VISVESVARAYA TECHNOLOGICAL UNIVERSITY

MINI PROJECT REPORT ON

"3 - Image Stitching Using Matlab"

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CERTIFICATE

Certified that the mini project work entitled "**3-IMAGE STITCHING USING MATLAB**" carried out by **P.SREE RAJ (1NH18EC084), SAI HASAAN (1NH18EC099), VB VASU (1NH18EC115), VMV MAHESHBABU (1NH18EC118),** bonafide students of Electronics and Communication Department , New Horizon College of Engineering, Bangalore.

The mini project report has been approved as it satisfies the academic requirements in respect of mini project work prescribed for the said degree.

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External Viva

Name of Examiner	Signature with Date
1.	
2.	

ACKNOWLEDGEMENT

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Finally, a note of thanks to the teaching and non-teaching staff of electronics and communication department for their co-operation extended to us, who helped us directly or indirectly in this successful completion of mini project.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

3-image Stitching using Matlab:

The Main objective of this project is to stitch 3 images together to create a larger image using Mat lab.Images are an integral part of our daily life. Image stitching is the process carried out to generate a panoramic image from a series of smaller overlapping images. Stitched images are used in applications like interactive panoramic display images, architectural tours, multi-node movies, and other applications associated with 3D modeling environment using images acquired from the real world. Image processing is any form of signal processing for which the input is an image, such as a photo or video frame; image processing output it can be an image or a feature set or image related parameters. Most image processing Techniques involve treating the image as a two-dimensional image. signal and applying standard signal processing techniques He. More precisely, the assembly of images presents different stages to render two or more overlapping images on one transparency stitched image, from feature detection to blending into one final image

In this process, Scale invariant feature the transformation algorithm can be applied to perform The step of detecting and combining control points, due to their good Properties. The automatic and efficient creation process. Various commercial and online programs Tools are available to perform the sewing process, providing Various options in different situations.

The image stitching detects multiple images of it. scene and then merge these images to generate a single Panoramic image. This article presents a framework for comparing different types of panorama creation process, such as correlation method and feature method to develop An optimal panorama. Assessments are done by comparing the outputs compared to the truth to the original land with calculation time We made simulations applying these two approaches to achieving a satisfactory resolution.

Keywords: Image stitching, feature detection, correlation, seamless stitched image, Panoramic image.

CHAPTER 01

INTRODUCTION

‘Image stitching’ is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama or high-resolution image.

The effectiveness of image stitching depends on the overlap removal, matching of the intensity of images, the techniques used for blending the image, the goal of this project is to create a Mat lab script that assembles 3 images together to create a larger image. Given a sequence of images taken from a single point in space but with variable orientations, it is possible to map images in a common frame of reference and create a perfectly aligned Larger photograph with a wider field of view.

There are many methods to produce a stitched image. Image assembly is less greedy in material but mostly based on software mechanism to generate a wide field of vision. The catch many regular photos to cover the entire viewing space and assemble all the images to create a single image with a wider field of view. Image alignment or recording it is a prerequisite for assembling images. Alignment o registration is the process of finding correspondence considering the rotation, translation and escalation between two Images from the same scene. The categories of image sewing techniques can be generally classified as intensity based or direct and characteristic based. The direct method is very functional for sewing images without overlapping area.

Based on functionality the method can be functional in a small overlapping region. Image correlation set is one of the most primitive sewing techniques which is essentially an intensity based on focus and suitable for images with an overlapping or non-overlapping region. To establish connections between a set of images, corresponds the correspondence between two or More images are considered necessary, so it is essential Identify a set of reflections in each image. When recording images, it is mandatory to align two or More photos of a scene. The main stages, related to the image.

The registration or alignment tasks are:

(i) detection of characteristics;

(ii) Functional mapping based on transformation functions using corresponding characteristics in the images;

(iii) reconstruction of images using the derived transformation function.

To pair and recognition, the first step is to detect the location of the interests in the photos Then the descriptors are calculated and they need compare to find the association between the images to correspondence operation. So we have to use a characteristic detector and a function descriptor to extract functions from images.

