Intermixing of Images and Enhancement

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***Abstract*—Mosaicing is the technique of image processing which includes the combination of two or more images. After combining the images together, some problems like irregular contrast, noise are needed to be taken care of. Thus, to get rid of these problems, Image Enhancement techniques are needed so that better output is obtained. This system contains three modules such as Feature Detection, Image Mosaicing and Image Enhancement. The feature detection is achieved using Harris and SURF algorithms. After obtaining combined image by mosaicing Image Enhancement processes are used. This project is useful in the applications where large span of area has to be pictured and quality of image should remain intact. It can be used to improve the images obtained from satellites which are needed to be noise free and should have higher resolution.**

Keywords—Image enhancement, mosaicing.

I. INTRODUCTION

Mosaicing has been in practice since very long, even before the age of digital computers. Shortly after the photographic process was developed in 1839, the use of photographs was demonstrated on topographical mapping. Images taken from the hills and hot air balloons are combined together. After the development of airplane technology (1903) aerophotography became an exciting new field. There was a height limit for fly-ing an aeroplane earlier and the need for large photo-maps, forced imaging experts to construct mosaic images from over-lapping photographs. This was initially done by manually mosaicing 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. The improvements in computer technology became a motivation to develop computational techniques and to solve related prob-lems.[1]
Since then, Mosaicing has been implemented into many real life applications. For example such as Google earth: an appli-cation developed by google where a 3D representation of the earth is done by capturing millions of images and then using the mosaicking technique which developed a great application. We can get a 3D view of any place in the USA just by using the google earth application

II. LITERATURESURVEY

The primary aim of this project is to mosaic the different im-ages using two algorithms like HARRIS and SURF algorithms.
The paper titled "Image mosaicing using HARRIS, SIFT fea-ture detection algorithm" by Hemlata Shah of IIT Roorkee in "IJSETR" helps us understand the HARRIS corner dete-tion algorithm.
The paper titled "Speded Up Robust Features and its advanatages" by Herbert Bay of ETH Zurich in Computer Vision and engineering 2008 helps us understand the comparison of the images by using gray scale values.
The paper titled "Median filtering " by R Fisher , S Perkins, A Walker, F Wolfort in "HIPR 2005" takes into a certain pixel values from the image frame and then calculate the median value of the image frame and then after the extreme values are assigned to the median filter.
The paper titled " Contrast stretching " by R Fisher , S Per-kins, A Walker, F Wolfort in "HIPR 2005" proposed the phe-nomenon in which a certain lower and upper limits are set for a certain image and then each pixel is scaled using a particular function

III. HARRIS CORNER DETECTION

Image mosaicing algorithm based on any arbitrary corner method is proposed. It is a method of assembling multiple overlapping images of a similar scene into a larger one. The output of the same will be the union of the two input images. In this chapter, three step automatic image mosaic method is used. The first step is considering two images and finding out the corners of both the images, second step is removing out the false corner in both the images and then by means of homography, the corresponding matched corner pair are found out and final output mosaic is obtained..[4].

A. Feature Extraction

Initially, the features were objects manually selected by an expert. Due to the automation of the registration process, two main approaches for feature understanding have been built. The approach is based on the extracting the salient structures– features—from the images. Significant points (region corners, line intersections) are understood as features here. These feature points should be distinct and spread all over the image, also these should be efficiently detectable in both the images. These are expected to be stable with variation in time to stay at fixed positions during the whole experiment in order to get proper result.[7]
The efficiency of extracted feature points in the two images is ascertained by the invariance and accuracy of the feature detector in the overlapping region. We can also say that the number of common feature points detected from the set of images should be sufficiently high, regardless of the variation in image geometry, radiometric conditions, presence of noise, and other minor variations etc. The effectiveness

of the features is given by its definition. On contrary to the area- based methods, the feature-based methods are not directly working on the intensity of image. The features represent higher level information. These properties of feature-based methods make it suitable for situations dealing with illumina-tion changes or multi sensors.

