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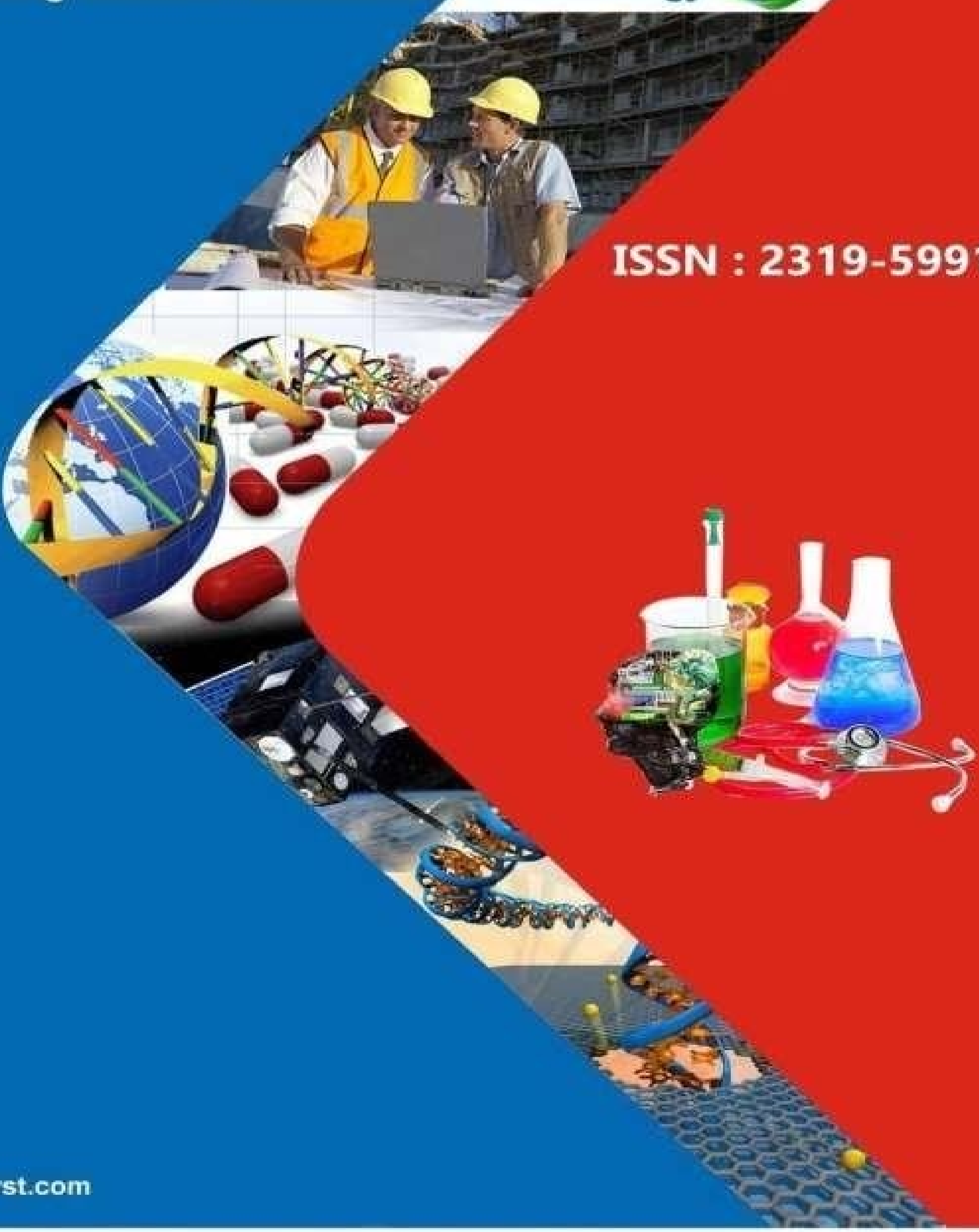
International Journal of
Engineering Research and Science & Technology



ISSN : 2319-5991

www.ijerst.com

Email: editor@ijerst.com or editor.ijerst@gmail.com

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com

Vol. 21, Issue 1, 2025

HOLOENTROPY MEASURES FOR IMAGE STITCHING OF SCENES ACQUIRED UNDER UNKNOWN CAMERA POSITIONS OR ARBITARY POSITIONS

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ABSTRACT:

