IMAGE STITCHING FROM VIDEO FRAMES USING CORNER DETECTION AND SIFT ALGORITHM

Mr. Sarvajeet Bhosale[1], Mr. K. R. Desai[2]

[1]*Student of ME, Bharati Vidyapeeth College of Engineering, Kolhapur, (India)*

[2]*Associate Professor, Bharati Vidyapeeth College of engineering, Kolhapur, (India)*

ABSTRACT

Image stitching is the process in which two or more overlapping images are stitched together. The overlapping images may two or more different images or a extracted frames from video. In this process a feature extraction algorithms such as SIFT and a Corner detection algorithm is used. SIFT provides good results when there are scale variations and rotations and when there are less rotations corner detection algorithms can perform better.

Keywords: Image Stitching, Corner Detection, SIFT, RANSAC

I. INTRODUCTION

Feature-based method [1] is one of methods of Image stitching. And we propose a method based on invariant scale feature [3], which mainly includes two key parts: image matching and image blending. Image matching is used to find the motion relationship between two images or several images, and it directly relates to the success rate and the speed of the total process. While image blending is used to eliminate the various illumination of the adjacent image or color does not consecutive caused by the geometric correction or dynamic scene illumination. In that way two images can stitch into a seamless image. In our work, invariant scale features are also called SIFT features. SIFT features are local image features, which keep invariant in rotation, scale or illumination, and also robust in vision changes, affine changes or noises. Consequently, we use the method based on SIFT features, which solve the problem of image matching variant with scale variant in the method based on Harris corner detecting[6]. Otherwise, in the actual study, there are some noise images in the input image sequence. In order to solve this problem we develop a probabilistic model, by matching it to confirm the image and remove interference images. Furthermore, in order to eliminate the stitching visible seams and double edge of the panorama image we use the weighted average method for the image fusion.

II. FLOW OF IMAGE STITCHING

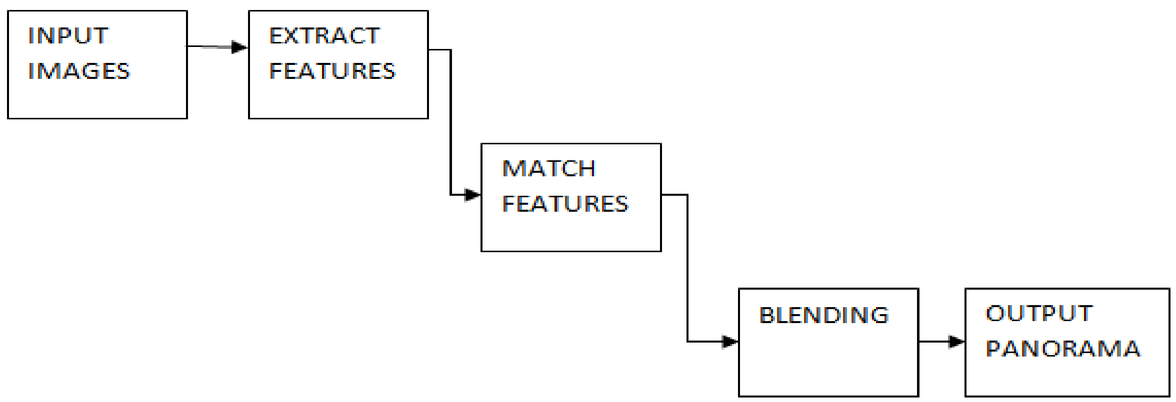


Fig: Flow of Image Stitching

III. HARRIS CORNER DETECTION

Harris corner detection algorithm was developed by Chris Harris and Mike Stephens in 1988. Instead of using shifted patches, Harris and Stephens [19] improved Moravec's corner detector by considering the differential of the corner score with respect to direction. Suppose two-dimensional gray scale image is used. Give it a name I. Assume image patch over the area (u,v) and shifting it by(x,y). The weighted SDD (sum of squared differences) between above two patches, S, is given by:

$$S(x,y) = \sum u \sum v\ w(u, v)\ (I\ (u+x, v+y) - I(u, v))^2$$

By using tailor expansion and partial derivatives, we can write above equation in matrix form as,

$$s\ (x,y) \approx (x\ y)\ A \begin{pmatrix} x \\ y \end{pmatrix}$$

Here, A is the structure tensor,

$$A = \sum_u\ \sum_v\ w(u, v) \begin{bmatrix} IxIx & IxIy \\ IxIy & IyIy \end{bmatrix}$$

