

### Compare/Decision Algorithm:

1. Take each pair of photos in a folder as input.
2. Find key points using SIFT with FLANN and perform a preliminary filtering
3. Compute fundamental matrix with FM\_RANSAC
4. Test and verify the matrix in masked matching points by computing distance and counting outliers. Pass if there are at least 10 points and 90% of the them are inliers.
5. Compute homography matrix with RANSAC
6. Test and verify the matrix in masked matching points by computing distance and counting outliers. Pass if there are at least 10 points and 90% of the them are inliers.
7. Compute the ratio between number of matches with fundamental matrix and number of matches with homography matrix.
8. If these two photos pass both fundamental matrix test and homography matrix test and the ratio is lower than 75%, then they are considered to be took at a same scene.

### Blend Algorithm:

1. Compute the transformed coordinate of 4 corners of source image.
2. Calculate the total width and height for generating a new canvas.
3. Besides the perspective matrix, create a transform matrix which transfers the coordinate system in destination image to the one in the new canvas.
4. Use warpPerspective to manipulate both source and destination image. Map each of them into the new canvas created before.
5. Blend two newly generated picture together, each of them takes 50% of color in the final result. For example: (0,0,0) blends with (2,2,2) is (1,1,1)

### Outputs:

#### Drink-machine

```
persian-07:hw5 elvinzhu$ python hw5_align.py drink-machine
Comparing image1.JPG image2.JPG
Analyze with fund :
    Matches: 190  Good ones: 176
    Confidence: 92.63 %
    Pass.

Analyze with homo :
    Matches: 48  Good ones: 48
    Confidence: 100.00 %
    Pass.
Ratio 0.25263157894736843
Not the same scene.

Comparing image1.JPG image3.JPG
Analyze with fund :
    Matches: 22  Good ones: 20
    Confidence: 90.91 %
    Pass.

Analyze with homo :
    Matches: 10  Good ones: 9
    Confidence: 90.00 %
    Pass.
Ratio 0.45454545454545453
Not the same scene.

Comparing image2.JPG image3.JPG
Analyze with fund :
    Matches: 208  Good ones: 196
    Confidence: 94.23 %
    Pass.

Analyze with homo :
    Matches: 91  Good ones: 91
    Confidence: 100.00 %
    Pass.
Ratio 0.4375
Not the same scene.
```

## frear-park



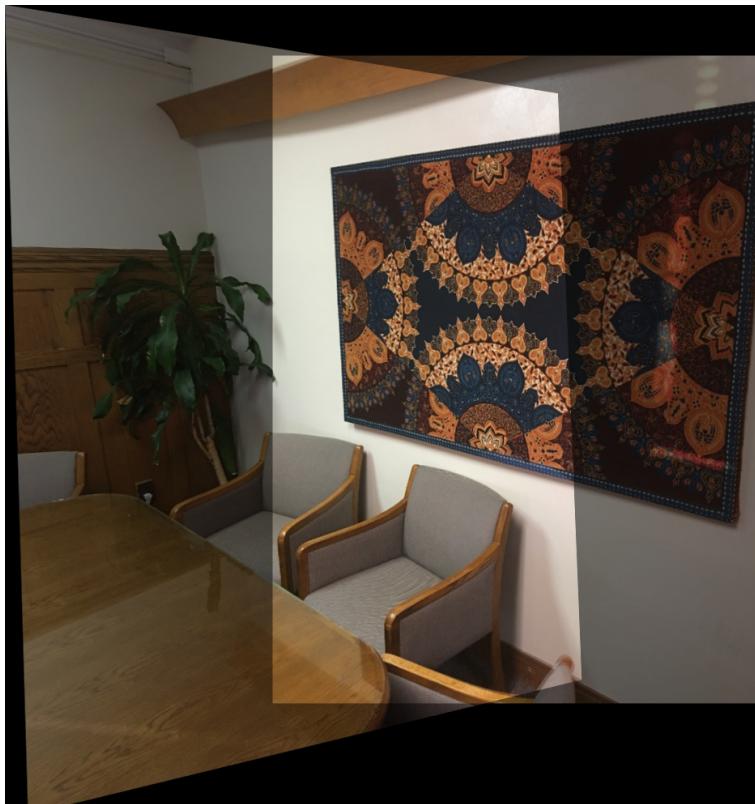
```
persian-07:hw5 elvinzhu$ python hw5_align.py frear-park
Comparing image1.JPG image2.JPG
Analyze with fund :
    Matches: 147  Good ones: 143
    Confidence: 97.28 %
    Pass.
Analyze with homo :
    Matches: 146  Good ones: 140
    Confidence: 95.89 %
    Pass.
Ratio 0.9931972789115646
Same scene.
```

