A Review of Various Image Mosaicing Techniques

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Abstract—**Mosaic image is a method of combining number of image pieces to get complete image. This technique can be applied to documents images, photos images and videos. It is an art of creating big image with help of collection of small images. There are many situations in which capturing of large image are not possible within available resources such as digital camera, scanner or copying machine. As a result large images are capture as split components and then they need to be mosaiced. Digital image mosaicing technique requires an overlapping region to generated large image. Image mosaic has a wide application such as image combining, image restoration, image data security, biomedical image processing, image forensic and historic artifact processing. In this paper discuss a review on various image mosaic techniques and overviews on various application of mosaic image.**

Keywords— *shredded images; image processing; image mosaicing.*

I. INTRODUCTION

Mosaic is art of combining multiple pieces to restore information from documents and photos. Image mosaicing techniques are widely for semi-automatic and automatic recovery of multiple images. This is useful in number of applications such as investigation science, biomedical, forensic, historical artifact reconstruction. Image shredded is done for various reason such is to destroy the information on the images. Whereas manually reconstruction of images is very difficult task and time consuming process as compare to automatic process. And automatic handling make job easier and make digitization.

Mosaic images are of four types, photo, puzzle image, crystallization, and ancient. The last two types of mosaic are tiles from the source image are decomposed and reconstructed image properly by tile painting. That's why group together to mosaic tile under the denomination. The first two types get by fitting images from database to cover an assigned source image. Hence multiple pictures are group together under the denominated mosaic image. Automatic mosaicing techniques are applied into various fields such as photogrammetric, image processing, computer graphics and biomedical image [1]. A framework for ripped-up or shredded document reconstructed block diagram is shown below fig.1.
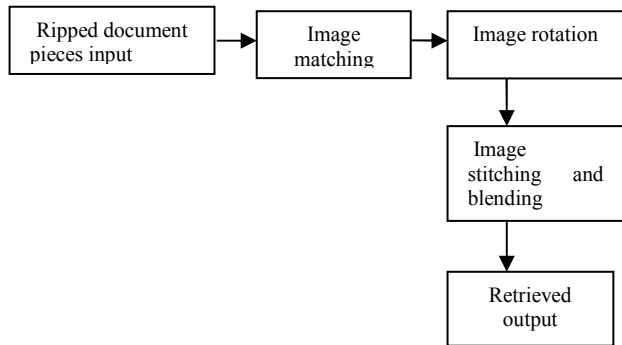

Fig.1. Block diagram for general framework

II. SURVEY ON IMAGE MOSAICING TECHNIQUES

Image mosaicing using various algorithms which is define.

In [2] quantitative analysis of two algorithms is done. Three step processes is used, first step new image and sub-mosaic image registries. Second step is feature detection, matching and estimating homography.

- *Feature detection and matching using KLT algorithm (Kanade-Lucas-Tomasi tracker) technique based on optical flow:* Harris detected is used to detected point of interest in an image and in next image track them by estimating the optical flow.
- *Feature detection and matching using SURF (Speeded-Up Robust Features) algorithm technique based on invariant:* SURF detector is used to detected point of interest in the two images and detected points are match by SURF descriptors.

homography matrix estimation using Direct Linear Transformation and Random Sample Consensus algorithm used for nonlinear estimator, to minimize the back projection. Last step is perspective warping. Feature extraction is done by SURF and KLT algorithm and then compared. Feature extraction algorithm KLT is thrice times faster than feature detector SURF algorithm. After analysis it shown that the mosaic image using SURF gives much better results compare to KLT.

In [3] image stitch by using feature based matching algorithm. Grid-based motion statistic (GSM) is a high speed and extreme strong image feature matching algorithm. However the correct match rate and registration accuracy of GSM is nearly less. In this firstly ORB method is used detect and describe feature points of two images. Bilateral matching is use to find out matched set to remove false matched and GSM separate true or false matches. RANSAC method used to calculate basic matrix. Then constraint reject to match points. Between two adjacent images, homography matrix is selected as the transformation model. The weighted average fusion algorithm is used to fuse the align image. To eliminate joints of image, the pixels of the overlapped area are super grating according to the corrponding weights. After fusing, the color and brightness of the reconstructed images seam are more natural and real.

