EN2550 - Assignment 2 on Fitting and Alignment

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GitHub: https://github.com/chira99/image-processing-opencv-python.git
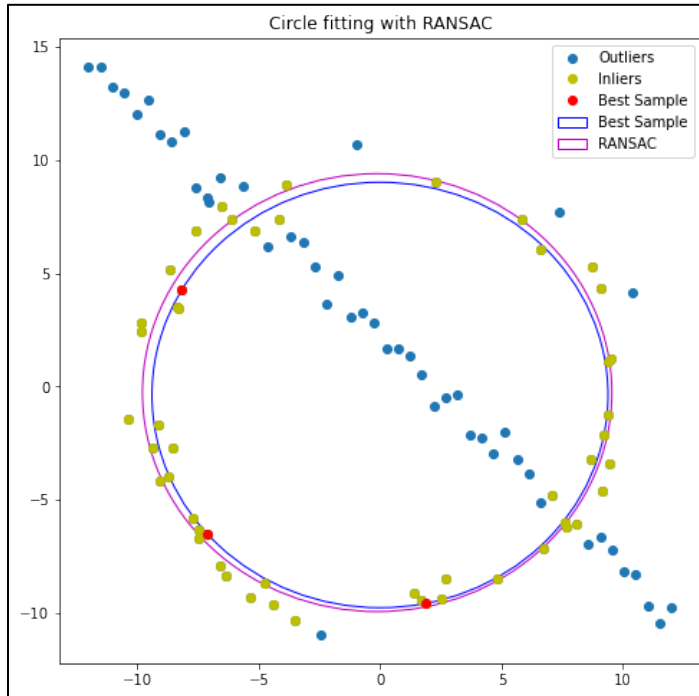
Question 01

a) RANSAC algorithm for circle estimation is implemented as follows.

```
1.  def RANSAC_circ(X):
2.
3.      e = 0.5      # outlier ratio
4.      s = 3        # Number of points needed to create the estimated model
5.      p = 0.99     # probability that at least 1 sample is free from outliers
6.      t = 1.96 * 10/16   # treshold
7.      d = 50       # expected inlier count
8.
9.      iters = int(np.ceil(np.log(1-p)/np.log(1-(1-e)**s)))
10.
11.     best_inlier_count = 0
12.     best_samples = None
13.     best_fit_inliers = None
14.
15.     for _ in range(iters):
16.
17.         # Choose 3 distinct points from dataset
18.         [p1, p2, p3] = np.random.choice(len(X), size=3, replace=False)
19.         [p1, p2, p3] = X[p1, :], X[p2, :], X[p3, :]
20.
21.         # Get circle through the 3 points
22.         f, g, r = getCircle(p1, p2, p3)
23.
24.         if r == None:
25.             continue
26.
27.         inlier_count, inliers = getInlierCount(f, g, r, X, t)
28.
29.         if inlier_count > best_inlier_count:
30.             best_inlier_count = inlier_count
31.             best_fit_inliers = inliers
32.             best_samples = [p1, p2, p3]
33.             best_fit_circle = [f, g, r]
34.
35.     if best_inlier_count < d:
36.         # Repeat RANSAC if no model found
37.         RANSAC_circ(X)
38.
39.     ransac_circle = bestFitCircle(best_fit_inliers) # returns f,g,r
40.
41.     return ransac_circle, best_fit_circle, best_samples, best_fit_inliers
```

Parameters of the algorithm:
- The minimum number of points needed to estimate the circle, **s = 3**
- A threshold of **t = 1.96*(r/16)** gives the required 95% probability of capturing all inliers since the dataset is corrupted by mean-zero variance-one gaussian noise. (r = 10)
- Consensus size, **d = 50**, since 50 points are inliers out of the given 100 dataset points.

b) The resulting circle fitting using RANSAC algorithm is as follows.

Question 02

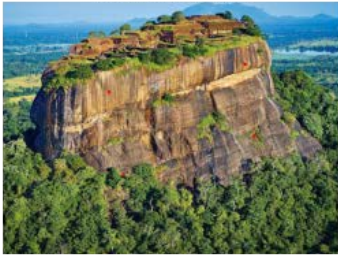1. Classical painting projected onto the wall of a display room.
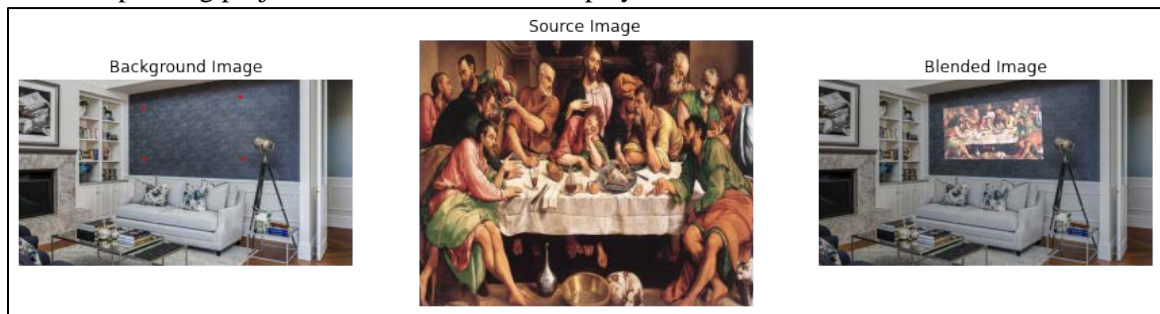
2. Movie poster on billboard display.

3. Sri Lankan flag projected/painted onto Sigiriya.

Background Image

Source Image

Blended Image