SIFT BASED IMAGE STITCHING

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Abstract **- This paper concerns the problem of image stitching which applies to stitch the set of images to form a large image. The process to generate one large panoramic image from a set of small overlapping images is called Image stitching. Stitching algorithm implements a seamless stitching or connection between two images having its overlapping part to get better resolution or viewing angle in image. Stitched images are used in various applications such as creating geographic maps or in medical fields.**

It uses a method based on invariant features to stitch image which includes image matching and image merging. Image stitching represents different stages to stitch two overlapping images which range from the detection of features to blending in a final resultant image. In this process, a Scale Invariant Feature Transform (SIFT) algorithm for detection and matching of feature points can be applied.

Keywords **- Feature Extraction, Matching Features, SIFT, RANSAC, Panoramic image.**

I. INTRODUCTION

Invariant feature based method is one of the image stitching method, and we are using scale invariant feature transform (SIFT) [1] which include key point detection and matching. Our aim is to create a large panoramic image from a set of images. Stitching images varying in orientation having some overlapping part among images to provide better view of angle is termed as panoramic image stitching.

SIFT features are local image features, which are invariant in rotation, scale and also robust in vision changes. In our experiment we observe that stitching algorithm not only create a smooth stitched image but also preserve the image properties. Stitched image should not break or create any misalignment, causing into blur or ghosting effect. During the stitching process context information about the objects in input images should be taken into consideration.

II. RELATED WORK

Sometimes it requires increasing or extending the angle of view or Field-Of-View (FOV) due to limited FOV of single Camera. Image stitching is one of the methods that can be used to create large image by the use of overlapping FOV [8]. The drawback is the memory requirement and the amount of computations for image stitching is very high. In this project, this problem is resolved by performing the image stitching by reducing the amount of required key points. First, the stitching key points are determined by transmitting two reference images which are to be merged together.

Most of the existing methods of image stitching either produce a 'rough' stitch or produce a ghosting or blur effect. For region-based image stitching algorithm detect the image edge, prepare for the extraction of feature points. The quality of the edge is related to the accuracy extract of feature point and the relevant experiment results directly. In region-based image stitching algorithm the edge detection technique for matching images is used. The approach offered in this project makes the selection of the best key points in the image. Positioning of acquired images with a manual stage is much less precise, so there is a need to explore a wider area in order to find the best cross-correlation point.

This project's goal is to create a script that will stitch two images together to create one larger panoramic image. Image stitching has wide uses in photo applications. These stitched images, become panoramic views which increase the field of view of an image, and are widely used for posters, postcards, and other printed materials.

III. PROPOSED SYSYTEM

Image processing deals with identifying shades and colors using various techniques. It also means image enhancement, such as refinement of a picture in a program. When both the input and output is images it is a form of information processing. Image processing is classified into two major branches: image enhancement and image restoration. Improving the quality of image or highlight particular aspects within image and to produce image that is different from the original one is called as Image enhancement, whereas to recover the original image after degraded by some distortions is termed as image restoration. The amount of data is not reduced but rearranged in Image Processing.

A. *Edge detection*

For finding region boundaries edges in an image are often used. Edges are pixels where brightness intensity changes suddenly. An Edge differentiates between two different regions or it can be termed as the border between different regions. Various operators such as Robert, Canny are used often[4]. Edge detection reduces the information about image and stores only important structural properties of an image.

An edge basically distinguishes between two distinctly different regions or in short, an edge is the margin between two different regions. Sobel operator, Robert operator, Prewitt operator, Canny operator and Krish operator are amongst edge detectors that are frequently used. Edge detection of an image reduces notably the amount of data and filters out information that may be regarded as less applicable, preserving the important structural properties of an image.

The subsequent are the key stages in the process of stitching images.

B. *Image Acquisition*

Images which are to be stitched are acquired using capturing devices like camera mounted on tripod stand. The orientation of camera can be varied to take different overlapping images.

C. *Image Registration*

The key of image stitching is image registration, so it is necessary for to research on image registration algorithm. Image registration algorithm means probing and optimization algorithm [9]. Image registration aims at finding image translations to align two or more overlapping images such that projection from view point through any position is unique into the 3D world.

Four main components of Image registration:

1) *Feature set:* A Feature set must be selected for each image registration method and includes intensity values, outlines or contours, textures and so on.

2) *Similarity measure:* A function which returns a scalar values that provides an indication of similarities between two features.

3) *Search strategy:* An algorithm that decides on selection of next transformations from the search set.

4) *Search set:* For aligning the images it is a set of possible transformations.

