

# Project 2 Writeup

Deng Chenguang  
85907286

November 28, 2018

## Introduction

The project aims to stitch two pictures together, with some overlapping area. We implement this goal by using SIFT and RANSAC. SIFT function is provided in *vlfeat* and the RANSAC is written by myself.

## Implementation Details

The algorithm is as follows:

- First read in two images, compress them so that the algorithm runs faster, and transfer their pixel data from RGB *int* to gray *single*.
- Then we use *vl\_sift* function in *vlfeat* toolbox to get the SIFT feature points in each picture.
- We use *vl\_ubcmatch* to get the match between SIFT points.
- Then use RANSAC to get the best affine matrix (H) in threshold iteration.
- Use this matrix to stitch two pictures.

```
1 maxIter = 5000;
2 N1 = size(matches1, 1);
3 seedSetSize1 = ceil(0.28 * N1);
4 maxInlierError = 40;
5 goodFitThresh1 = floor(0.92 * N1);
6 h1 = RANSACFit((f1(1:2,:))', (f2(1:2,:))', matches1, maxIter,
    , seedSetSize1, maxInlierError, goodFitThresh1);
```

This is one of the most important sections in the project. The parameters here determines whether the RANSAC fit will be found or not, the quality of the stitched image, and the time consumed in the running process.



Figure 1: *Left:* Picture1 *Right:* Picture2



Figure 2: The picture after stitching.

## Experiments & Results

Figure 1-6 show the original pictures and the result pictures.

## Discussions

As you can see, there are difference appearances in the results. Let me explain this later.

1. Figure 1-2 has a relatively good performance. The line of the road is straight.
2. Figure 3-4 are two cuts from a complete picture from my phone. The exposure parameters and shooting position of this picture had not changed (very precise) so the performance is quite well.
3. Figure 5-6 are not very well because my camera may move or rotate when taking two pictures, and the exposure parameters are not the same as well, so there are some deviation between the lines.

My finding is that the performance of this algorithm highly depends on the input pictures, which means we can not change too much by simply adjusting the parameters in RANSACFit.m .

A good picture pairs for this project, is concluded below from my point of view:

1. The camera position should not change.



Figure 3: *Left: Picture1 Right: Picture2*



Figure 4: The picture after stitching.

2. The exposure parameters(such as ISO) should not change.
3. The object in pictures should not have too many repeated patterns, for it is hard for SIFT to draw the difference between the features, so there may be some wrong matches.
4. The two pictures should not vary too much, they should have lot in common so that it's easier for RANSAC to find the best match.
5. The object in pictures should be far from camera. In other words, it should be shot with a wide-angle lens. Also the lighting condition should be well enough too. A pair of tight, narrow and dim pictures may not get ideal result.

## Multipano

We also add codes in Multipano.m, and give images in cells rather than images. The result is as follows (Fig.7), not quite good to be honest. Maybe the vision range is too large.

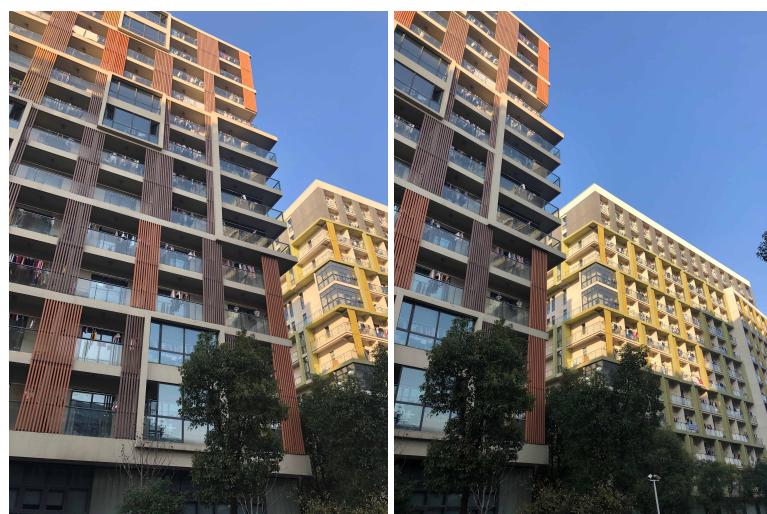


Figure 5: *Left:* Picture1 *Right:* Picture2

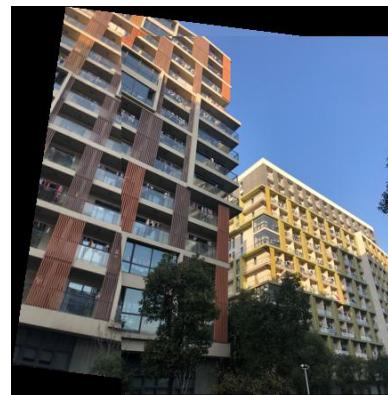


Figure 6: The picture after stitching.



Figure 7: *Left:* Picture1 *Right:* Picture2