Image stitching of similar scenes is a challenging task when scenes are captured under varying illuminations between the scenes, varying camera positions, varying orientations either in axial or azimuth. In this paper, we explore a seamless image stitching algorithm to address the above-said issues by applying techniques of dehazing on the acquired scenes and before identifying the image features and holoentropy aided feature matching on the Scale Invariant Feature Transform (SIFT) based features for the image. Experimentation of the proposed system is compared with the existing image stitching methods using squared distance, Minkowski and pair wise Euclidean distance for feature matching. The proposed seamless stitching method is evaluated based on the metrics, horizontal square gradient value (HSGV) and vertical square gradient value (VSGV). The obtained results are shown to be feasible for stitching the nonuniform or illumination variation multiple images.The exploration of above said stitching algorithm is intended to reduce the number of computations and inconsistencies in the stitched results.

INTRODUCTION

Image stitches multiple correlated images to obtain an image of greater field of view (FOV). General cameras, which have low FOV can't generate images with higher FOV while stitching can help us achieve it. It is a special case of scene reconstruction through which images are related by planar homograph. Two or more images scan be stitched with each oth- er uniquely without loss of information in any images with a greater FOV.

Numerous stitching algorithms have been proposed. Applications of the algorithms proposed is based on the quality of the results we obtain. It depends upon human perception (how much aesthetic the generated picture is) as well as machine perception (these can be used for other processing where some data extraction is required from the image.)

This paper proposes a unique algorithm for stitching two or a number of images. Input images are taken and features are detected using Harris-corner detection method. RANSAC is applied to find feature correspondences between images. Images are then projected in a plane and blended together. The whole method is implemented using MATLAB software.

International Journal of Engineering Research and Science & Technology
ISSN 2319-5991 www.ijerst.com
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SYSTEM MODEL

A. Feature Detection and Matching

Feature Detection and feature correspondence between images is one of the basic steps in Stitching of Images. As we have to align and blend the images, we need to have feature correspondence between the images to blend them properly. How to detect and correlate the fea- tures is described briefly below.

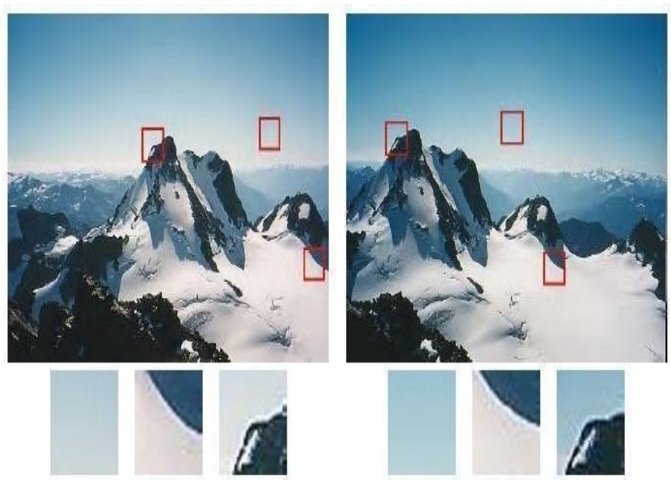

Figure.1 Feature detection & Matching

B. Harris-Corner Detection

Simplest criterion one can think of to detect the relationship between two images is to compare different patches on them.

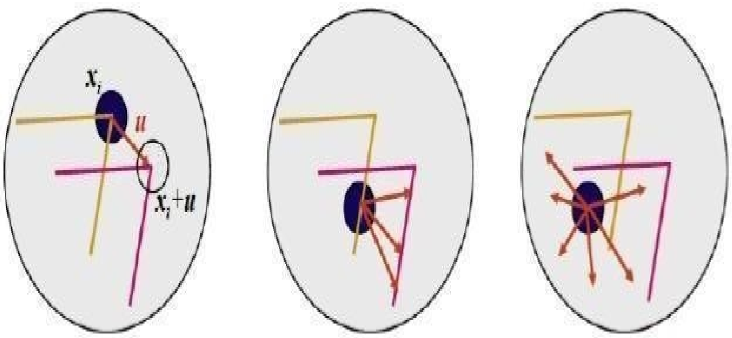

Figure.2 Harris – Corner Concept

As shown in fig, a window can be taken. The window should be moved from one place to other place and calculations should be done over the window. The radius and value of the window constant can be varied to get different results.

$$EWSSD(u) = \sum_i w(x_i)[I_1(x_i + u) - I_0(x_i)]^2 ,$$

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ISSN 2319-5991 www.ijerst.com
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This is a general method taken for corner detection. Now, the question that arises is how to take the window and what values should be assigned to the weights of the window. To know those values, let's go back to the basic of Harris –Corner Detection and understand it properly.

