



An Improved Virtual Walkthrough from a 2D Stitched Image

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Abstract—Walk through can be produced using various methods like image based approach and video based approach. In this paper is concentrating on image based approach for generating walkthrough. Image based approaches is more concern with generating 3D walkthrough from 2D images of same sight. Image stitching create the high-resolution mosaics by combining two or more images of the same scene into one image. There are many existing system that provides the 3D interactive virtual walkthrough based on 2D images of same scene. Limitation in many of these system is poor quality of walkthrough, memory utilization is more. This propose system is intended to overcome these problems by providing appropriate and high quality walkthrough from 2D stitched images. This methodology uses the image registration, finding average distance between key feature points, best match score and optimal selection to find the key feature points to overcome the problem in existing systems. This aims of this research is on the advancement in the field of interactive 3D walkthrough by producing stitched images from a same set of images.

Keywords— Walkthrough; Image based approach; SIFT, RANSAC; Homograph Transformation; Image Stitching; Image Mosaic; Match Score.

I. INTRODUCTION

Walk-through is a demonstration from a particular view point of a camera that can be three dimensionally flown through the 2D image. Walkthrough which are based upon image based approach have to be of high quality images take from photographic lenses. In crime forensics, the 360 degree panoramic images can benefit investigator to conduct wide-ranging and visual observation on the focus and the surrounding parts. Due to the integral limitations in the lenses of the camera and its field of view, it is challenging to capture a single large sized scene with a single camera shot. The solution to this problem is to capture the scene by splitting images into two to more images of same scene and stitching the images to create a single image comparable to the original scene. Image stitching is a process in which various images of same scene are stitched together after forming geometric relationship between these images. A significant form of image mosaicing known as image stitching has become growingly common in the making of interactive panoramic image. Associated sets of image matches will later become panorama. Image stitching can also be stated as image alignment (geometrical registration) plus Image Blending (photometric registration). The captured images are usually not well aligned and the important steps for image stitching is the alignment of these images. Throughout the process, images may need to be transformed so that each part of the resultant panorama seem like to be taken from the same viewpoint. This process makes the image stitching result smooth and natural. In panorama image stitching technique, there are two main techniques first is regional technique which uses pixel to pixel matching and other is feature based techniques which uses to find all corresponding feature points in a image and to compare all features in one image against all features in the other using one of the local descriptors. The well-known feature based techniques is SIFT (Scale-Invariant Feature Transform) technique [10] is very robust nature. The pre-processing techniques are applied to find the distortion in captured images. Using SIFT, key points in each input images are calculated. More compute the transformation that

aligns the points in the first image to points in the second image using match score, average distance and RANSAC. A calculated transformation matrix is used to stitch the given input images. A virtual walk-through from the stitched image is created by cropping the stitched image in the vertical direction using rectangular mesh.

A review on the related works is highlighted in next section 2. Section 3 explains the proposed procedure of the Image stitching. Section 4 explains creating a virtual walk-through the stitched image. Section 5 followed by conclusion.

II. LITERATURE SURVEY

A research shows that Image stitching is still a challenging problem for single and panoramic images. Till date many algorithms have been extensively proposed to tackle image stitching problem; some of which are straight related to the work are highlighted here.

Tour Into the Picture: Using a Spidery Mesh Interface to Make Animation from a Single Image, Horry et al, 1997[2] proposed image based modelling for generating 3D walk through single view images. System generates 3D walk through single view images where the surfaces are orthogonal to each other and forms a single vanishing point at the centre of the image. These 3D model allows the user to virtually navigate through the scene. This system is well-matched for hand held devices like PDAs. The main limitation of this method is the long and monotonous user interaction during camera calibration step, every parameter has to be defined manually. Also the spidery mesh used to identify the regions in the image is computationally complex to draw since it involves too many lines to be drawn in the 3D space. There is a more manual human interaction involved.

ATIP: A Tool for 3D Navigation inside a single image with Automatic Camera Calibration, K.Boulanger et al, 2006[7] proposed a system for providing automatic virtual tour without using a calibration target for any view location. Less user interaction is required. The user interface is simple but it involves complex calculation while finding the dominant edges, vanishing points, camera parameters and background colour.

An Improved Algorithm Based on TIP Using a Vanishing Line, Jian Liu et al, 2013[9] proposed a framework for a three-dimensional model based on vanishing line. An image rendering method is presented based on the relative depth calculation and scene roaming. It does not require modelling of complex geometry of a scene. System being a three-dimensional model but unable to combine with panorama technology.

V2 Walk-through a Stitched Image, Geetha Kiran A et al, 2014[10] proposed framework is use for Creating a vertical virtual walk-through a Single stitched large sized image is proposed in two folds: In the first phase, the input images are stitched to create a single large image of a scene and in the second phase the virtual walk through the stitched image is rendered. Proposed system only consider 2 to 3 images of same scene. The method is for creating panoramas using images taken from a singular camera at different heights with only 20%-30% overlapping. Error percentage is less, it occurs in presence of any moving objects at the time of taking the images.