## ice-storm



```
persian-07:hw5 elvinzhu$ python hw5_align.py ice-storm
Comparing image1.JPG image2.JPG
Analyze with fund :
    Matches: 427  Good ones: 418
    Confidence: 97.89 %
    Pass.
Analyze with homo :
    Matches: 403  Good ones: 402
    Confidence: 99.75 %
    Pass.
Ratio 0.9437939110070258
Same scene.
```

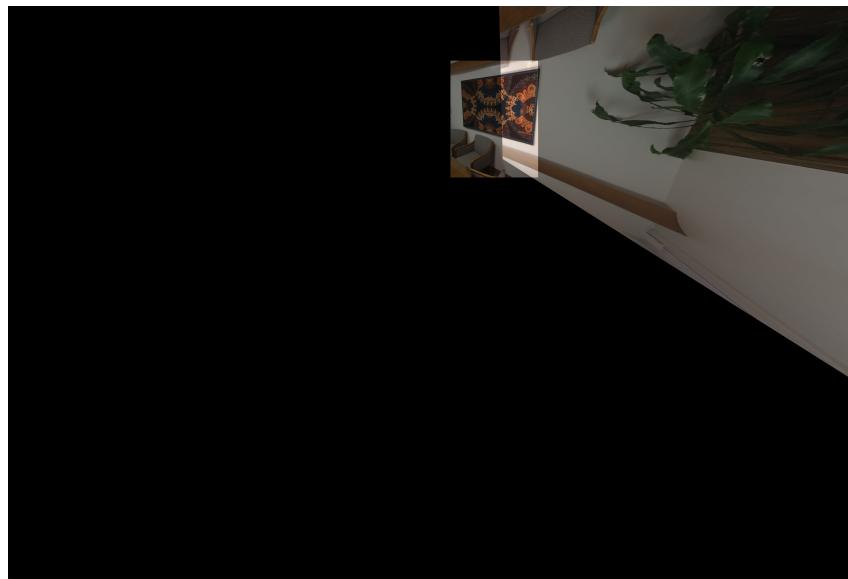
## office



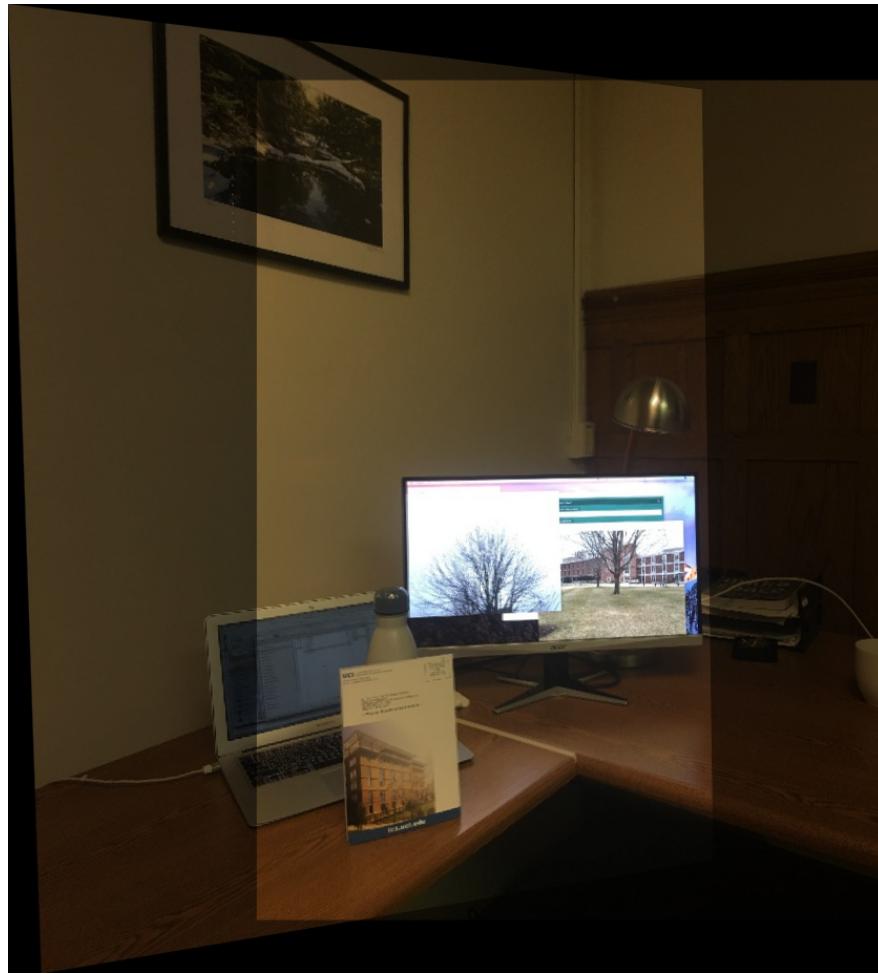
```
persian-07:hw5 elvinzhu$ python hw5_align.py office
Comparing IMG2533.JPG IMG2532.JPG
Analyze with fund :
    Matches: 39  Good ones: 38
    Confidence: 97.44 %
    Pass.
Analyze with homo :
    Matches: 26  Good ones: 26
    Confidence: 100.00 %
    Pass.
Ratio 0.6666666666666666
Not the same scene.

Comparing IMG2533.JPG IMG2531.JPG
Analyze with fund :
    Matches: 96  Good ones: 94
    Confidence: 97.92 %
    Pass.
Analyze with homo :
    Matches: 88  Good ones: 82
    Confidence: 93.18 %
    Pass.
Ratio 0.9166666666666666
Same scene.

Comparing IMG2532.JPG IMG2531.JPG
Analyze with fund :
