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Image Acquisition, Registration and Merging Using Matlab

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ABSTRACT: In many clinical studies, including those of cancer, it is highly desirable to acquire images of whole tumour sections whilst retaining a microscopic resolution. A usual approach to this is to create a composite image by appropriately overlapping individual images acquired at high magnification under a microscope. A mosaic of these images can be accurately formed by applying image registration, and overlap removal techniques. We describe an optimized, fast and reliable method for both image alignment and image joining. These algorithms can be applied to most types of light microscopy imaging and in applications where camera aperture is small as compared to the image to the image to acquire. The algorithms are robust to the varying image overlap of a manually moved stage, though examples of composite images acquired both with manually-driven and computer controlled stages are presented. The overlap-removal algorithm is based on the cross-correlation method; this is used to determine and select the best correlation between any new image and the previous composite image. A binary check algorithm based on pasting of pixels besides checking the redundancy has been used for image stitching purpose. The details of the algorithm to overcome geometric misalignments and the overlap regions problem between the stitched images will be presented.

KEYWORDS: Image Stitching, Acquisition, Registration, Merging.

I. INTRODUCTION

In today's modern era of technology there are many applications which need high resolution images. In bright-field or epifluorescence microscopy, e.g- Those used in biological and medical applications, it is often necessary to analyze a complete tissue section which has dimensions of some tens of millimetres, at high resolution. The high resolution single image cannot be perceived with a low power objective, requisite to perceive a large sample, even if using cameras with millions of active pixels. A general approach adopted is to receive several images of parts of the tissue at high magnification and then assembling them into a complex single image which conserves the high resolution. This process of assembling the composite image from a number of images, also known as 'tiling' or 'mosaic king'. The automatic creation of large high resolution image mosaics is a blooming research area necessitating computer vision and image processing. Mosaic king with blending can be defined by producing a single edgeless image by putting together a set of overlapped images. Automating this process is an important task and also time consuming to achieve it manually. One such algorithm for image registration and image stitching is presented. The process in which a multiple photographic images with overlapping field are combined to produce a segmented panorama or high resolution image is called Image Stitching or Photo Stitching. This process is performed by the use of computer software like MATLAB 7.0 or higher versions. Further in this process the nearly exact overlaps between images and uniform exposures are necessitated to produce seamless results. Digital cameras can be used as they have the ability to stitch their photos internally.

The image stitching process can be performed are as follows:

1. Image Acquisition: Acquiring the image with the help of digital camera or any other image capturing device.
2. Image Registration: Featureless registration method which handles rotation and translation between the images.
3. Image Merging: Removes the redundancy of pasting pixels in the overlapped regions between the images.

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II. IMAGE ACQUISITION

The images we are acquiring are only 2D images. All images were acquired using a standard digital camera. All 2D images were acquired by sample translation and0 collected either manually or automatically. The imaging area is of the order of 1:2:3 of 2 Mega Pixel Resolution when using objective 4.8 mm. The images acquired may have intensity variations due to the angle of sunlight with the objective lens of the camera. Lens aberrations are also present. All imaging systems, due to such aberrations, suffer to a greater or lesser extent from distortion. The most difficult conditions for image stitching are those with wide range of ambient lighting i.e. with the large intensity span- spatially varying illumination. It is assumed that rotation and scaling stay the same throughout both the experiments and processing the images. Only translation errors need to be corrected during the stitching process. We use the digital camera provided to collect a several images that we'll stitch together. We start at the far left of the scene, and for each new image, rotate the camera about its centre until around half of the image is "new". That is, we should have about 50% overlap between each pair of successive images. The more we constrain our camera to rotate only about its vertical axis, the happier we'll be when we're building our panorama. We may use a different camera if we like, but we will need to know the focal length of the camera, and we may find that working with higher resolutions is computationally demanding.

III. IMAGE REGISTRATION

Image registration is the method of aligning two or more images of the same scene. Image registration is often used as a primary step in other image processing applications. Image registration is the fundamental task used to match two or more partially overlapping images. During image registration, portions of adjacent images are compared to find the translations which align the pictures. To register two images, the coordinate transformation between a pair of images must be found. In this project, a multi-resolution feature-based method is developed to efficiently estimate the type of projective transformation model between pairs of images. Image registration is the process of aligning two or more images of the same spot. Typically, one image, called the base image or reference image, is considered the reference to which the other images, called input images, are equated. The object of image registration is to bring the input image into alignment with the base image by registering a spatial transformation to the input image. The differences between the input image and the output image might have arised as a result of terrain relief and other changes in perspective when imaging the same scene from various viewpoints. Lens and other internal sensor distortions, or differences between sensors and sensor types, can also cause distortion.

IV. IMAGE MERGING

Image merging is the technique of altering the values of pixels in two registered images, such that when the images are attached, the transition from one image to the next is invisible. It should also ensure that the new image has a quality comparable to that of the original image used. Image merging can be carried out by making the seam invisible in the output image. The seam is the line that is perceptible at the point where the images overlap.

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V. BINARY CHECK ALGORITHM

In the fig. It shows the different steps taken for the Image acquisition, registration and merging technique which follow the Binary Check Algorithm.