Whenever the image pixel values shows a better gradient value in its neighborhood, the patch is taken as feature point. But for better processing, we need good features yet less in number. Corners satisfy such a criterion.

PROPOSED SYSTEM

This paper proposes a unique algorithm for stitching two or a number of images. Input images are taken and features are detected using Harris-corner detection method. RANSAC is applied to find feature correspondences between images. Images are then projected in a plane and blended together. The whole method is implemented using MATLAB software.

STIMULATION RESULTS

Test Case -1

Figure.3 Input Image

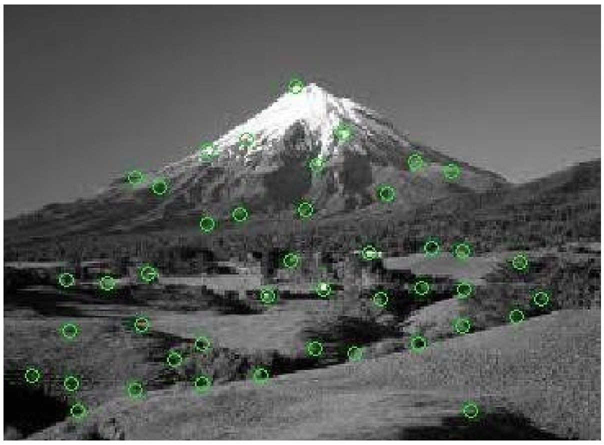

Figure.4 Output Image with threshold = 20

Figure.5 Output Image with threshold = 200

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ISSN 2319-5991 www.ijerst.com
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Test Case 2

Figure.6 Input Image

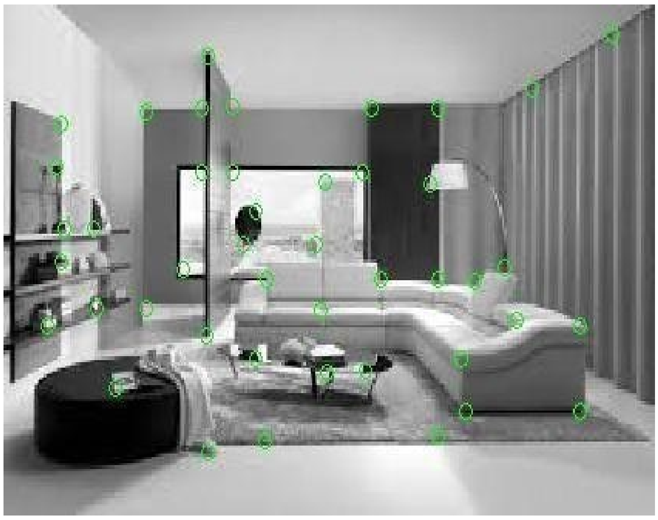

Figure.7 Output image with Threshold = 100

Figure.8 Output image with threshold = 20

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ISSN 2319-5991 www.ijerst.com
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HARRIS CORNER DETECTION

