Automatic Image Stitching Using Feature Based Method

Monikrishna Roy(130306) and Mahbubur Rahman(120262)
Supervised by Professor Dr. Mohammad Shorif Uddin
Department Of Computer Science and Engineering
Jahangirnagar University
roy.monikrishna,mahbuburrahman2111,shorifuddin,(@gmail.com)

Abstract

Image stitching is an interesting topic in computer vision. To improve the accuracy of image stitching, image enhancement is a crucial part. In this project, we represent a method of image stitching using feature based methods. The main objective of this project is to improve the accuracy of image stitching, especially in different illumination scenarios. We use adaptive histogram equalization for contrast enhancement. Various features detectors like SURF, FAST, Harris and MSER are used to find the features. Modified RANSAC algorithm are used to estimated the geometric transformation of input images. To improve the image stitching quality, we use alpha blending method. From the experimental result, we analysis the accuracy among various features detectors.

Introduction

Image stitching is the process of generating a high resolution panoramic image from multiple overlapping images of same field. Extracting features and matching images are the main section of feature based methods. There are many robust and popular feature detectors are used in feature based method such as Speed-Up Robust Features detector (SURF), Harris detector, Scale Invariant Feature Transform (SIFT), Bage of Features (BOF), Features from Accelerated Segment Test (FAST), Principal Component Analysis SIFT (PCA-SIFT) and Oriented FAST and Rotated BRIEF (ORB) [1] [2].

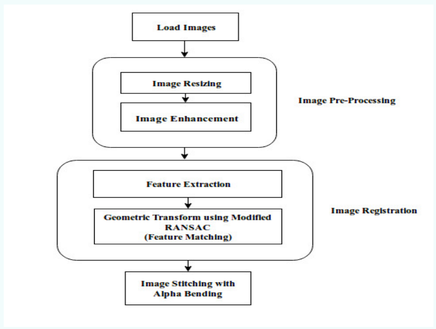

Figure 1: *Block Diagram of Image Stitching*

Objectives

- To improve the accuracy of Image stitching.
- To improve the efficiency of Image stitching.
- Producing seamless stitched images.
- Preprocessed images for better performance.

Methodologies

Image Preprocessing Procedure

- Resized images.
- Applied adaptive histogram equalization for contrast enhancement.

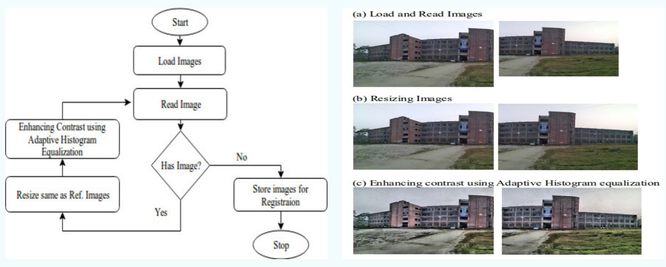

Figure 2: *Image Preprocessing*

Image Registration Procedure

- Feature points extraction.
- Finding correspondences between images.
- Estimated geometric transform between images.

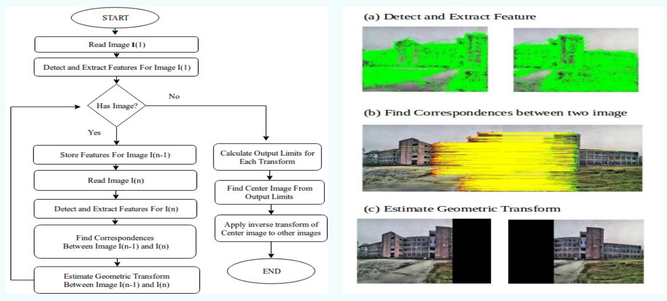

Figure 3: *Image Registration*

Image Stitching and Blending Procedure

- Used Alpha blending method for image blending.

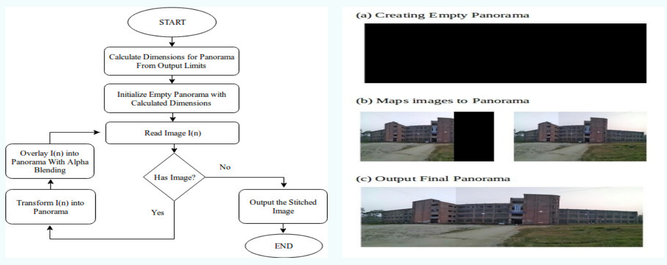

Figure 4: *Image Stitching and Blending*

Experimental Results and Analysis

Feature Extraction

- Used SURF, FAST, Harris, MSER feature detectors.