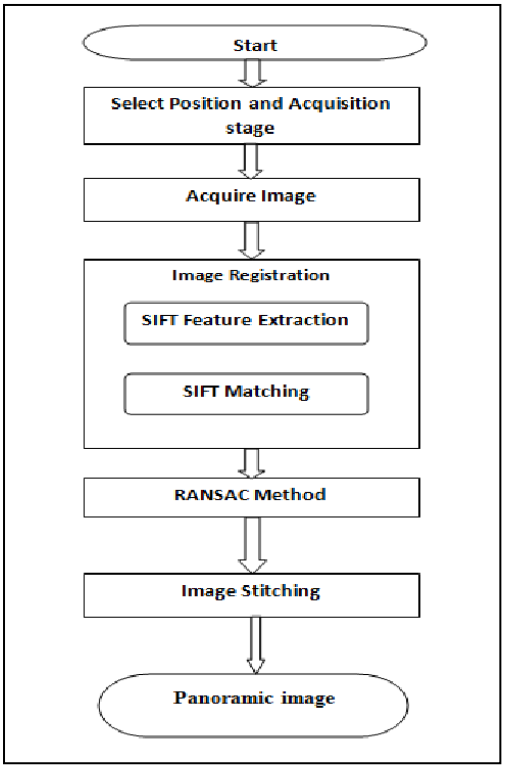

Fig1. Steps for Image Stitching

Image merging is the process of adjusting the pixel values in two registered images, such that transitions from one image to next is un-perceivable or invisible when the images are joined.

The new image should have a quality comparable to that of the original images used.

Making the seam invisible in the output image can be carried out in image merging. The invisible line at the point where two images overlap is called a seam Steps for Image Stitching.

IV. METHODOLOGY

A. *Scale Invariant Feature Transform Algorithm:*

The SIFT algorithm [2], [3] (Scale Invariant Feature Transform) proposed by Lowe is relatively good and it is scale invariant, affine invariant and rotation invariant. It is an approach used for extracting distinct invariant features from images.

Problems based on feature matching such as pose estimation, object recognition, image retrieval and many others has been successfully applied using SIFT. However there is still a need for improving the algorithm in real world applications. In this paper, an improvement for providing more reliable feature matching for object recognition is proposed. The main idea is to minimize the number of extracted features before they are matched. The features are reduced to minimum 128 descriptor points.

The Four main steps to generate set of image features: scale space peak detection, key point localization, orientation assignment, key point descriptor.

1) *Scale-space extrema detection:* This is the stage where the interest points, which are called key points in the SIFT structure, are detected. The image is convolved with Gaussian filters at diverse scales, and then the dissimilarity of successive Gaussian-blurred images is taken.

2) *Key point localization:* Scale-space extrema detection produces too many key point candidates, some of which are unbalanced. The further step in the algorithm is to select based on measures of their stability.

3) *Orientation assignment:* Each key point is assigned one or more orientations based on local image gradient directions. This is the important step in achieving invariance to rotation as the key point descriptor can be represented relative to this orientation and therefore achieves invariance to image transformation.

4) *Key point descriptor:* This step is performed on the image closest in scale to key point's scale. In the region around each key point the local image gradients are measured at the selected scale. Compute a descriptor vector for each key point such that the descriptor is highly distinctive and partially invariant to remaining variations. As it transforms image data into scale invariant coordinates corresponding to local feature, this approach has been termed as the Scale Invariant Feature Transform (SIFT).[7]

B. Random Sample Consensus algorithm

The RANSAC algorithm [5] samples in each iteration a minimal subset of points and computes from it a model. Fischler and Bolles proposed RANSAC to deal with large proportion of outliers in input data. To generate candidate solution using minimum observation, resampling technique RANSAC is used. RANSAC uses the smallest set possible and proceeds to enlarge this set with consistent data points.

The algorithm is defined as follows:

- select data items at random
- solve parameters
- find how many data items fit the parameter model
- accept fit and exit with success
- If fractions exceed, re-estimate the parameters
- otherwise repeat above steps

A disadvantage is there is no upper bound on time taken to compute parameter. It requires the setting of problem-specific thresholds as RANSAC can only estimate one model for a particular data set. [6]

V. APPLICATION OF IMAGE STITCHING

Image Stitching has applications as follows:

- For creation of panoramic images. Large panoramic reconstruction from non panoramic images to enlarge the field of view.
- This can be constructed by using the merging multiple images together.
- Implemented in Video Stabilization [5] which aims to remove annoying shaky motions from videos.
- It is used in Medical fields to create images with higher resolutions and for creation of aerial or satellite images.

VI. FUTURE SCOPE

To obtain a full view of object of interest where the normal camera is unable to capture the panoramic image stitching can be used in such application. By overlapping the images having similar point or region the full view or real world view of the object can be constructed.

VII. CONCLUSION

In this paper we proposed image stitching algorithm which increase matching accuracy. Our experiments show that our method is invariant to image orientation. It provides flexible and cost effective alternatives to acquire panoramic images. Our algorithm can be used to construct panoramic images by overlapping similar regions in applications where camera is unable to obtain full view of object.

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