The methods proposed by the authors Geetha Kiran A et al [10] have given suggested method for Image Stitching from set of images. Most of the Image stitching methods require images with more 50-70 percentage of overlap. Usually video frames are used for image stitching where overlapping percentage is 90% [10].In the work proposed, the aim to stitched images with only 10% - 20% of overlapping which takes less storage space. Lather these images are stitched to get a full view of 360 degree of the desire scene and navigate through the obtained scene.distance measures.

III. PROPOSED WORK

To create a high-resolution image (panorama) set of images of the same scene with overlapping fields are combine stitched image. The panorama provide information of each image that contains all the information needed to look around in 360 degrees. A set of images can be connected to form a walkthrough sequence. Due to this user is limited to restrict its view of walkthrough to cylindrical. The proposed method will provide horizontal and vertical view of walkthrough in a single view point from the stitched image.

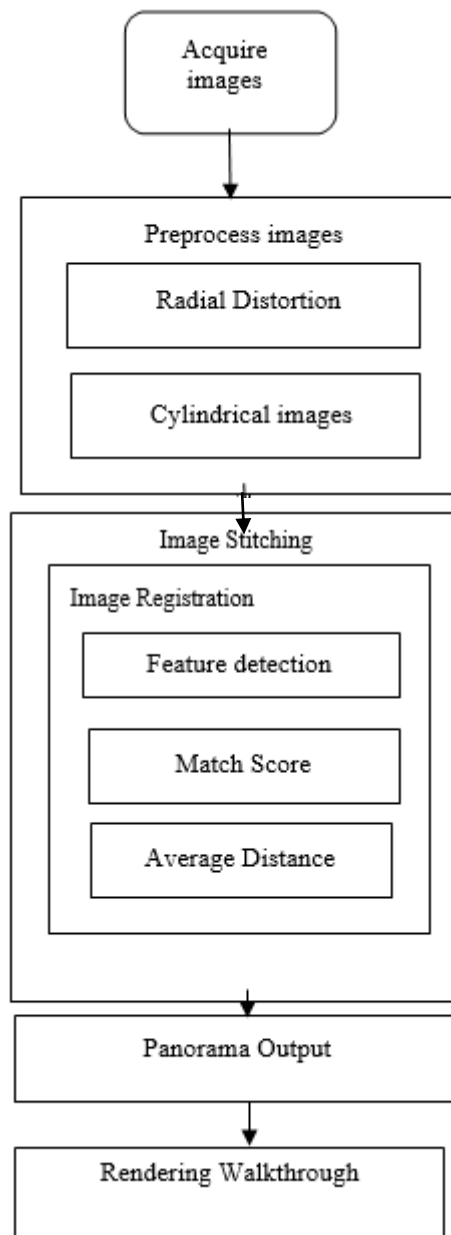


Figure 1. Block diagram of Proposed Framework

A. Image Acquisition

Image Acquisition can be basically of three type as the camera is set upon a tripod and the images are obtained by rotating the camera around. The camera mounted on a sliding plate and the images are obtained by shifting the camera on the sliding plate [5]. Where the camera is held in a person's hands and the person takes the images by turning around on the same spot [5]. Acquiring images by

a hand held camera is very easy to manage and can be performed in many locations where it might be difficult to set up equipment such as the tripod or the sliding plate. So the proposed work support for hand held camera.

B. *Preprocess images*

Distortion can be asymmetrical patterns, the most generally encountered distortions are radially symmetric, arising from the symmetry of a photographic lens. These radial distortions can usually be classified as either barrel distortions or pincushion distortions [14]. In proposed work is concern with barrel distortion as image magnification decreases with distance from the optical axis [14]. Further calculating cylindrical images because it's easy to project the images onto the surface of a cylinder and then unroll the cylinder to make it a flat plane.

C. *Image Stitching*

The proposed methodology has six major steps: First, pre-processing techniques are applied to find the distortion in input images. Second, key points in each input image using SIFT method are considered. Third, the match is found in the overlapping images using the SIFT descriptors and Calculate homography that maps key points in the two overlapping images. Fourth, compute the match score of each key points and calculate the average distance between key points. Five, Compute composite image using the images and the transformation matrix. Finally, a 360 degree walk through from 2D stitched image is created by cropping the stitched image.

D. *Panorama output*

Panoramic images usually contain outdoor environments with multiple individual object. Like 3D modelling it is possible to recover the geometry of scene from set of panoramic images [13]. Image stitching on multiple images of similar scene gives output of panoramic image which help the user to render walkthrough it.

E. *Rendering Walkthrough*

The inputs for the navigation are stitched 2D image, cropped based on the size of the stitched image generated at time of stitching and the size of the predefined border frame size. A proper set of key-frames are determined for each image based on the size of the stitched image. The cropped images is resized to the desired image size and stored in an array of images. Further, navigation is based on providing the input frames to the video file [10]. Thus walkthrough is rendering from 2D stitching images.

IV. CONCLUSION AND FUTURE SCOPE

Image stitching is still an inspiring domain for single and panoramic images. Since when compared to other existing systems which only provides 180 degree panorama images. The proposed system, generate a 360 degree virtual walkthrough from set of multiple images of desire scene. User interaction will be less which in turn would automatically generate 360 degree panoramic view and render walkthrough.

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