Bansilal Ramnath Agarwal Charitable Trust’s

Vishwakarma Institute of Information Technology

*(Department of Electronics & Telecommunication)*



**Group No.:- A1**

A Final Year Project Synopsis

Project entitled

“Image Stitching”

(Domain: Digital Image Processing)

**Submitted By:**

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*Year 2019 – 2020*

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**1. Introduction**

The process of taking photographs which are ordered in collection of the scene is called a Panorama.

Let us say that you need to capture a big scene, but our camera has a limited field of view and a specific resolution of image, this is certainly not enough to capture the scene. So, with the existing hardware we can capture multiple images of the respective scene and put them together by matching some part of the previous image with the next, forming one image that is the big scene which had to be captured. This is a good idea about having the big scene with some process behind.

The outcome will be one big image of the scenic view.

**2. Literature Survey**

Image stitching is the process of combining two or more images of the same scene as a single larger image. The effectiveness of image stitching depends on the overlap removal, matching of the intensity of images, the techniques used for blending the image.

Various studies have been conducted at different levels regarding how frames can be separated from a video and form a single image by combining all the frames. Image stitching is a method which is implemented for various applications like creating a panorama, stabilization, etc.

Using sequence of images to create a panorama was done earlier by Lowe (2004) and Zaleski (2004). They used the process of feature matching, image matching and Bundle adjustment. The first step in the panoramic recognition algorithm is to extract and match SIFT features between all of the images. SIFT features are located at scale-space maxima/minima of a difference of Gaussian function. In image matching the objective is to find all matching (i.e. overlapping) images. Connected sets of image matches will later become panoramas. Given a set of geometrically consistent matches between the images, we use bundle adjustment to solve for all the camera parameters jointly. Automatic Panorama Straightening technique is used to correct the slight tilt in the adjacent image frames when they are being stitched together.

Later another method was used for image stitching that clusters a set of pictures into separate panoramas based on scale invariant feature matching. Then uses these separate clusters to stitch together panoramic images. There are several different classification algorithms which are well known and widely implemented to solve several different problems. Many of these algorithms come from machine learning techniques.

The main purpose of our project is to separate out frames from a video. Later the frames will be stitched together to form an image. With this we will be able to achieve minimal loss of quality of the image and we will be able to get a single image from the video. This will be mainly used to capture the images of windmill blades where clicking a single image of the blades is impossible without loss of quality of the same.

**3. Objectives**

1. Take videos taken from a drone.
2. Extract images from video.
3. Find the overlapping area in consecutive images (matching key points).
4. Check if the two images have enough overlapping area if no select next image.
5. If none of the further images have overlapping area discard the image in consideration.
6. To perform each operation precisely with minimal error.

**4. Motivation:**

Large structures like windmills are continuously exposed to harsh weather and prone to fatigue and serious damage. Hence, regular maintenance at regular intervals is required but inspection of such large structures is difficult to be done manually. For this issue Drones fitted with camera are used for inspection by taking videos of the structure. Now the issue is, watching long videos and processing them to detect damages is time consuming, one way to save time would be to look at the entire image of the structure at once but if entire structure is photographed at once very expensive camera would be required a the image would have to be taken from large distance so as to cover the entire structure.

Hence, we are working on a solution to take videos of the structure using a drone from a proximity to get higher clarity from a cheaper and low-resolution camera forming an image of the complete structure by extracting images from the video and perform image stitching on those images and form a high-resolution panoramic image.

**5. Block Diagram**

**Input Images from video**

**Image Composition**

**Image Warping**

**Matching Feature**

**Feature Detection**

**Image Registration**

**No**

**Yes**

**Color Correction**

**Image Blending**

**Enough Match?**

Panorama Output

**6. Methodology**

Panorama Image Stitching can be divided into four main components – Image Registration, Image warping, Color Correction and Image Blending.

The images will be extracted from the video at fixed frame rate. Image Correspondence will be taken into consideration for the common identified points in back to back images.

Image registration will be necessary in order to be able to compare or integrate the images obtained from these different continuous images. Enough match will be checked, and Image composition which describes how different subjects and visual elements are arranged inside of the image frame will be performed. The purpose of image composition is to create a visually compelling picture, a picture that evokes the interest of the viewer.

Inside image composition operation of Image warping which is the process of digitally manipulating an image such that any shapes portrayed in the image have been significantly distorted. Warping may be used for correcting image distortion while processing.

Post the Color Correction the final operation of Image Blending will be performed to stitch the image resulting in the final Panoramic Image.

**7. Hardware and Software Requirement:**

Python and OpenCV software.

**8. Budget:**

**9. Applications:**

The possible applications for image stitching for the need of today are meagre. Image stitching is used in modern applications, such as the following:

* [Image Stabilization](https://en.wikipedia.org/wiki/Image_stabilization) feature that use frame-rate image alignment
* High-resolution photo in digital maps and [satellite photos](https://en.wikipedia.org/wiki/Satellite_imagery)
* Medical imaging
* Multiple image super resolution
* Video stitching
* Object insertion
* Video stabilization
* Video matting
* Panorama

The main aspect of our project is to extract the frames from a video and collect the frames in order and put them together for a perfect view of the pattern.

The actual pattern here refers to the “windmills” specifically where a video will be taken through a unmanned aerial vehicle / drone and the video will be converted into a image of much higher resolution. This will help in having the whole pattern at a single instant where there will be no need of seeking through the video to view the part of image for inspection.

Further might be that this can be processed with the help of deep learning to help out inspection for the life of the windmill in this specific application.

**10. Implementation Plan**

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| **Work Plan** | | **July** | **Aug** | **Sept** | **Oct** | **Nov** | **Dec** | **Jan** | **Feb** | **Mar** |  | **Apr** |
|  |  | **2017** | **2017** | **2017** | **2017** | **2017** | **2017** | **2018** | **2017** | **2017** |  | **2017** |
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| ***References*** | |  |  |  |  |  |  |  |  |  |  |  |
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**Name and Signature of Guide**