B.Harris corner detector

Chris Harris and Mike Stephens developed this operator in 1988. It is a low level processing step to aid researchers trying to build interpretations of a robot's environment based on im-age sequences. Specifically, Harris and Stephens were inter-ested in using motion analysis techniques to interpret the envi-ronment based on images from a single mobile camera. Like Moravec, method is needed for matching common points in consecutive image frames, but were interested in tracking both edges and corners between frames. The limitations of Moravec operator are overcomed by Harris and Stephens after developing combined corner and edge detector. The result is a much more desirable detector in terms of repeatibility and detection rate at the cost of requiring significantly more computation time. This algorithm is highly used even though it has high computational demand.[4]

IV. SURF

The SURF algorithm is a robust local feature detector, first presented by Herbert Bay.in 2006, which can be used in com-puter vision tasks like object recognition or 3D reconstruction. The SURF was inspired by the SIFT descriptor. The standard version of SURF is several times faster than SIFT and more robust against different image transformations than SIFT. SURF is based on sums of 2D Haar wavelet responses and ef-ficiently use the integral images.

It uses an integer approximation to the determinant of Hessian blob detector, which can be computed quickly using an integral image. For features, it uses the sum of the Haar wavelet transform around the point of interest. Again, these can be computed with the aid of the integral image

A.Integral Images

Let us consider a digital image defined over pixel grid. In the following steps, only consider the gray value of the images (range 0 to 255), which is a simple process to be robust to co-lour variations (as a white balance correction). Integrate im-ages help in faster processing of the box type convolution fil-ter. An example of integral image is shown in Fig 1. Convolve the considered image with a 2-D rectangular function. The pre-computation of integral images permit to convolve with the box type filter in three operations and four memory ac-cesses. Since computation time does not depend upon the size of the box, because it performs only the addition operation, so it is better to use bigger filter sizes.[3]

B.Interest Point Detection

The most popularly used detector is the Harris corner detector but because of its variance towards scale leads to the improvement of other interest point detectors. Several scale invariant detectors have been proposed For detecting the

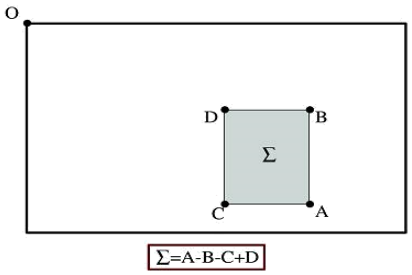

Fig 1 Integral image

interest point using a SURF approximation of basic Hessian matrix is used. For the feature detection step, local maxima from the Hessian determinant matrix is applied to the scale-space and are computed to select feature point candidates. These candidates are then tested if the response is above a defined threshold. Both scale and location of the candidate points are then refined using an iterative procedure to satisfy a quadratic function. In short a threshold value selected, if the interest point is greater than that value, then it is compared with its twenty- six neighbouring pixels. If extreme point is found greater than the neighboring value, then that point is known as a feature point. Normally, a few hundreds of feature points are detected in a digital image with a size of 1 Mega- pixels. The more detailed description of interest point detection can be understood under the heading of integral images and hessian matrix[3].

V. IMAGE ENHANCEMENT

A.Median Filtering

The median filtering technique is normally used to reduce the amount of noise in an image, which is almost similar to the mean filter. It, however does a better job than the mean filter by preserving useful details in the image. It belongs to the class of edge preserving filters which are non-linear filters.This filter smooths the data and keeps the small and sharp details.The median is nothing but the middle value of all the values of the pixels in the neighbourhood. It considers each pixel in the image and looks all it's nearby neighbors to de-cide whether it is representative of its surroundings. Like the mean filter replaces the pixel values with the mean of the neighbouring pixel values, the median filter replaces it with the median of the neighbouring pixel values. The median is calculated by arranging all the pixel values from the neighborhood into ascending or descending order and then replac-ing the pixel being considered with the middle pixel value.[7]

B.Contrast Stretching

The Contrast stretching is an image enhancement technique which is used to improve the contrast in an image by `stretching' the range of intensity values. This technique is used to increase the dynamic range of an image. The number of gray levels in an image is enhanced by expanding the gray levels. It is different from the histogram equalization which can only apply a linear scaling function to the image pixel values. Most implementations accept a gray level image as input and produce another gray level image as output.[8]

C.Histogram Equalization

This method is basically incorporated to increase the global contrast of many images, whenever the usable data of the im-age is represented by similar contrast values. Due to this adjustment, the intensities can be better distributed on the histogram. This also allows for areas of lesser local contrast to gain a considerably higher contrast. This can be accomplished by effectively spreading out the most frequent intensity values.[8] The flowchart is shown in the figure 2.

