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Review on Efficient Image Mosaicing Using Corner Detection Techniques

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ABSTRACT: ***In image processing, mosaic images are made by adding together small images. Creation of mosaic images from a sequence of partial views is a powerful means of obtaining a larger view of a scene than available within a single view, and it has been used in wide range of applications. A general framework for images is proposed in this paper. This paper also discusses a review on different applications of image mosaicing mainly in the area of image mosaicing using corner detection technique.***

KEYWORDS- Image Mosaicing, Image Processing, Panorama, Image Fusion.

I. INTRODUCTION

An image is an array, or a matrix, of square pixels (picture elements) arranged in columns and rows. An image is also defined as a two dimensional function (x, y), where x and y are spatial (plane) coordinates, and the amplitude of f at any pair of coordinates (x, y) is called the intensity or gray level of the image at that point. The mosaic as an art form is defined in the Merriam-Webster dictionary as "a surface decoration made by inlaying small pieces of variously colored material to form pictures or patterns." The mosaic dates to the 4th century B.C., and is generally associated with the Greeks. In fact, the word mosaic is of Greek origin, meaning "patient work of art, worthy of the muses". The Greeks, and later the Romans, embraced the mosaic in many areas of architecture as a decorative element. During the first centuries A.D., mosaics were popular among the Romans, and could be found in many parts of Roman society-set in floors and walls of houses, temples, baths, columns and entrances to many residences and buildings. Image mosaicing is the process of mixing multiple overlapping images of same scene into a larger image. When the size of an image such as picture or painting is beyond the scope of camera, it is difficult to take the whole picture which is a high resolution image at all once. In this method,each part of the image is taken by a camera one by one. A part of an Image is an image patch, using image patches, the whole picture is reproduced. This method is called Image Mosaicing. The output of image mosaicing operation will be the combination of input images. Image mosaicing is an effective means of constructing a single panoramic image from a series of snapshots taken in different viewing angles.

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An Image mosaic is a synthetic composition generated from a sequence of images and it can be obtained by understanding geometric relationships between images. The geometric relations are coordinate transformations that relate the different image coordinate systems. By applying the appropriate transformations via a warping operation and merging the overlapping regions of warped images, it is possible to construct a single image from a single large image of the same object, covering the entire visible area of the scene. This merged single image is the motivation for the term mosaic. Various steps in mosaicing are feature extraction and registration, stitching and blending. Image registration refers to the geometric alignment of a set of images. The set may consist of two or more images taken of a single scene from different viewpoints. The goal of registration is to establish geometric correspondence between the images so that they may be transformed, compared, and analyzed in a common reference frame. This is of practical importance in many fields, including remote sensing, medical imaging, and computer vision Mosaic images can be classified into four types, ancient mosaic [1][6],crystallization mosaic [1][6], puzzle image mosaic [1][6] and photo mosaic [1][6]. The first two types of mosaic decompose a input image into smaller ones (with different colour size and rotation), reconstructing the image by properly painting the smaller images. So they can be grouped together under the denomination of image mosaics [6]. The last two types are obtained by fitting images from a database to cover an assigned input image. So they may be grouped together under the denomination of multi picture mosaics [6]. These processes should not be intended as a rigid one. Automatic mosaic construction has been applied in many areas like computer vision, photogrammetric, image processing and graphics. To build a mosaic image from a sequence of partial views is a powerful means of obtaining a wider view of a scene than from a single view and has been used in many applications [7]. The most important application is the construction of large aerial and satellite photographs from many photographs. In the aspect of medical images the large panoramic image can help doctors to conduct comprehensive observation on the focus and surrounding parts. An application in which mosaics are specifically useful in the diagnosis and treatment of retinal diseases. Mosaicing is also used for document image analysis when it is not possible to capture a large document at a reasonable resolution in a single exposure. Another application area is panoramic image mosaics from sequences of images. Here a review on the research works in the field of image mosaic is discussed. The main challenges in image mosaicing are correcting geometric problems using image data and /or camera models, image registration using image data and/or camera models and eliminating seams from image mosaics.