$$= \begin{bmatrix} IxIx & IxIy \\ IxIy & IyIy \end{bmatrix}$$

IV. SIFT ALGORITHM

The SIFT algorithm (Scale Invariant Feature Transform) proposed by Lowe is an approach for extracting distinctive invariant features from images [9,2]. It has been successfully applied to a variety of computer vision problems based on feature matching including object recognition, pose estimation, image retrieval and many others. However, in real world applications there is still a need for improvement of the algorithm's robustness with respect to the correct matching of SIFT features [10]. In this paper, an improvement of the original SIFT algorithm providing more reliable feature matching for the purpose of object recognition is proposed. The main idea is to divide the features extracted from both the test and the model object image into several sub-collections before they are matched. The features are divided into several sub collections considering the features arising from different octaves that are from different frequency domain [4,5].

The major stages of computation used to generate the set of image features are Scale-space extrema detection, Orientation assignment/ Key point localization and Key point descriptor.

1. Scale-Space Extrema Detection

This stage of the filtering attempts to identify those locations and scales which can be identified from different view of the same object. This can be efficiently achieved using a "scale space" function which under certain assumptions can be approximated to a Gaussian function.

2. Key Point Localization

This stage attempts to eliminate more points from the list of key points by finding those that have low contrast or are poorly localized on an edge. This is achieved by calculating the Laplacian, value for each key point found in stage 1.

3. Key Point Descriptor

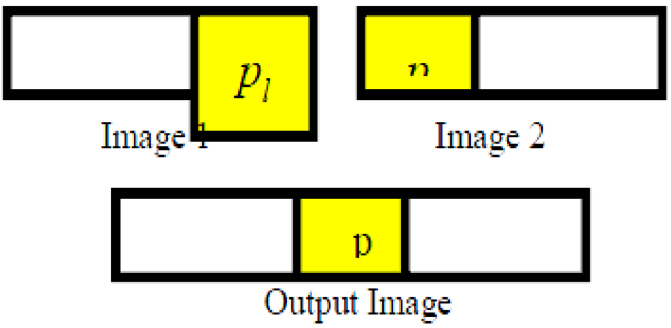
Figure illustrates the computation of the keypoint descriptor. First the image gradient magnitudes and orientations are sampled around the keypoint location, using the scale of the keypoint to select the level of Gaussian blur for the image. In order to achieve orientation invariance, the coordinates of the descriptor and the gradient orientations are rotated relative to the keypoint orientation. For efficiency, the gradients are precomputed for all levels of the pyramid.

V. RANSAC

The Random sample Consensus algorithm (RANSAC) proposed by Fischler and Bolles is a general parameter estimation approach designed to cope with a large proportion of outliers in the input data [13]. Unlike many of the common robust estimation techniques such as M-estimators and least median squares that have been adopted by the computer vision community from the statistics literature, RANSAC was enveloped from within the computer vision community. RANSAC is a resampling technique that generates candidate solutions by using the minimum number observations (data points) required to estimate the underlying model parameters. As pointed out by Fischler and Bolles , unlike conventional sampling techniques that use as much of the data as possible to obtain an initial solution and then proceed to prune outliers, RANSAC uses the smallest set possible and proceeds to enlarge this set with consistent data points [14].

VI. BLENDING

Image obtained by image matching is a overlapping image. Blending minimize intensity difference of overlapping pixels. Pixels near center of image get more weight.



VII. RESULTS

Figure shows the results obtained from corner detection and SIFT algorithm.