VI. APPLICATION

Image mosaicing can be used in satellite imagery. Image mo-saicing can be used to receive several images sent by satellite and then enhancement methods can be applied to improve the quality of the sent image. This project can be used for Mapping Arial photos is used for geological survey, military intelligence, urban and regional development and transportation. Using image mosaicing and enhancement techniques, an application similar to Google Streets can be developed which gives virtualised view to the user who needs to find a particular location on the map. These techniques can be used to virtualise the objects which might not exist at that location or at that time instant. Some sports related video games like FIFA scan the facial and physical features of real players and then they implement them in the video game. These techniques can be used in such applications.

VII. CONCLUSION

Two images taken from same position but different angle are taken as an input and using image mosaicing algorithms viz. Harris and SURF, single intermixed image is obtained. Thus, even after mosaicing two images together, still some faults remain in the output which can be eliminated using proposed project. Experimentally, it is observed that the SURF Algorithm is more efficient as compared to Harris. Since SURF algorithm is more sophisticated, output obtained from SURF algorithm would be faster than Harris algorithm. Therefore for practical purposes, SURF should be preferred over Harris algorithm.

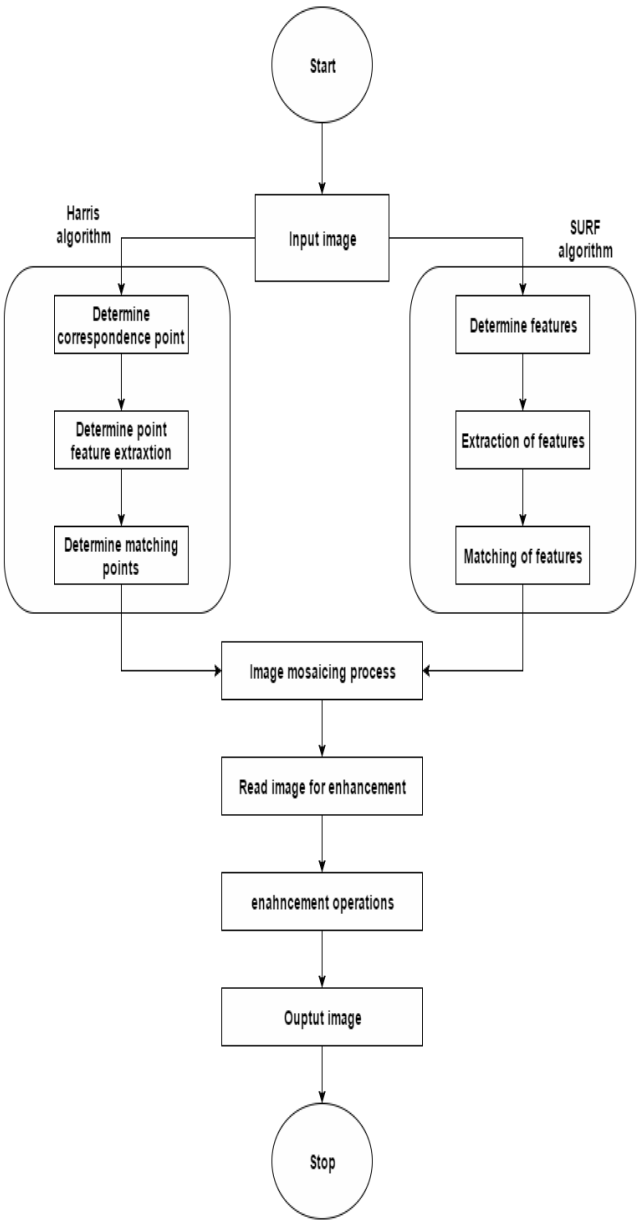

Fig 2. Flowchart

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