    Matches: 619  Good ones: 608
    Confidence: 98.22 %
    Pass.
Analyze with homo :
    Matches: 526  Good ones: 510
    Confidence: 96.96 %
    Pass.
Ratio 0.8497576736672051
Same scene.
```



**office2**



```
persian-07:hw5 elvinzhu$ python hw5_align.py office2
Comparing IMG2536.JPG IMG2537.JPG
Analyze with fund :
    Matches: 217  Good ones: 208
    Confidence: 95.85 %
    Pass.

Analyze with homo :
    Matches: 195  Good ones: 169
    Confidence: 86.67 %
    Pass.

Ratio 0.8986175115207373
Same scene.

Comparing IMG2536.JPG IMG2538.JPG
Analyze with fund :
    Matches: 100  Good ones: 97
    Confidence: 97.00 %
    Pass.

Analyze with homo :
    Matches: 56  Good ones: 52
    Confidence: 92.86 %
    Pass.

Ratio 0.56
Not the same scene.

Comparing IMG2537.JPG IMG2538.JPG
Analyze with fund :
    Matches: 84  Good ones: 79
    Confidence: 94.05 %
    Pass.

Analyze with homo :
    Matches: 55  Good ones: 53
    Confidence: 96.36 %
    Pass.

Ratio 0.6547619047619048
Not the same scene.
```