In [4] two images are considered to find out overlapping regions between them and stitch it. The main aim of image mosaicing is that camera view of field is limited by 50 to35 degrees. While human view of field is obliged to 200 degree view of field. In this first step is detection of overlapping regions in which analyze the two images and the common pixels point are matched between the two images by comparing the images pixel to pixel. To determine overlapping region between two images bidirectional scanning is done. Horizontally or vertically are scanned for detecting overlapping regions. Once it detected it will stitched together and alpha blending is used to eliminate breakages in the retrieved image.

In [5] document stitching is based on optimal seam. First overlapping region is found and second optimal seam is detected. Hough transform is used for finding line segment among numbers of edge pixels and for edge detection using by sobel operator. After skew correction, feature point detected by SURF algorithm used for obtaining matching region. Then the gray level to the binary image reduction is done for searching optimal seam using Otsu's algorithm. For detection of connected region in binary images labeling is done by computer vision. Primary election of optimal seam areas and projection method to retrieve the path and optimal path selection is done.

In [6] feature extracted from the information of the character in the document. Intelligent algorithm is used for recognize the characters and test whether the matching of the pieces are devoted. The reconstruction process of the shredded document is basing on text information and document preprocessing. Select the pieces by blank area searching algorithm for the first column. Then there is a reconstruction of each row by searching adjacent piece. This is done by two methods. First one is rightward eduction algorithm basing on minimum euclidean distance, second special cases in rightward searching process and the corresponding solving algorithms. When the endless loop case occurs, rightward edcution algorithm stops and report the current pieces then human recognition is needed. For False searching case pattern recognition is use to arranged pieces.

In [7] a novel dataset is used which consist of two scientific magazines from there 120 pages taken. All pages have been manually shredded into 16 pieces of various sizes

and shapes. A subset of 48 pages has been further divided into 24 and 32 pieces. In which algorithm is capable of rebuild pages consisting of up to 32 pieces and gives fair result even multiple pieces are missed. Automatically assemble shredded document. A two-step frame work is done. First each fragment of document shape and content local features extracted. Identify pair of corresponding points using and SVM classifier. Finally iterative algorithm is used which selected the edged having topmost weight.

In [8] semi-automatic approach used to retrive crosscut shredded document. Automatic algorithm used for segmentation and orientation for individual shreds from scan shred images for features extracting and potential rank matched for each pieces using the computed feature and match information. In this document de-shredder was test on puzzles for shredder DARPA challenge, allowing reconstructions of multiple ripped pieces documents and testify the effective automatic algorithm.

In [9] there is a use of camera for capturing images of document and it used to stitch multiple overlapping documents images. First, use the nearest-neighbor clustering techniques in documents lies about rectifying and to locate the disappearing points of the horizontal text plane. Secondly, separation of the image into multiple overlapping blocks centered with the centroid of each connected part and introduced a run length opening algorithm to calculate the orientation of up and down character stroke, to located document vertical disappearing point. Finally, using local alignment is revised of all Pairs of the overlapping images to obtain global alignment model.

In [10] accurate registration is used for montage synthesis. The feature based detection with the help of computer aid instrument for mosaicing technique. A feature-based automatic technique is used for mosaicing of color image of the human retinal. SIFT detects (scale invariant feature transform) less features therefore drawback is overcome by mSIFT therefore mSIFT algorithm (modified scale invariant transform). In the mSIFT algorithm the second-nearest-neighbor method is used for feature extraction and matching purpose. Two images are considered for detection of interesting point by euclidian distance along with this inlier identification, bilinear warping and multi-blending techniques is done. Pairs of color image of the curved retinal are used for mosaicing to obtain panoramic images.