To remove the edges and create a compact image, you need to apply an additional mix of images. The image blending process is limited to overlapping areas that are determined during the sewing process. This means that if the overlapping regions between the images are large and the images do not match perfectly in these parts, ghost or "blur" images are visible. However, if these regions are small, the seams will be visible. To avoid these effects and make the blur effect negligible, the cross-correlation function betweenThe composite image and the image to be joined must be applied appropriately.

The new method presented shows that the best image quality can be obtained if the blend is applied after each image has been sewn. This approach improves the assembly of additional images because cross correlation is applied to a mixed composite image that gives a more robust result.

In our project, we observed that a successful image bonding algorithm must not only create a smooth transition in the overlapping region, but also preserve the following properties, which are generally in accordance with our visual perception: preservation of the structure. The joined image should not break existing structures or create new protruding structures. where the edge of the tower breaks in the overlapping region due to misalignment of the structure, causing an obvious phantom artifact. Alignment of intensity. Human eyes are sensitive to large changes in intensity. Unbalanced contrast beyond the overlap area of a stitched image can be increased perceptually. Although the structure is well aligned and the color transition is smooth in the overlap area, the unnatural color transition from left to right reveals the unrivaled intensities inherent in input images. The context information of the objects in the input images must be taken into account during the assembly process.

CHAPTER 02

LITERATURE SURVEY

Many researchers have already worked on sewing images. A closer look at the union of images is presented below:

Yang et al have proposed an image mosaic method based on phase correlation and Harris operator.

Wang et al. introduced an automatic method of mosaic panoramic images based on a graphic model.

Adel et al have proposed an image joining system. based on ORB (FAST Oriented (Accelerated Features) Segment test) and SHORT rotated (robust binary Independent basic characteristics)) techniques and compensation mix

Szeliski proposed a method of alignment and stitching of images.

Fatah etal had a proposal for automatic seamless stitching of the image set Qiuet method when presented an algorithm based on SIFT (Scale the invariant entity transformation) and transformation parameters.

Ostiak etal presented a Fully automated HDR (high dynamic range) panorama assembly algorithm where you used the SIFT-based algorithm for the recognition of the corresponding characteristic points.

All methods have advantages and disadvantages. With that see, in this project we have made a comparison Study of the method based on characteristics and correlation. develop an optimal approach to stitch images based on Application perspective.

In this paper titled “image stitching”, Gil Rupert Licu, NelvynJohn Mendoza, Mark Kelvin See, Sonam, Carlo Noel Ochotorena, Maria Antonette Roque , Edwin Sybing co presented method for stitching.In recent years, many researchers have implemented and proposed various systems for assembling panoramic images. In addition to joining images, the document also describes methods that can also be used for image mapping.

The method of merging intensity difference linear distribution images that uses a linear ramp to distribute the pixel intensity differences that They are immediately next to the seam to mix pairs of grayscale satellites. The document gives an idea that the concept of joining production images can be used when the camera cannot get the full view.

Pranoti Kale and others gave a technical analysis of the image assembly algorithm. It has been discussed that the process of assembling images can be divided into three main stages: image fusion of transformed images and image fusion. The main approaches involved in the assembly of images, viz. Direct and feature-based techniques are briefly discussed. Direct techniques work by minimizing pixel-to-pixel differences directly. Although these methods are computer complex due to the process involved.

CHAPTER 03

EXISTING SYSTEM AND PROBLEM STATEMENT

Since illumination in two views cannot be guaranteed to be identical, combining 3 images can create a visible seam. Other reasons for the seams could be the change of background between two images for the same continuous close-up. The other important problems to solve are the presence of parallax, lens distortion, scene movement, and exposure differences. In a non-ideal real case, the intensity varies throughout the scene, as does the contrast and intensity between the images. Also, the aspect ratio of a panoramic image must be taken into account to create a visually pleasing composite.