An image mosaicing based long scene panorama[4][8], which crops and stitches the proper segments from video frames, usually provides a natural visualization. However, high quality results shall depend on expensive operations for accurate image registration. Structure from motion algorithms are employed to determine the projection surface and Markov random field is adopted to select stiching region [4]. Dense depths are estimated and seams connected adjacent frames are chosen by graph cut algorithm [8]. Section 2 discusses a proposed approach for general image mosaicing framework. The relevance of the image mosaicing is explained in section 3. In section 4 we are discussing the conclusion.

II. IMAGE MOSAICING FRAMEWORK

A general framework for image mosaicing is proposed in this framework. The block diagram for the proposed framework is shown in the Fig1.

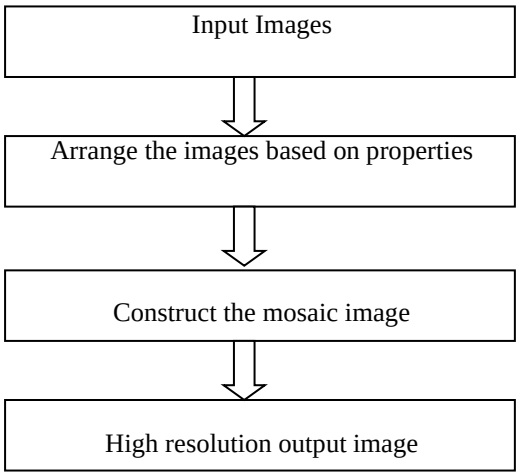

Fig:1 Proposed framework for image mosaicing

The algorithm for this proposed framework is given as:

- First we have an image.
- Arrange them in correct order and orientation by using the features extracted.
- Construct the mosaic image
- Apply distortion reduction methods to improve the quality of mosaic image.
- Finally the high resolution mosaic image is obtained.

III. REVIEW OF IMAGE MOSAICING

Mosaicing is one of the techniques of image processing which is useful for tiling digital images which generally is blending together of several arbitrarily shaped images to form one large radio-metrically balanced image with boundaries between the original images are not visional. It can be a special case of geometric correction where registration takes place in the existing image. Stitching blends the aligned images seamlessly. Image stitching is a technique to merge a sequence of images into one blended picture [5]. Integration of plenty of small images to create one large image. This can be even defined as the process of perspective warping of images [9]. Kamesh et.al. proposes an image stitching technology wherein there is no restriction to the space between the two stitched images. A larger white space between the two images will yield the same result as that by two images with very less distance between the stitched images.

Xiong Shi et. al. [11], Proposed feature block matching. Edge detection is used to pick up base feature block automatically and thus improves the precision of image stitching. In the problem of searching matching blocks, a hierarchical search strategy is employed, which improves the speed of image stitching. Its main advantage is to improve the speed and precision of image stitching.

Yi Meng et.al. [12], An automatic image mosaic method based on optimal derivative filters with well distributed was proposed. Firstly interest points in an image are detected by corner operator with optimal derivative filter, Delaunay triangulation is used to reject the spurious feature point's pair and estimate the parameters of geometric transform model. After the geometric transform of two input images were fused and the image stitching was finished. Its main advantages are improvement in mosaic accuracy, efficiency and robustness. The output shows the seam mosaic image.

Miao Ligan, Yue Yongiuan proposes an image mosaicing method for camera captured document images, and it can be used to stitch multiple overlapping document images into a large high resolution image. In this method they used nearest neighbour (NN) clustering technique in document skew rectification to locate the horizontal vanishing point a run length opening algorithm (RLOA) to compute the local orientation of vertical character stroke (VSB), used to locate the document's vertical vanishing point, a three-step hierarchical rectification method is proposed to rectify document images. It is not possible to capture a large document at a reasonable resolution in a single exposure so multiple, overlapping images of the document are stitched together seamlessly to form a high resolution composite.