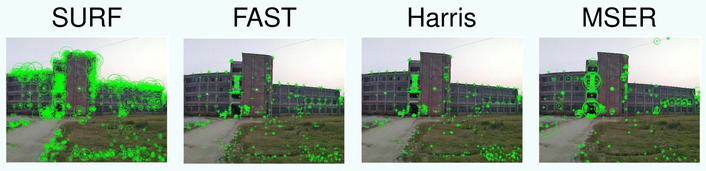

Figure 5: *Responses of Feature Detector respectively SURF, FAST, Harris, MSER*

Feature Matching

- Used SURF, FAST, Harris, MSER feature detectors.

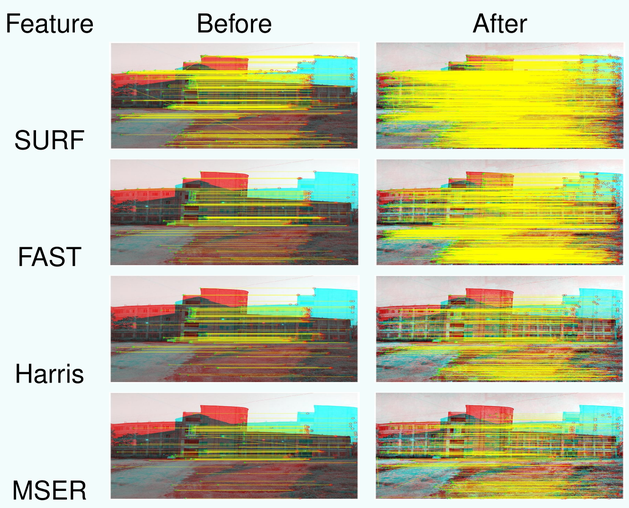

Figure 6: *Responses of Feature Matching respectively SURF, FAST, Harris, MSER before and after contrast enhancement*

Image Stitching

Input images

Figure 7: *Input image set respectively 1 & 2*

Output Images

- Showing output images for SURF based method.

Figure 8: *Stitched Images respectively input set 1 & 2*

Performance Evaluation

Table 1: *Comparison results of the responses before and after image enhancement.*

Methods	Feature points		Matching Points	
	Before	After	Before	After
SURF	1299	11946	239	1622
FAST	1170	19215	104	988
Harris	1028	8986	123	338
MSER	1366	8934	56	245

Table 2: *Comparison accuracy of Image stitching before and after image enhancement (for input set 1).*

State	SURF	FAST	Harris	MSER
Before Enhancement	89.83%	Failed	Failed	Failed
After Enhancement	92.27%	92.10%	92.08%	92.17%

Table 3: *Accuracy rate of various feature based methods comparing output stitched images with Original images.*

Input Images	SURF	FAST	Harris	MSER
Input Set 1	92.27%	92.10%	92.08%	92.17%
Input Set 2	94.65%	94.65%	96.60%	94.47%

Table 4: *Average score from a survey among 10 students of our department (score 1, 2, 3, 4, 5 for Bad, Poor, Fair, Good, Excellent respectively).*

Input Images	SURF	FAST	Harris	MSER
Input Set 1	3.93	3.73	3.73	3.67
Input Set 2	3.87	3.67	3.80	3.73

Conclusion

We have done implementation and compared those approaches based on performance and accuracy rate. Among various feature based methods, we have analyzed the results and the reports confirmed that the SURF based method is better for image stitching.
We used two input set of images for analyzing results of different illuminations. Images of first input set are for daylight images and second input set are for dark images. From the results, we came to know that SURF based feature method is the best method among all others feature based methods.

References

[1] T. Wang, G. Lu, and Y. Xia, “An efficient preprocessing method for feature based image stitching,” in *8th International Conference on Wireless Communications & Signal Processing, WCSP 2016, Yangzhou, China, October 13-15, 2016*, 2016, pp. 1–5.

[2] M. Z. Bonny and M. S. Uddin, “Feature-based image stitching algorithms,” in *Computational Intelligence (IWCI), International Workshop on*. IEEE, 2016, pp. 198–203.