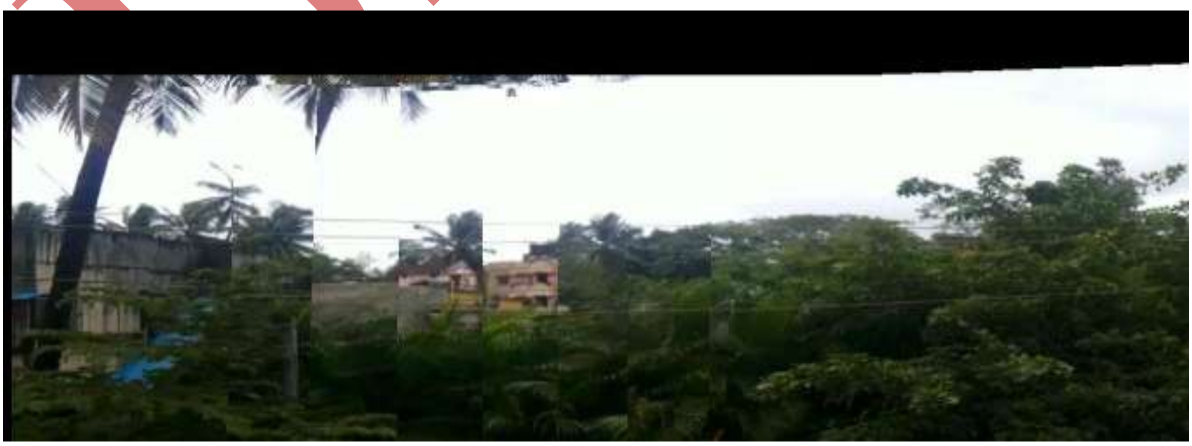


Fig: Image Stitching Using Corner Detection Algorithm

Fig: Image Stitching Using SIFT Algorithm

VIII. CONCLUSION

Based on extracting invariant scale features, we get potential feature matches SIFT algorithm. SIFT can give better performance and when there are less rotations corner detection algorithms can perform better. RANSAC algorithm and a probabilistic model to realize image match precisely. The average weighed method ensures smooth translation between the overlap regions.

REFERENCES

[1] Tejasha Patil, Shweta Mishra Poorva Chaudhari, Shalaka Khandale, "IMAGE STITCHING USING MATLAB" International Journal of Engineering Trends and Technology- Volume4Issue3- 2013.

[2] Yanfang Li, Yaming Wang, Wenqing Huang, Zuoli Zhang, "Automatic Image Stitching Using SIFT", IEEE 2008.

[3] Dianyuan Han, "A standing tree image mosaic algorithm based on SIFT", International conference on Computer Science and Electronics Engineering, 2012.

[4] Drew Steedly, Charis Pal, Richards Szeliski, "Efficient Registrating Video into Panoramic Mosaic", IEEE, 2005.

[5] Pengrui Qiu,Ying Liang and Hui Rong. "Image Mosaics Algorithm Based on SIFT Feature Point Matching and Transformation Parameters Automatically Recognizing", proceedings of second International conference on Computer Science and Electronics Engineering, 2013.

[6] V S Veena Devi, S.M. Prasad and H. Gangadhara Bhat, "An efficient algorithm for image stitching based on scale-invariant feature transform", International Journal of Engineering and Applied Sciences, vol. 2, 2012.

[7] Chaokui Li, Gang Yang, Jun Wu and Fang Wang, "The UAV Video Image Stitching Based on Improved Moravec Corner Matching Method", International Journal of Remote Sensing Applications, vol. 2, 2012.

[8] Migual Lourenco, Joao P. Berreto and fransisco Vasconcelos, "sRD-SIFT: Keypoint detection and matching in images with radial distortion", IEEE transaction on Robotics, vol. 28, 2012.

[9] Matthew Brown and David Lowe, "Automatic Panorama Image Stitching Using Invarent Features", IJCV, 2011.

[10] Li Jin ,Wang Yanwei ,Liang Hong, "Image Mosaic Based on Simplified SIFT", International Conference on Mechanical Engineering and Automation Advances in Biomedical Engineering, Vol.10, 2012.

[11] Richard Szeliski, "Video mosaic for virtual environment", IEEE computer graphics and application, vol. 16, 1996.

[12] Yongmin Li ,Li-Qunxu, Geoff Morrison, Charles Nightingale &Jason Porphett, "Robust Panorama from MPEG video", IEEE, 2008.

[13] Stiffen Gauglitz, Tobias Hollerer and Matthew Turk, "Evaluation of intrest point detectors and feature descriptors for visual tracking", International journal for computer vision, 2011.

[14] F. Tarsha-kurdi, T. Landes, P. Grusenmeyer, "Extended RANSAC algorithm for automatic detection of building roof planes from lider data", The photogrammetric journal of Finland, 2008.

[15] Michal Irani and P. Anandan, "Video indexing based on Mosaic Representation", ISRAEL, 2000.

[16] David G. Lowe, "Object Recognition from Local Scale-Invariant Features", proc. of International Conference of Computer Vision, 1999.

[17] Guozhu Liu, and Junming Zhao, "Key Frame extraction from MPEG video stream", Proceedings of the Second Symposium International Computer Science and Computational Technology, 2009.

[18] Vladan Rankov, Rosalind J. Locke, Richard J. Edens, Paul R. Barber, "An algorithm for image stitching and blending", proceedings of SPIE, 2005.

[19] Ms. Ashwini P , Mrs. Jayalaxami H, " IMAGE MOSAICING USING SIFT AND CORNER DETECTION ALGORITHM", International Journal of Advanced Technology & Engineering Research, March 2014.