

Image Stitching using Matlab

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Abstract—Images are an integral part of our daily lives. Image stitching is the process performed to generate one panoramic image from a series of smaller, overlapping images. Stitched images are used in applications such as interactive panoramic viewing of images, multi-node movies, mobile phones and other applications associated with modeling the 3D environment using images acquired from the real world. Feature matching, used in Specifically, image stitching presents different stages to render two or more overlapping images into a seamless stitched image, from the detection of features to blending in a final image. In this process, Scale Invariant Feature Transform (SIFT) algorithm[1] can be applied to perform the detection and matching control points step, due to its good properties. The process of create an automatic and effective whole stitching process leads to analyze different methods of the stitching stages. SIFT methods to extracting feature points, is the key of image mosaic. The advantages of SIFT is one of the most robust and the widely used image matching algorithms based on local features This paper describes the design and implementation of an image stitcher which can be used to join colour images.

Keywords: Seamless stitched image, Panoramic image.

I. INTRODUCTION

This project's goal is to create a Matlab script that will stitch two images together to create one larger image. Given a sequence of images taken from a single point in space, but with varying orientations, it is possible to map the images into a common reference frame and create a perfectly aligned larger photograph with a wider field of view. This is normally referred to as panoramic image stitching. In our experiments, we observe that a successful image stitching algorithm should not only create a smooth transition within the overlapped region but also preserve the following properties, which are in general agreement with our visual perception: Structure preservation. The stitched image should not break existing or create new salient structures. where the edge of the tower is broken in the overlapped region due to structure misalignment, causing obvious ghosting artifact. Intensity alignment. Human eyes are sensitive to large intensity change. Unbalanced contrast beyond the overlapped area of a stitched image can be perceptually magnified. Although the structure is well aligned and color transition is smooth within the overlapped area, the unnatural color transition from left to right reveals the unmatched intensities inherent in the input images. The context information of objects in the input images should be taken into account during the stitching process. Image processing can be defined as analysis of picture using techniques that can basically identify shades and colors. It deals with images in bitmapped graphic format that have been scanned or captured with digital camera.

It also means image improvement, such as refining a picture in a program or software that has been scanned or entered from a video source or in short, image processing is any form of information processing when both the input and output is images. Image processing is divided into two major branches; image enhancement and image restoration. Image enhancement is to improve the quality of image or emphasize particular aspects within image and to produce image that is different from the original. Whereas image restoration, is to recover the original image after degraded by known effects such as geometric distortion within camera system. Image processing does not reduce the amount of data present but rearranges it.

A. Spatial filtering :

An image can be filtered to remove a band of spatial frequencies, such as high frequencies and low frequencies. Where rapid brightness transitions are established, high frequencies will be there. In the other hand, slowly changing brightness transitions represent low frequencies. The highest frequencies normally will be found at the sharp edges or points. Spatial filtering operations include high pass, low pass and edge detection filters. High pass filters accentuate the high frequency details of image and attenuate the low frequency, creating a sharpening effect.

B. Sharpening :

The main aim in image sharpening is to highlight fine detail in the image, or to enhance detail that has been blurred due to noise or other effects. Sharpening emphasizes edges in the image and make them easier to see and recognize. In creating a sharpened image, no new details are actually created. The nature of sharpening is influenced by the blurring radius used. In addition to that, differences between each pixel and its neighbour too, can influence sharpening effect.

C. Blurring :

The visual effect of a low pass filter is image blurring. This is because the sharp brightness transitions had been attenuated to small brightness transitions. It have less detail and blurry. Blurring can be done in spatial domain by pixel averaging in a neighbor. Blurring is aimed to diminish the effects of camera noise, unauthentic pixel values or missing pixel values. For blurring effect, there are two mostly used techniques which are neighbourhood averaging (Gaussian filters) and edge preserving (median filters). The blurring effect can improve an image's low frequency details by removing visually disruptive high frequency patterns. By subtracting a low pass filtered image from the original image, a sharpened image can be created. The latter operation is known as unsharp masking enhancement.

D. Edge detection :

Edges are often used in image analysis for finding region boundaries.