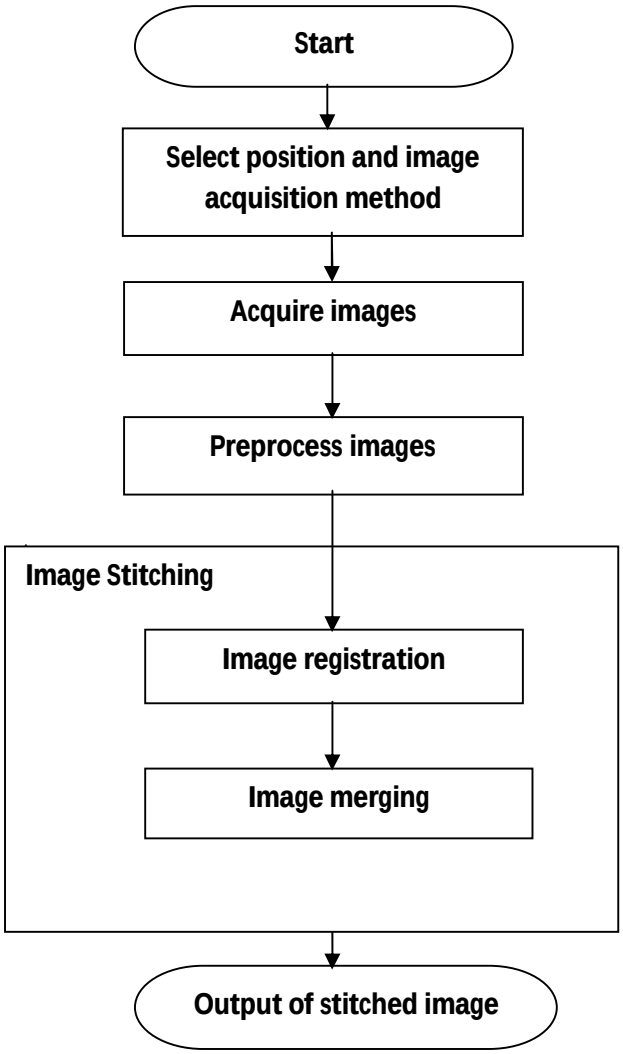

Fig. Flow Chart for Image Acquisition, Registration and Merging.

Stitching with binary check:

1. Create 2 canvases.
   a. First canvas is for the mosaic of all the images. We call it image canvas.
2. Make the entire binary canvas black. For a given image I, for each pixel in the image I, paste a mapped pixel on the canvas, only if the corresponding binary pixel is black, and make the binary pixel white.

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VI. RESULT

In the fig. 1, it shows the left side image with some overlapping region.

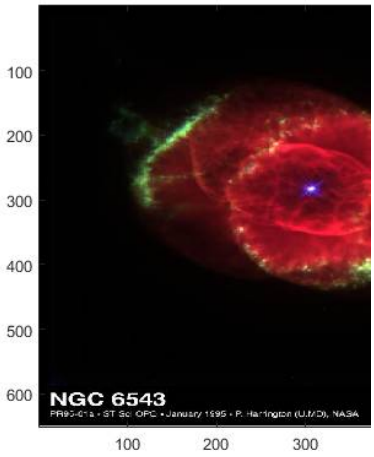

Fig.1 Left Image

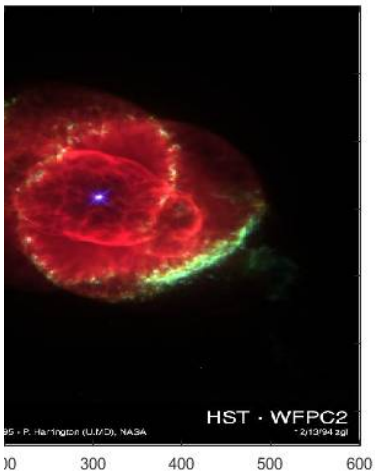

Fig.2 Right Image

In the fig. 2, it shows the right side image with some overlapping region.

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Fig.3 Stitched Image

In the fig. 3, it shows the stitched image by using the binary check algorithm and MATLAB.

VII. APPLICATIONS

1. Used in applications where the camera is unable to obtain a full view of the object of interest.
2. In many clinical studies, including those of cancer, it is highly desirable to acquire images of whole tumor sections whilst retaining a microscopic resolution.
3. This allows more freedom with respect to the viewing of environment and user navigation.
4. Applications where mathematical analysis of any image is needed.
5. Image Stabilization feature in camcorders which use frame-rate image alignment.
6. High resolution photo mosaics in digital maps and satellite photos.
7. Medical Imaging.
8. Multiple image super-resolution.
9. Video Stitching.
10. Object Insertion.

VIII. CONCLUSION

This research work proposed Binary check algorithm. Proposed algorithm can significantly increases the number of matching pairs and matching accuracy. This image stitching technique provides a cost effective and flexible alternative to acquire panorama images using a panoramic camera. In this research work we stitched the RGB images by using MATLAB. By using this technique we can stitch the images with very minimum ratio of error.

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