A REVIEW OF IMAGE WARPING & IMAGE MOSAICING METHODS USING FORWARD MAPPING TRANSFORMATIONS

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ABSTRACT: Image mosaicing is combining or stitching several images of a scene or object taken from different angles into a single image with a greater angle of view. This is practised a developing field. Recent years have seen quite a lot of advancement in the field. Many algorithms have been developed over the years.
Our work is based on feature based approach of image mosaicing. The steps in image mosaic consist of feature point detection, feature point descriptor extraction and feature point matching. RANSAC algorithm is applied to eliminate variety of mismatches and acquire transformation matrix between the images. The input image is transformed with the right mapping model for image stitching.
Therefore, this paper proposes an algorithm for mosaicing two images efficiently using Harris-corner feature detection method, RANSAC feature matching method and then image transformation, warping and by blending methods.

Keywords: image mosaicing, Image Warping

INTRODUCTION

This paper investigates sets of images consisting of many overlapping views of a scene, and how the information contained within them may be combined to produce single images of superior quality. The generic name for such techniques is *frame fusion*. Using frame fusion, it is possible to extend the field of view beyond that of any single image, to reduce noise, to restore high-frequency content, and even to increase spatial resolution and dynamic range. The aim in this thesis is to develop efficient, robust and automated frame fusion algorithms which may be applied to real image sequences.

An essential step required to enable frame fusion is *image registration* : computing the point-to-point mapping between images in their overlapping region. This sub-problem is considered in detail, and a robust and efficient solution is proposed and its accuracy evaluated. Two forms of frame fusion are then considered : *image mosaicing* and *superresolution.*

Image mosaicing is the alignment of multiple images into a large composition which represents part of a 3D scene. Super-resolution is a more sophisticated technique which aims to restore poor quality video sequences by modelling and removing the degradations inherent in the imaging process, such as noise, blur and spatial-sampling.

Image Mosaicing 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 mosaicing can help us achieve it. It is a special case of scene reconstruction through which images are related by planar homography. Two or more images can be stitched with each other uniquely without loss of information in any images with a greater FOV.

Numerous mosaicing 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 mosaicing 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.

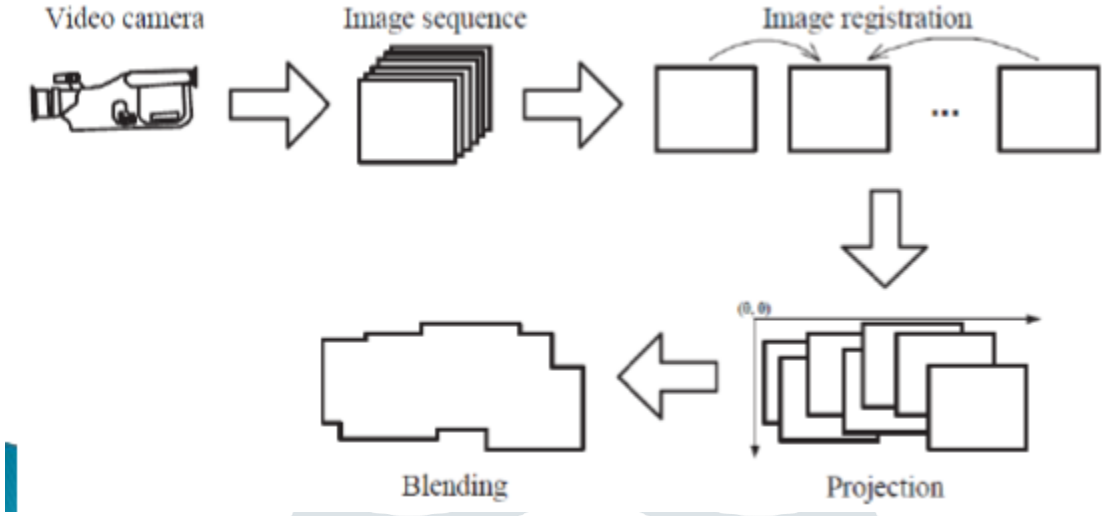
LITERATURE REVIEW

Work by Samy Ait-Aoudia was focused on mosaicing of satellite images or aerial images. It was using SIFT future correspondence for feature detection. Thus finding the relevant ones and stitching the images. Debabrata Ghose worked on quantitative evaluation of image mosaicing methods. An algorithm was developed to determine the performance matrix for different methods i.e. RANSAC, SIFT etc., thus determining the correlation and errors between the outputs and taking the best of the results among those from the created performance matrix. Richard Szeliski has done an extended research on the topics and had found many novel algorithms for registration and stitching. There are unique methods developed for extracting large 2-D textures from image sequences based on image registration and compositing techniques. After a review of related work and of the basic image formation equations led to the development of method for registering pieces of a flat (planar) scene, which is the simplest interesting image mosaicing problem. Then it was seen how the same method can be used to mosaic panoramic scenes attained by rotating the camera around its centre of projection. Finally, we conclude with a discussion of the importance of our results.

In computer graphics, compositing multiple image streams together to create greater format (Omnimax) images is discussed in . However, in this application, the relative position of the cameras was known in advance. The registration methods developed are related to image warping since once the images are registered, they can be warped into a common reference frame before being composited. While most current methods require the manual specification of feature correspondences, several new methods as well as the methods developed can be used to automate this process. Combinations of local image warping and compositing are now commonly used for special effects under the general rubric of morphing.

PROPOSED METHODOLOGY

Image mosaicing The images themselves may be geometrically warped and combined in a manner which both reduces noise and greatly increases the effective field of view. This is known as *image mosaicing*, and it may be used to compose tens or hundreds of images into wide-angle, panoramic views.



Three major issue are important in image mosaicing:

1. *Image alignment:* Determines the transformations that align images to be combined into a mosaic. This may be Euclidean (Rigid body) transformation, a similarity transformation, affine or, in the most general case, projective transformation.

Image registration or image alignment is a fundamental task in image processing to overlay two or more images used. Registration methods can be loosely divided into following classes.

(a) algorithms that use image pixel values directly *i.e.*, correlation method.
(b) algorithms that use frequency domain method *i.e.*, Fast Fourier transform based methods
(FFT)
(c) algorithms that use low level feature such as edges and corners *i.e.*, feature based method.
(d) algorithms that use high level features such as identified (parts of) object or a relation between features *i.e.*, graph theoretic methods .

2. *Image cut and paste:* Image mosaicing involves a combination of images which have overlapping regions. The cut and paste process involves selecting this region in mosaics. There are two ways to determine this region.

(a) Using colour/gray scale information from all constituent images for the region of overlap (median, average, etc.)
(b) Selecting a region from one of images.

Method (a) requires accurate alignment over the entire image area, otherwise resulting mosaic will be blurred. The method (b) requires alignment only along the seams. This is more useful in cases where camera motion, scene geometry and imaging condition are challenging.

3. *Image blending :* It is used to overcome the intensity difference between the images, differences that are present even when images are perfectly aligned.

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