EN2550 Assignment 2 on Fitting and Alignment

Ranga Rodrigo

April 13, 2022

1. The code snippet in Listing 1 shows the code to generate a noisy point set X amounting to a circle and the code to estimate a circle—center and the radius—from a set of inliers in X.

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

   (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.

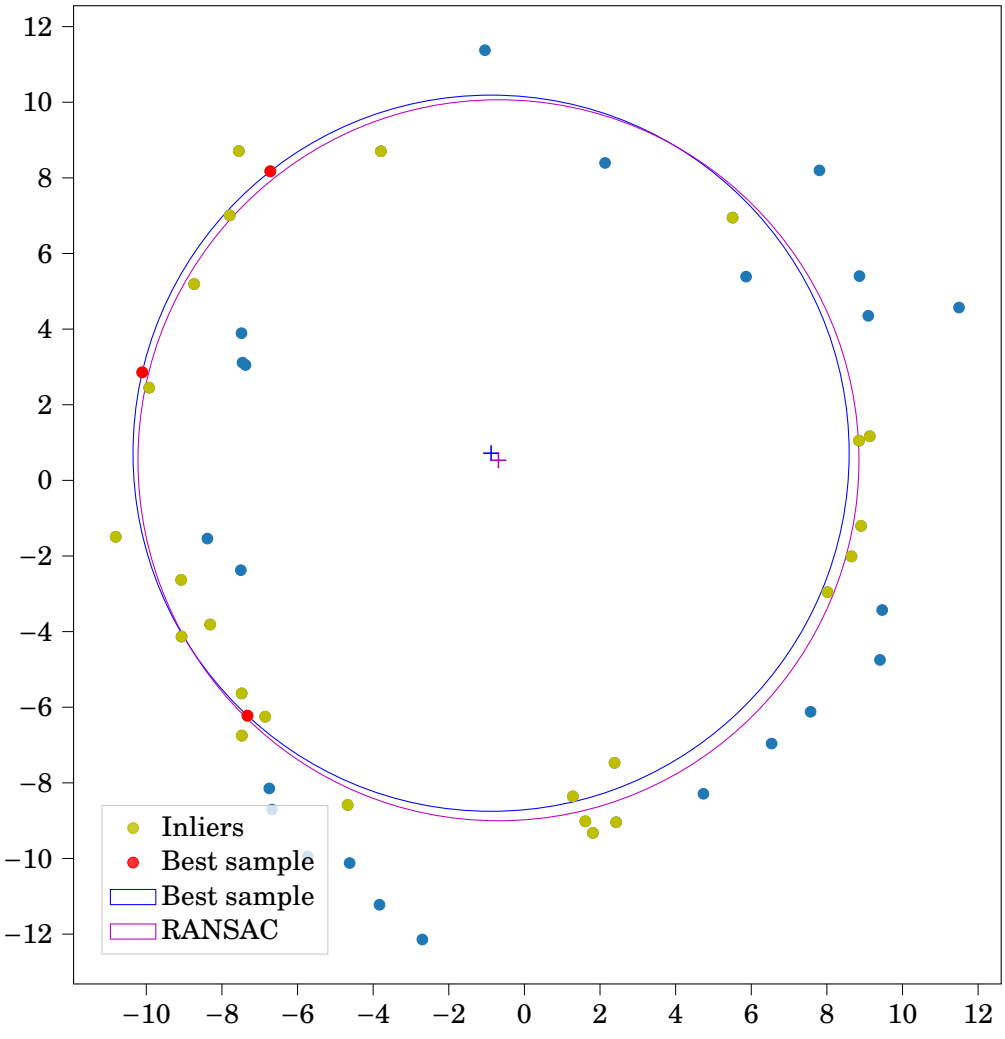

Figure 1: Circle fitting with RANSAC.

2. Figure 2 shows an architectural image[1] with a flag [2] superimposed. This is done by clicking four points on a planar surface in the architectural image, computing a homography that maps the flag image to this plane, and warping the flag, and blending on to the architectural image. Carry this out for a couple of image pairs of you own choice. You *may* explain the (non-technical) rationale of your choice.

3. In this questions, we will stitch the two Graffiti image[3] img1.ppm onto img5.ppm.

[1] https://www.robots.ox.ac.uk/ vgg/data/mview/
[2] https://en.wikipedia.org/wiki/Flag_of_the_United_Kingdom
[3] https://www.robots.ox.ac.uk/ vgg/data/affine/

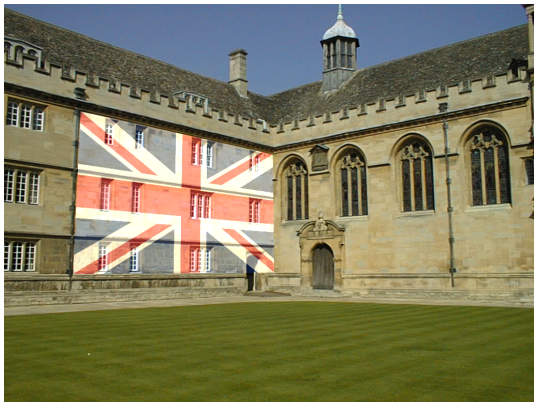

Figure 2: Wadham College image with the British flag superimposed.

(a) Compute and match SIFT features between the two images.

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

(c) Stitch img1.ppm onto img5.ppm.

Listing 1: Circle Estimation

```
import numpy as np
from scipy.optimize import minimize
from scipy import linalg
import matplotlib.pyplot as plt
# np.random.seed(0)
N = 50
r = 10
s = r/8
t = np.random.uniform(0, 2*np.pi, N)
n = s*np.random.randn(N)
x, y = (r + n)*np.cos(t), (r + n)*np.sin(t)
X = np.hstack((x.reshape(N,1), y.reshape(N,1)))

inliers = []
def circle_tls(x):
    return np.sum((np.abs(x[2] - linalg.norm(X[inliers,:] - x[:2], axis=1) ))**2)

x0 = np.array([c[0], c[1], r])
# Computing the new model using the inliers
res = minimize(circle_tls, x0, method='nelder-mead', options={'xatol': 1e-6, 'disp': True})
res.x # Estimated circle
```

GitHub Profile

You must include the link to your GitHub (or some other SVN) profile, so that I can see that you have worked on this assignment over a reasonable duration. Therefore, make commits regularly. However, I will use only the pdf for grading to save time.

Submission

Upload a report (four pages or less) named as your_index_a02.pdf. Include the index number and the name within the pdf as well. The report must include important parts of code, image results, and comparison of results. The interpretation of results and the discussion are important in the report. Extra-page penalty is two (2) marks per page.