In [11] feature extracting and matching is done by using Y-position method across the image. A set of initial Y position are found using PCA (principal component analysis) from the six filters output at every pixel. Global registration is done for constructing graph of multiple images. Pairwise image registration is done for selecting matching pair for affine transform. The quality of resultant mosaic image is depends on selected reference frame. The lowest registration error using graph analysis method for reference frame selection is used. The short path from all other references frames simply reduced registrations to obtained mosaic image.

III. COMPARISON

There are lots of improvements up to last decay in the field of image mosaicing techniques. While moving towards the next techniques there are some advantages over the previous one and also some drawbacks of the previous method are tried to remove in the next upcoming method. sComparison of the mosaicing algorithms given in the below table:

TABLE I.COMPARISON OF VARIOUS IMAGE MOSAICING TECHNIQUES

Sr.no	Authors	Year	Central ideas	Purpose of image mosaicing
1.	Khellal Atmane, Nemra Abdelkrim and Sayah Houari	2018	Real time registers image and mosaic of image taken by UAVs.	Aligning multiple images to retrieve image of a 3D scene. To view larger image than standard image.
2.	Min Han and Kuo Yan	2018	Feature matching based image stitching is done GMS algorithm. Firstly ORB extract feature point of image, GMS based bidirectional match points and rejected false match. Finally used RANSAC algorithm.	Aerial image stitching with high matching speed and accuracy.
3.	Chaudhary Zamirhasan, Prof. Waheeda Dhokley, Khan Zahid and Shaikh Asif	2017	Direct intensity method for mosaic achieved matching the pixel values of two images.	Multiple images stitching with some overlapping region to get lager image view.
4.	Jiehua Chen, Guoqiang Liu, and Yayu Zheng	2016	Tilt corrected for the archives, overlapping region are detected, binary image are extract from OTSU algorithm and ghost effect is eliminated from stitch image.	To eliminate effect of registration ghost and good blending effect is achieved for image stitching.
5.	Honghao Qiu, Yehong Liu, Jiaqi Lu, and Yong Fang	2014	Automatic reconstruction of shredded document by processing on document. Pieces are choose by blank area search algorithm and searches for adjacent pieces by rightward eduction algorithm.	To reconstruct shredded document automatically.
6.	Nicolas Cebron, Fabian Richter, Christian X. Ries, and Rainer Lienhart	2013	Automatically assemble shredded documents. A two-step frame work is done. First each fragment of document shape and content local features extracted. Identify pair of corresponding points using and SVM classifier. Finally used an iterative algorithm which selected the edged having topmost weight.	Manually shredded documents are automatic assemble using assembling algorithm which is fully automated.
7.	Andrew Gallagher, Aaron Deever and Eastman Kodak	2012	Semi-automatic method used for crosscut shredded documents to reassemble. A human interference is needed to allow semi-automatic method for assembling shred using computer and match information.	Based on puzzles form the shredder DARPA challenges.
8.	Yue Yongjuan and Miao Ligang	2011	Mosaic of camera capture document image can be stitched multiple overlapping image into large image with high resolution using RLOA and VSB to locate document.	Higher resolution and full page retrieve from small patched images of documents accurately. .
9.	Yao Chang, Li Jupeng, Chen Houjin, and Zhang Xinyuan	2008	For feature transform mSIFT algorithm is used. In the mSIFT algorithm the second-nearest-neighbor method is used along with the inlier identification, bilinear warping and multi-blending techniques. Pairs of color image of the retina are used for mosaicing to create panoramic images.	To create panoramic image, from which analyze of a several of diseases.
10.	Munwai Lee, Tae Eun Choe, Isaac Cohen and Gérard Medioni	2006	The lesser error which is found by all-pairs from shortest path algorithm using reference frame and registered all other images to reference frame using an affine transformation model.	To create mosaic from retinal multiple fluorescein and color images. .

IV. CONCLUSON

We review the various image mosaicing algorithms, main goal of this paper is to use stitching images, retrieving and restoring information from documents or photo images. Image mosaicing techniques are used for combining multiple pieces of images to get a complete and larger view of image. This field is still full of research opportunities. There are wide applications used in various field such as photography, archeology, historical documents preventions, forensic science and also in corporate field.

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