A NOVEL METHOD FOR GENERALISED STITCHING OF VIDEOS

[1]L.Hima Bindu, [2]Shaik Taj Mahaboob

[1]M.Tech Student, [2]Assistant Professor, ECE Dept

[1]Electronics and Communication Engineering
[1]JNTUA College of Engineering Pulivendula, Pulivendula, INDIA.

ABSTRACT: Traditional method video stitching techniques cause incorrect correspondences in the overlapped region of fixed objects. In computer vision, it becomes a very tough issue particularly for the commonly available artifacts in the movement of objects. In this proposed method, the field of optic flow in the region where coincidence is present has grasped providing the dense projection of pixels, from this the extreme artifact decreases occurs. The projection of a region where there is no coincidence has designed from the projection of a region where there is coincidence. To prevent inconsistent conversion when the object passes over the boundary between the overlapping and the non-overlapping regions we put forward a method which is selection of right or left frame from shorter duration of videos and joining them to form a larger duration of video that looks like panoramic. Experimental results express the advantages of this technique across the movement of objects.

Index Terms **– Panoramic video, video stitching.**

I. INTRODUCTION

A panorama is a view in which we can see a long way over a wide area. From the normal image techniques, we cannot capture the images over a wide area but by using the panorama image techniques, we can see the wider area. There are also image stitching techniques some of them are feature based techniques. These techniques involve scale invariant feature transform (SIFT), speeded up robust features (SURF). In these methods, SIFT technique is highly accurate but the disadvantage of this method is complete computing is not suitable for the application of stitching videos in real time. The SURF method is less intense computation. This method is quicker than the method of SIFT and is commonly used in real time applications. Image stitching is a method of merging various images with a wider field of perspective into a lengthier image. Now a days, there are many panoramic image stitching technologies to stitch the number of image frames into a wider angle of view that looks like a panoramic [1]-[2]. For example, mobile phones can create a panoramic image or using some applications like auto stitch [3]. It mainly concentrates on improving precision of alignment like detecting the distortions to align the pictures whereas warping of pictures can be used for picture distortion. Several local warp models are proposed to address the inadequacy and improve alignment quality [4]. The stitching of image frames with parallax tolerant methods are proposed depending on the elastic warping to attain precise alignment and effective processing [5]. To take away from the distortions that are occurred from the movement of objects and for creating a smooth natural image, the novel algorithms are also proposed which means moving objects in the scene while capturing the images [6]. In addition to these panoramic image stitching methods, panoramic video generation techniques from an array of shorter duration of videos are also available in real time and the various steps of a panoramic video are processed by removing the overlapped region in between the input video frames. An improved dynamic program algorithm is used to obtain optimum seams with a comparatively small execution moment of this video and these techniques use contextual data in video stitching to accomplish a significant reduction in artifacts[7]-[8]. In this proposed method, an optical flow field method is used for stitching the videos. It explains that taking the number of shorter duration of videos at various angles and combining them to form a larger video in a wider angle of perspective.

II. PROPOSED METHOD

For implementing a large viewing field panorama the Multi-Row Panorama Generation (MRPG) algorithm is used. In this algorithm, the multiple images that are captured from the different views or different directions can be stitched to form a large panoramic image.

The advantage of using this multi row panorama generation algorithm is that we can see a large viewing field when compared to normal captured images but apart from the panoramic image there is also a panoramic video. That means video stitching can be done in this proposed method.

Algorithm:

The process of video stitching is the combining of number of videos that are taken from the different angles into a wider angle of view. The main intention of this process of stitching of videos is that obtaining a wider angle of view in 360° which looks like a panoramic. The proposed algorithm mentions the process of how the panoramic video stitching can be explained as:

- Taking the shorter duration of videos as inputs which are taken over a wide range of view.
- Each input videos are converting into frames. The frames division depends on the length of input video.
- By removing the overlapped regions between the frames, aligning all the frames sequentially.
- The frames are stitching using Image registration technique after aligning the frames.
- Converting these frames to videos
- Finally all videos are stitched to get a final panoramic video.

By taking the shorter videos having smaller view angle as an input and combined these videos to form a lengthier video giving a view angle of 360° in which humans are not able to see.

Usually, the natural video scene contains number of movement of objects because of the influence in the 3D scene and the parameters of the camera cannot be precisely aligned in between the frames (right fr and left frame fl) of a single projective model.

First computing the optic flow in the images where there is coincidence in the left and right frames. By using the K-means algorithm the three fields of optic flow are gathered. Depending on the thick projection of pixels the left and right frames are stitched. At last, the region where the occlusion of images are present that can be corrected. Finally, the final output of panoramic video is obtained.

A. Dense-wise projection of pixels depends on the optic flow:

The field of optic flow which is used in the proposed method is that, aligning the pixels in between the left and the right frames in the overlapped region. The optical flow gives the dispersion of the similarity of pixels in the left and the right frames, so that it is considered as the dense-wise projection of pixels.

$$(i+Vx_{ij,}\, j+Vy_{ij}) \in f_{r,o} \tag{1}$$

Where Vx_{ij} ,Vy_{ij} represents optic flow from left frame to right frame in (i, j). Based on this technique, the overlapping region is calculated because the use of cameras always keeps the overlapping region in the unchanged condition and it can be calculated only once. Assuming that this processing phase maps the correct frame to the left. Due to the camera model's impact, the object which is far away from the camera is less distorted. When the object is nearer to the camera, the distortion in the picture is high. So to decrease distortion in the final obtained image, grouping a picture into two dominant fields, they are remote back region and the floor region.