tree-mrc



```
persian-07:hw5 elvinzhu$ python hw5_align.py tree-mrc
```

```
Comparing image4.JPG image1.JPG
```

```
Analyze with fund :
```

```
    Matches: 52  Good ones: 48
```

```
    Confidence: 92.31 %
```

```
    Pass.
```

```
Analyze with homo :
```

```
    Matches: 27  Good ones: 27
```

```
    Confidence: 100.00 %
```

```
    Pass.
```

```
Ratio 0.5192307692307693
```

```
Not the same scene.
```

```
Comparing image4.JPG image2.JPG
```

```
Analyze with fund :
```

```
    Matches: 176  Good ones: 170
```

```
    Confidence: 96.59 %
```

```
    Pass.
```

```
Analyze with homo :
```

```
    Matches: 96  Good ones: 96
```

```
    Confidence: 100.00 %
```

```
    Pass.
```

```
Ratio 0.5454545454545454
```

```
Not the same scene.
```

```
Comparing image4.JPG image3.JPG
```

```
Analyze with fund :
```

```
    Matches: 530  Good ones: 521
```

```
    Confidence: 98.30 %
```

```
    Pass.
```

```
Analyze with homo :
```

```
    Matches: 475  Good ones: 456
```

```
    Confidence: 96.00 %
```

```
    Pass.
```

```
Ratio 0.8962264150943396
```

```
Same scene.
```

```
Comparing image1.JPG image2.JPG
```

```
Analyze with fund :
```

```
    Matches: 1573  Good ones: 1547
```

```
    Confidence: 98.35 %
```

```
    Pass.
```

```
Analyze with homo :
```

```
    Matches: 1460  Good ones: 1437
```

```
    Confidence: 98.42 %
```

```
    Pass.
```

```
Ratio 0.9281627463445645
```

```
Same scene.
```

```
Comparing image1.JPG image3.JPG
```

```
Analyze with fund :
```

```
    Matches: 444  Good ones: 435
```

```
    Confidence: 97.97 %
```

```
    Pass.
```

```
Analyze with homo :
```

```
    Matches: 257  Good ones: 255
```

```
    Confidence: 99.22 %
```

```
    Pass.
```

```
Ratio 0.5788288288288288
```

```
Not the same scene.
```

```
Comparing image2.JPG image3.JPG
```

```
Analyze with fund :
```

```
    Matches: 1170  Good ones: 1114
```

```
    Confidence: 95.21 %
```

```
    Pass.
```

```
Analyze with homo :
```

```
    Matches: 1038  Good ones: 1037
```