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They are pixels where brightness changes abruptly. An edge essentially distinguishes between two distinctly different regions or in short, an edge is the border between two different regions. Robert operator, Sobel operator, Prewitt operator, Canny operator and Krish operator are among edge detectors that are often used. Edge detection of an image reduces significantly the amount of data and filters out information that may be regarded as less relevant, preserving the important structural properties of an image. There are many methods for edge detection, but most of them can be grouped into two categories, search-based and zerocrossing based.

E. Image Acquisition:

The images that need to be stitched are acquired using a camera mounted on a tripod stand. The camera angle is varied to take different overlapping sample images.

F. Image Registration:

The process of image registration aims to find the translations to align two or more overlapping images such that the projection from the view point through any position in the aligned images into the 3D world is unique. Image Registration consists of four main components: Feature set- The set of features includes the intensity values, contours, textures and so on. A feature set must be selected for each image registration method. Similarity measure- It is a function which returns a scalar value that provides an indication of the similarities between two features.

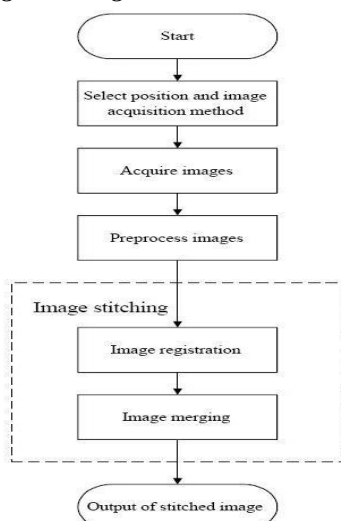
- Search set- It is a set of possible transformations for aligning the images.
- Search strategy- It is the algorithm that decides how to select the next transformations from the search set.

Techniques used:

- 1) Registration using a different feature set.
- 2) Registration using different similarity measures.
- 3) Registration with step search strategy.
- 3) Image Merging:

Image merging is the process of adjusting the values of pixels in two registered images, such that when the images are joined, the transition from one image to the next is invisible. It should also ensure that the new image has a quality

Steps for Image Stitching :



III. METHODOLOGY

Scale Invariant Feature Algorithm

The SIFT algorithm (Scale Invariant Feature Transform) proposed by Lowe is an approach for extracting distinctive invariant features from images. It has been successfully applied to a variety of computer vision problems based on feature matching including object recognition, pose estimation, image retrieval and many others. However, in realworld applications there is still a need for improvement of the algorithm's robustness with respect to the correct matching of SIFT features. In this paper, an improvement of the original

SIFT algorithm providing more reliable feature matching the purpose of object recognition is proposed. The main idea is to divide the features extracted from both the test and the model object image into several sub-collections before they are matched. The features are divided into several subcollections considering the features arising from different octaves, that is from different frequency domains. [1]

Following are the major stages of computation used to generate the set of image features:

- Scale-space extrema detection: The first stage of computation searches over all scales and image locations. It is implemented efficiently by using a difference-of-Gaussian function to identify potential interest points that are invariant to scale and orientation.
- Keypoint localization: At each candidate location, a detailed model is fit to determine location and scale. Keypoints are selected based on measures of their stability.
- Orientation assignment: One or more orientations are assigned to each keypoint location based on local image gradient directions. All future operations are performed on image data that has been transformed relative to the assigned orientation, scale, and location for each feature, thereby providing invariance to these transformations.
- Keypoint descriptor: The local image gradients are measured at the selected scale in the region around each keypoint. These are transformed into a representation that allows for significant levels of local shape distortion and change in illumination.

This approach has been named the Scale Invariant Feature Transform (SIFT), as it transforms image data into scale invariant

IV. IMAGE MATCHING

At this stage the objective is to find all matching images. Connected sets of image matches will later become panoramas. Since each image could potentially match every other one, this problem appears at first to be quadratic in the number of images. However, it is only necessary to match each image to a small number of overlapping images in order to get a good solution for the image geometry.

V. FEATURE MATCHING

The most important thing, we should to solve, is how to find feature-points effectively. In this paper, we applied simplified SIFT to extract feature points. The SIFT is the abbreviation of Scale Invariant Feature Transform, it is an algorithm to extraction local features including extreme points, position and scale, in scale space. The important question in feature matching is how to extracting feature points effectively, SIFT algorithm is the effective method to abstract character points. So Simple SIFT algorithm to extracting feature points is applied in this paper.



