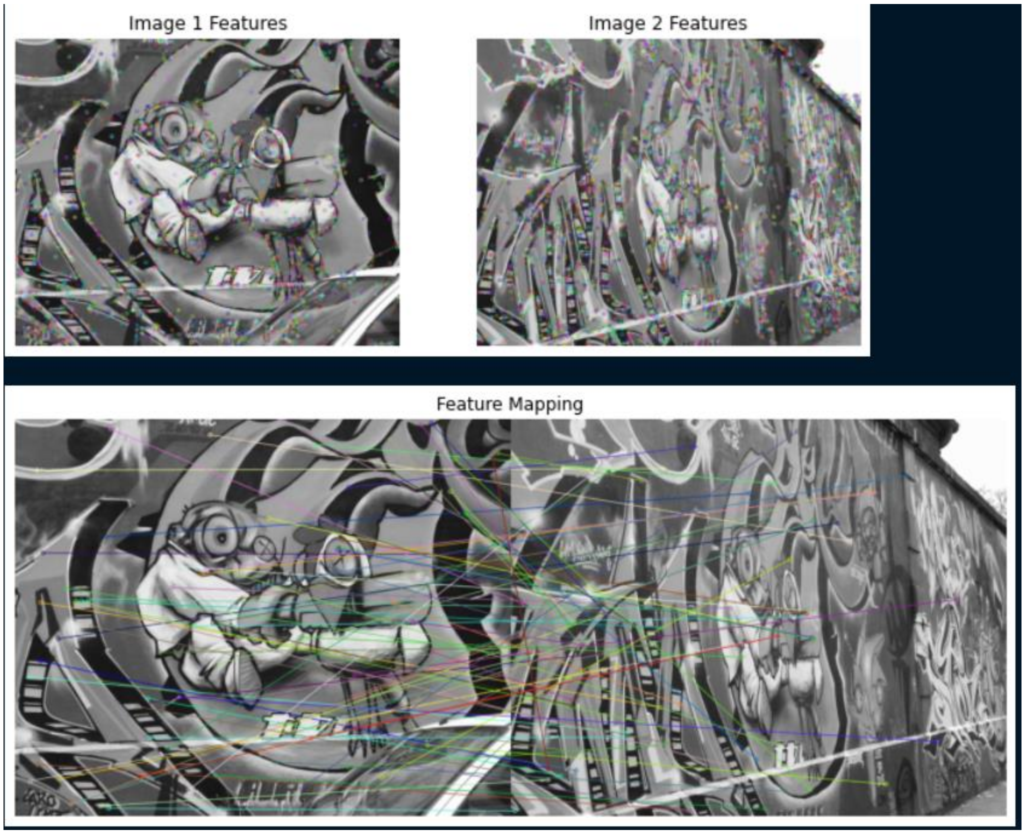
02)Movie image projected onto a poster

03)Movie image projected to a billboard

Question 03

a) Compute and match SIFT features between the two images

First two images show the SIFT features of the images that are going to stich together. Below figure shows how the sift features map one image to the other image.



b) Compute the homography using your own code within RANSAC and compare with the homography given in the dataset.

c) Stitched Image