Prabhakara Rao G.V. et. al [3], Proposed a complete system for mosaicing a sequence of multiple still images with some amount of overlapping between every two successive images. There are three contributions in this paper. First is a featureless registration method which handles rotation and translation between the images using phase correlation even under blur and noise. The second is an efficient method of stitching of registered images. It removes the redundancy of pasting pixels in the overlapped regions between the images with the help of a binary canvas. The third contribution is a minimal blending approach to the mosaic and preserve the quality close to reality.

Nagraj B. Patil1.et.al.Proposed an algorithm for mosaicing of torn document images. The use of mosaicing torn document images is that it has reliable performance, fast document recovery capability and on-screen visual verification. Further, Most document reconstruction problems can be solved in two steps first, finding an initial set of matching fragment pairs, then resolving the ambiguity among these fragments to reconstruct the original document. The principle technique used here is the featureless image mosaicing technique.

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Ning Li.et.al Proposed an Algorithm of Fast Corner Match for Image Mosaic. The Algorithm for fast corner match is mainly to be used in video mosaic which has high requests in speed. Since the speed of many image mosaic algorithms is not as fast as request, a fast speed algorithm for video mosaic is necessary. The result shows that the speed of the proposed algorithm is faster.

I-Jen Lai.et.al .Proposed a new type of computer art image called secret-fragment visible mosaic image is proposed, which is created automatically by composing small fragments of a given image to become a target image in a mosaic form, achieving an effect of embedding the given image visibly but secretly in the resulting mosaic image. This effect of information hiding is useful for covert communication or secure keeping of secret images.

Chao Sui.et.al. Proposed an Image Mosaic Construction Using Feature Matching and Weighted Fusion. The merit of this method is that it can effectively reduce the rate of feature mismatches. Corners in two overlapping images are taken as features which are detected and matched in order to derive a transformation matrix to align the images to be combined. In order to guarantee a reduced rate of mismatching, a similarity definitude algorithm is employed. Furthermore, a smooth mosaic is obtained by the use of a weighted fusion process. Experimental results, which are conducted using indoor images, show that our approach can effectively obtain a fused image.

Jie Hu, Dong-Qing Zhang proposed an image stiching technology, wherein long scene panorama (LSP) can provide the immersive experience for an extended view in one single photograph. The state of the art image mosaicing based LSP techniques are significantly constrained by their high computational complexity. In this paper the author propose a novel scheme which can generate the LSP for the indoor environment. A novel adaptive resembling scheme is introduced to generate more natural looking panoramas from videos captured by cameras with non constant moving speed. A multiple slits replacement scheme is also developed to reduce the zigzag distortion and to handle the depth change. Experimental results show that the proposed scheme can achieve satisfactory performance with handheld cameras.

Jari et.al proposed an image stitching technology wherein there is no restriction to the space between the two stitched images. A larger white space between the two images will yield the same result as that by two images with very less distance between the stitched images. Image alignment procedure establishes geometric correspondences among the images. The automatic construction of image stitching is an active research area of research in the field of photogrammetric, computer vision and computer graphics.

Table 1 shows the comparative study of two image mosaicing papers. The first paper is image mosaicing for medical images by using fourier shift theorem[13]. The second paper is based on the pyramid method of image mosaicing which is used for non overlapping images[14].

Table 1

S.No	JOURNAL	TITLE	PSNR	ENTROPY	BLUR METRIC
1.	IEEE-2014	A novel technique for mosaicing of medical images	-	6.9207 (Retina)	0.2218 (Retina)
2.	IEEE-2013	A novel technique for non overlapping image mosaicing based on pyramid method	28.6264	3.6672	0.1825

IV. CONCLUSION

Image mosaicing is a powerful tool for generating larger view of a scene. Various image mosaicing techniques are discussed. Image mosaicing helps to capture a large document at a high resolution in single exposure. To improve image mosaicing precision further, future work can be done by establishing high order transformation models where nonlinear local deformations happens and the RANSAC algorithm can be imported with image blending and warping to enhance the quality of a mosaic image.

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