It is necessary to introduce the SIFT algorithm, SIFT algorithm is the abbreviation of Scale Invariant Feature Transform, Which (scale invariant feature transform) is one of the most robust and the widely used image matching algorithms based on local features, and find the extreme point in scale space to extracting position, scale and rotation information. However, its computational complexity is high.

VI. RESULTS

In this paper, we have proposed image stitching approach by image deformation, where the overlapped regions may contain significant intensity inconsistency and geometrical misalignment. The below example depicts two geometrically misaligned images stitched using MATLAB.



Fig.No,1 First Acquire Image

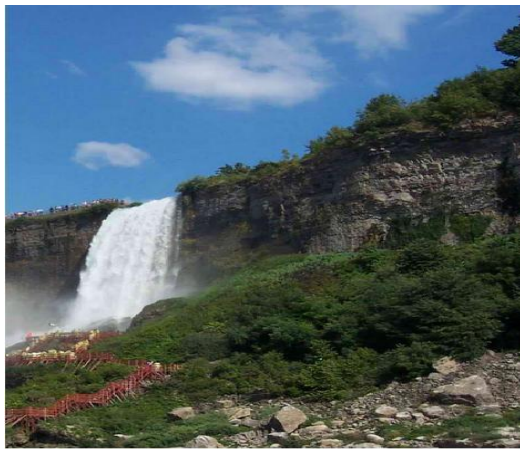


Fig.No,1 Second Acquire Image

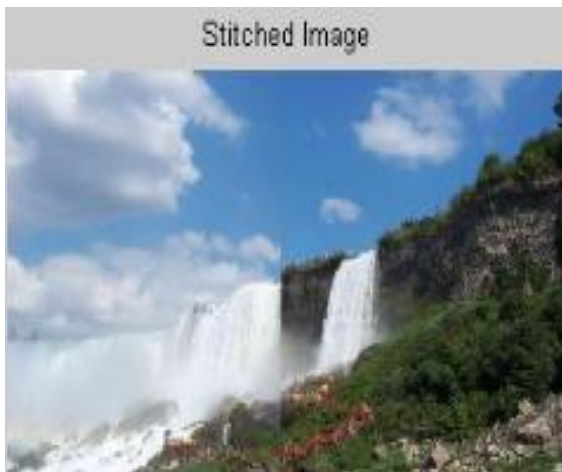
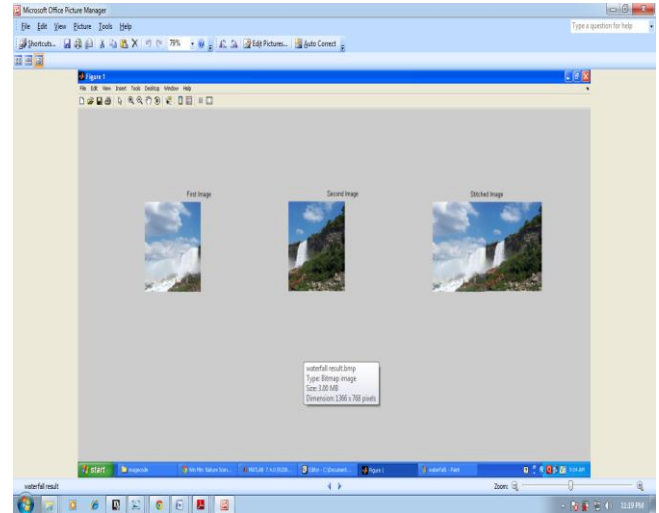


Fig.No3.Stitched Image

Below Figure show the final output of Stitched image using Matlab



VI. CONCLUSION

We illustrated a Simple SIFT algorithm for feature matching in image mosaic. This method is robust. At the same time it can cope with some images with tilt and roll. It is effective, because it can stitch two images correctly. Moreover it is meaningful, because the simplified SIFT reduced the dimensions of SIFT feature, enhanced the matching accuracy and time. The experimental results show that this method for image mosaic is valuable. We can obtain the liable estimate parameter and the stitched image is good in this method.

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