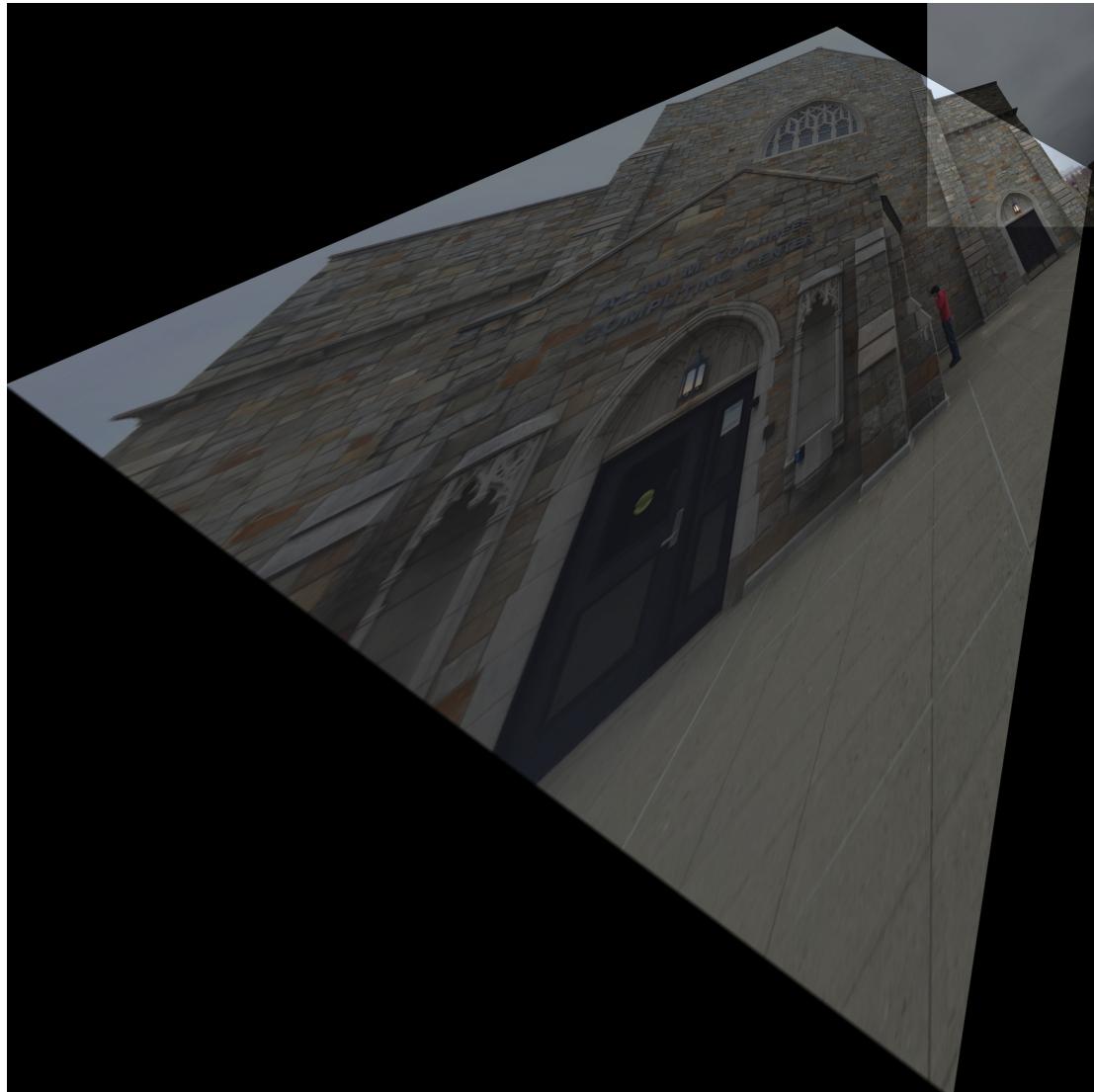
```
    Confidence: 99.90 %
```

```
    Pass.
```

```
Ratio 0.8871794871794871
```

```
Same scene.
```

vcc-entrance



```
[persian-07:hw5 elvinzhu$ python hw5_align.py vcc-entrance
Comparing image1.JPG image2.JPG
Analyze with fund :
    Matches: 886  Good ones: 864
    Confidence: 97.52 %
    Pass.

Analyze with homo :
    Matches: 518  Good ones: 484
    Confidence: 93.44 %
    Pass.
Ratio 0.5846501128668171
Not the same scene.

Comparing image1.JPG image3.JPG
Analyze with fund :
    Matches: 34  Good ones: 30
    Confidence: 88.24 %
    Pass.

Analyze with homo :
    Matches: 13  Good ones: 12
    Confidence: 92.31 %
    Pass.
Ratio 0.38235294117647056
Not the same scene.

Comparing image2.JPG image3.JPG
Analyze with fund :
    Matches: 88  Good ones: 85
    Confidence: 96.59 %
    Pass.

Analyze with homo :
    Matches: 67  Good ones: 64
    Confidence: 95.52 %
    Pass.
Ratio 0.7613636363636364
Same scene.
```

Strength: Trees, buildings, simple geometric contour items( books, screens, tables ,etc)

Weakness: Huge symmetric patterns, massively repeated items.