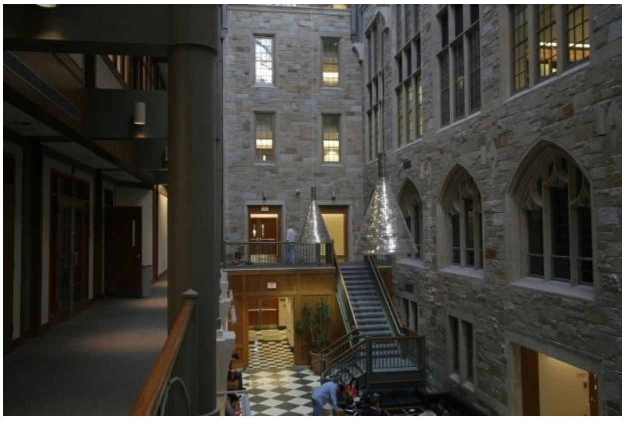

Figure.9 Input Image

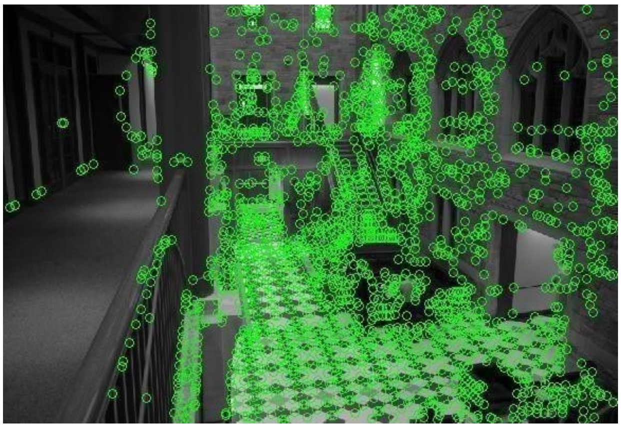

Figure.10 Harris corner output

Figure.11 Input Image

Figure.12 Harris Corner Output

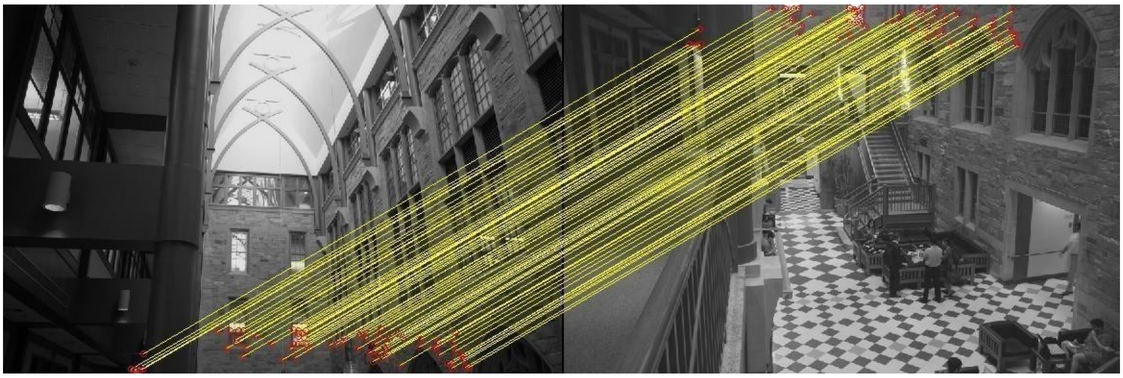

Figure.13 RANSAC Output

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Figure.14 Final Output

ADVANTAGES

- **Improved Accuracy –** The integration of motion models with feature detection enhances object tracking precision.
- **Real-Time Processing** – Optimized algorithms enable fast motion estimation, making it suitable for real-time applications.
- **Robustness to Noise** – Feature extraction techniques like SIFT and SURF ensure stable detection even under varying lighting and occlusion conditions.
- **Scalability** – The method can be adapted to different environments, from small-scale image processing to large-scale video analytics.
- **Low Computational Cost** – Efficient algorithms like ORB and optical flow allow implementation on low-power embedded systems.

APPLICATIONS

- **Surveillance and Security –** Detects intrusions, tracks moving objects, and recognizes faces in CCTV footage.
- **Autonomous Vehicles –** Helps in obstacle detection, lane tracking, and motion prediction for self-driving cars.
- **Medical Imaging –** Assists in tracking anatomical structures and diagnosing motion-related disorders.
- **Robotics –** Enables robots to perceive and navigate dynamic environments using motion tracking.
- **Sports Analysis –** Tracks player movements and ball trajectories for performance evaluation.
- **Augmented Reality (AR) & Virtual Reality (VR) –** Enhances motion recognition for interactive applications.

ISSN 2319-5991 www.ijerst.com
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CONCLUSION

This paper proposes a multi-row panoramic image stitching method. Firstly, it designs an optimal scanning path to cover the large viewing field, and then selects the center frame to start to stitch. This process can cover the viewing field as large as possible, and also avoid the strabismus and accumulative errors. And then, the stitching process uses first-column and second-row manner, rather than uses the common stitching along the scanning direction, or uses the reference frame along horizontal and vertical directions synchronously. The first- column and second-row manner is in favor of handling the accurate alignment. Furthermore, multi- point joint stitching is proposed to guarantee the accurate matching in subtle regions, especially the stitching border and the non-overlapping region. Experimental results show that the proposed method can provide a faster and more accurate panoramic image than other state-of- the-art image stitching methods, and also give a better visual effect in a large view stitching.

Future works can be done on removing the aliasing (Image feathering) that were in- troduced as noise. For removal of noise, Poisson or Laplacian distribution method can be used. Images with non-overlapping regions can be taken into consideration for stitching pur- poses. RANSAC algo can be further developed. Image stitching for document stitching should be taken into account.

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