Projection v = (Vx , Vy) in (i, j) is $f_{r,n.}$

$$v(i,j)=e_{ij}v_d+(1-e_{ij})\, v_g \tag{2}$$

Where e_{ij} is pixel weight that regulates the contribution of projective model in the place of the pixel (i, j). There is boundary $f_{r,n}$ between the remote back region and floor area.

B. Video stitching:

In this portion, the image stitching detail will be introduced. The output of panoramic video is classified into three regions. The three regions are left, middle and right. The left region data is from the area of left frame $f_{i,n}$ that is not overlapped. The middle region data represents the fusion of left frame $f_{l,o}$ and the correct frame $f_{r,o}$ overlapped regions. The correct region data acquires from the non-overlapped region. The final view of output contains the same perspective because of this stitching can be done on the left frame as a reference. For that purpose the left frame does not changed and the left region is placed as the final output.

In order to acquire middle region data $f_{l,o}$ and $f_{r,o}$, the weights are added. The weight of pixel in $f_{l,o}$ is high when the pixel location is nearer to $f_{l,n}$ and the weight of pixel in $f_{r,o}$ is high when the pixel location is nearer to $f_{r,n}$. The two respective weights of pixel sum is set to 1. The correct region is acquired by mapping $f_{r,n.}$

From the above three sections it is given that,

$$f(i,j) = \begin{cases} f_l(i,j), & \text{if } (i,j) \in \text{left area} \\ (1-\frac{j-wij}{wo})\, f_l(i,j)+\frac{j-wij}{wo} * & \\ f_r(i+Vx_{ij}\,,\, j-w_{ij}+Vy_{ij}), & \text{if } (i,j) \in \text{middle area} \\ f_r(i+Vx_{ij}\,,\, j-w_{ij}+Vy_{ij}), & \text{if } (i,j) \in \text{right area} \end{cases} \tag{3}$$

Here, W_o is the width of the region where the image coincidence is present, $j - W_{ij}$ represents the distance between (i, j) and the left boundary of image region coincidence, the term (Vx_{ij}, Vy_{ij}) represents the process of projecting an image in (i, j).

C. Alignment of the frames:

The issue of video alignment can be simplified by using picture alignment techniques to align respective frames, but there are instances when using only prevalent spatial data is not enough to determine the conversion. This discusses distinct methods with distinct limitations trying to fix the video alignment issue. As described above, there would be no desirable outcomes from the simplest techniques of picture alignment.

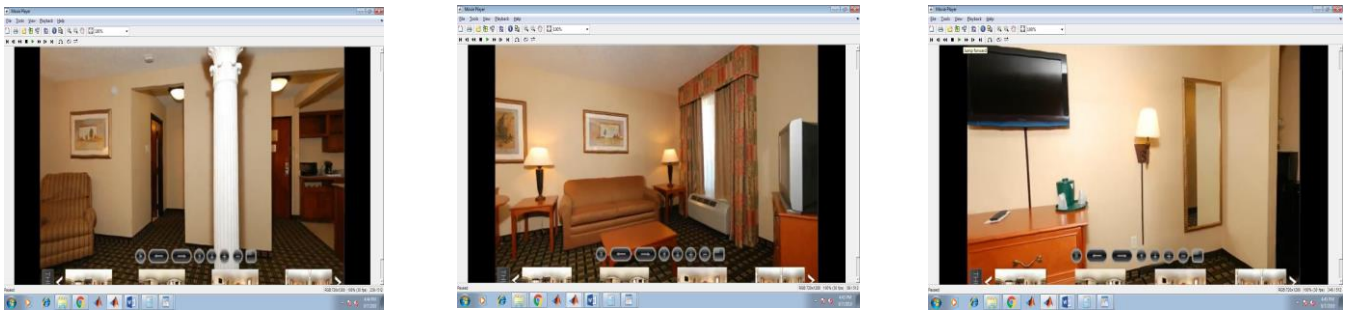
D. Video matching:

This algorithm defines a technique that creates a new version of the secondary video that is recorded with the main video spatially and temporarily. The following describes the algorithm.

- Use the robust picture alignment algorithm to assess the frames to search for possible pairings between frames in the main and secondary video.
- For each main frame, warp back the established secondary frame into alignment with the main frame. The novel robust image alignment method is the essence of the algorithm.
- This technique starts with the selection of feature points followed by the search for the most probable match in the secondary picture by the respective weighting function (including both pixel matching and movement consistency).

III. EXPERIMENTAL RESULTS:

By using the optical flow field method and from the image registration technique, the input video frames which are taken at an angle of 90° are stitched without overlapping of the video frames. The image warping technique is used in order to remove the distortion of overlapping of images. The video frames which are taken in different angles of view in different directions are stitched. The arbitrary taken video frames of shorter duration with lesser view angle can be shown as below figures.



(a) (b) (c)

Fig.1. Input video frames at an angle of 90°

(a) Input video frame taken as the left frame (b) Input video frame taken as the middle frame (c) Input video frame taken as the right frame.

These shorter duration of input video frames are stitched to form a final panoramic video. The final output video frames with wider angle can be shown as below:

(x) (y)

(z)

Fig.2. Output video frames at angle of 360°

(x) Left output frame (y) Middle output frame (z) Right output frame at an angle of 360°.

The final panoramic video is obtained at angle of 360° from the shorter duration of input video frames taken at angle of 90° or 180° depending on the length of the video.

IV. CONCLUSION

This paper put forward the technique of panoramic video stitching based on the movement pattern of pictures in a visual region resulting from the relative motion between the observer and the scene in the region where the coincidence of pictures occurs. Firstly, the input videos are taken with a shorter duration at an angle of 90° or 180° and then these shorter duration of videos are stitched to form a larger video with a wider angle of 360°. Experimental outcome proves that this process attains a final output of video with a wider angle of view which is panoramic in nature.

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