A Review Paper on Various Approaches for Image Mosaicing

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ABSTRACT

Image mosaicing is one of the most important subject of research in computer vision. Image mosaicing requires the integration of direct methods and feature based methods. Direct methods are found to be useful for mosaicing large overlapping regions, small translations and rotations while feature based methods are useful for small overlapping regions. Feature based image mosaicing is combination of corner detection, corner matching, motion parameters estimation and image stitching. In this paper we present a review on different approaches for image mosaicing and the literature over the past in the field of image mosaicing methods. We take an overview on the various methods for image mosaicing.

Keywords---- Direct method, feature based method, homography, image registration, image wrapping, image compositing, pixel blending.

I. INTRODUCTION

Image mosaicing is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama of high-resolution image. It is commonly performed through the use of computer software; most approaches to image stitching require nearly exact overlaps between images and identical exposures to produce seamless results.

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 indistinguishable 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. There are two methods of image mosaicing: 1) Direct method 2) Feature based methods. 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 digital images taken of a single scene at different times, from different sensors, or from different viewpoints. Image registration is a very important step among all image analysis tasks in which the final information is received from the combination of sources like in image mosaicing, image fusion, change detection, and image restoration. Registration is necessary for comparison or integration of the received data from different measurements. 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 [1]. Registration methods can be loosely divided into the following classes: algorithms that use image pixel values directly, e.g., correlation methods [2]; algorithms that use the frequency domain, e.g., fast Fourier transform based (FFT-based) methods [3]; algorithms that use low-level features such as edges and corners, e.g., feature based methods [1]; and algorithms that use high-level features such as identified (parts of) objects, or relations between features, e.g., graph-theoretic methods [1]. The registration method presented uses the Fourier domain approach to match images that are translated and rotated with respect to one another. The algorithm uses the property of phase correlation which gives the translation parameters between two images if there is no other transformation between the images other than translation, by showing a distinct peak at the point of the displacement [4]. The next step, following registration, is image stitching. Image integration or image stitching is a process of overlaying images together on a bigger canvas. The images are placed appropriately on the bigger canvas using registration transformations to get the final mosaic.

Homography is the mapping between two spaces which is often used to represent the correspondence between two images of the same scene.

II. LITERATURE SURVEY

Registration and mosaicing of images have been in practice since long before the age of digital computers. Shortly after the photographic process was developed in 1839, the use of photographs was demonstrated on topographical mapping [5].

Image mosaicing algorithms traditionally follow a structural alignment approach, involving warping and stitching. Steps can be complicated by the introduction of parallax, which degrades the quality of image alignment. To avoid such complications, some algorithms impose constraints of planar scenes or parallax-free camera configurations. For example, Quick- Time VR [16] generated a panoramic view of the environment based on images from a rotating camera. Shum and Szeliski [17] introduced global and local image alignments to reduce accumulated image registration errors when given inputs of approximately planar scenes.

Images acquired from hill-tops or balloons were manually pieced together. After the development of airplane technology (1903) aerophotography became an exciting new field. The limited flying heights of the early airplanes and the need for large photo-maps, forced imaging experts to construct mosaic images from overlapping photographs. This was initially done by manually mosaicing [6] images which were acquired by calibrated equipment.

The need for mosaicing continued to increase later in history as satellites started sending pictures back to earth. Improvements in computer technology became a natural motivation to develop computational techniques and to solve related problems. The construction of mosaic images and the use of such images on several computer vision/graphics applications have been active areas of research in recent years. There have been a variety of new additions to the classic applications mentioned above that primarily aim to enhance image resolution and field of view. Image-based rendering [7] has become a major focus of attention combining two complementary fields: Computer vision and computer graphics [8]. In computer graphics applications images of the real world have been traditionally used as environment maps. These images are used as static background of synthetic scenes and mapped as shadows onto synthetic objects for a realistic look with computations which are much more efficient than ray tracing.

Reversible data hiding in AES Encrypted images by Reserving room before encryption can achieve real reversibility with high confidentiality for the secret data because of the use of multiple keys during the process ie, encryption key as well as data hiding key. With AES encryption, the secret key is known to both the sender and the receiver. The AES algorithm remains secure, the key cannot be determined by unauthorized person.

Feature Based Methods are in general more accurate. It can handle large disparities. Direct methods, may not converge to the optimal solution in the presence of local minima. For reliable performance direct methods rely on feature based initialization. Feature based methods [9] mosaic the images by first automatically detecting and matching the features in the source images, and then warping these images together. Normally it consists of three steps: feature detection and matching, local and global registration, and image composition.

Local and global registration starts from these feature matches, locally registers the neighboring images and then globally adjusts accumulated registration error so that multiple images can be finely registered. Image composition blends all images together into a final mosaic. Direct methods [10] attempt to iteratively estimate the camera parameters by minimizing an error function based on the intensity differences in the area of overlap.

III. CONCLUSION

Image mosaicing is useful for a variety of tasks in vision and computer graphics. Due to the wide range of applications, image mosaicing is one of the important research areas in the field of image processing. Here we have presented some of the very fundamental and basic techniques used in image mosaicing. This paper presents a complete process for image mosaicing.
REFERENCES