For panoramic stitching, the ideal set of images will have a reasonable overlap (at least 15-30%) to overcome lens distortion and will have enough detectable functionality. The image set will have constant exposure between images to minimize the likelihood of stitching.

The Main **problem statement** of this project is

- To combine multiple images with overlapping fields of view to produce a high-resolution image

The Main **objectives** are:

- To get a clear image without any repeating parts of different images
- Comparing the key points in different images
- Finding out which technique gives much favourable results.

EXISTING SYSTEM:

Due to the limited field of view (FOV) of a single camera, sometimes you want to extend the FOV using multiple Cameras The union of images is one of the methods that can be used to exploit and eliminate the redundancy created by the Overlapping FOVs. However, the required memory and amount of computation for conventional implementation of The image montage is very high. In this project, this problem is solved by assembling and compressing the image strip by strip. First, the sewing parameters are determined by transmitting two reference images to a intermediate node to carry out the treatment. So these parameters are returned to the visual node and stored in there these parameters will be used to determine how to assemble the incoming images strip by strip.

After sewing a strip, it can be compressed using a tape compression technique. Most of the existing methods to join images produce an "approximate" point that the features such as blood vessels, kite cells, and histology, or require user input. Approaches to linking images that optimize the search for the best correlation point using Levenberg-Marquardt method.

Levenberg-Marquardt method gives good results, but is expensive in calculation and can get stuck at local lows. The approach proposed in this project select the best correlation point in the next path Based on knowledge of expectations. overlay when using the motorized stage which would easy to find the best correlation point ideally Case. However, the area of overlap is not perfect, and certainly not with pixel precision, due to stage deviations ideal position and due to misalignment of the scene / camera.

Our algorithm offers a way to overcome this problem by find the small area around the expected central overlap pixel to find the best correlation point. Positioning of images acquired with a manual step are much less accurate, therefore You need to search a wider area to find the best one cross correlation point

CHAPTER 03

PROPOSED METHODOLOGY

The purpose of this project is to create Matlab scripts that combine two/three images to create a larger image. Given a sequence of images taken from a single point in space, but with different orientations, it is possible to map the images in a common frame of reference and create a larger photo perfectly aligned with a wider field of view. This is normally called image stitching.

The methodology follows following steps:

Spatial filtering:

You can filter an image to remove a space strip frequencies, such as high frequencies and low frequencies. When fast light transitions are established, The frequencies will be there. However, slowly evolving Brightness transitions represent low frequencies. The tallest frequencies are normally found on sharp edges or points. Spatial filtering operations include high pass, low pass, and edge detection filters. High-pass filters increase treble Frame rate details and attenuate low frequencies.

The main purpose of image clarity is to highlight image or to enhance blurred details due to noise or other effects. Sharpening accentuates the edges of the the image and make them easier to see and recognize.

Edge detection:

Borders are often used in image analysis to find a region limits There are many edge detection methods, but most of them can be grouped into two categories, research-based and zero-crossing based. The 3 important steps in the image joining process are:

1. Image Acquisition: Images to be assembled are obtained with a camera mounted on a tripod. The camera angle varies to take different overlapping sampling images.

2.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.

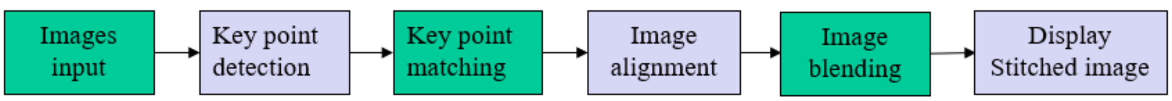
3. Image Merging: Image merging is the process of adjusting the values of pixels in two registered images, such that when the images are joined, the transition from one image to the next is invisible. It should also ensure that the new image has a quality comparable to that of the original images used.

Correlation:.

Compare common variables between two images. Here it is used to detect the key points of the images

Blending: it calculates the correlation coefficient between a and b where a and b are the matrix of the same matrix. "Imshow (I)" displays the grayscale image I. "imshow (I, [low high])" displays the grayscale image I, specifying the display range for I in [low high]. The low value is displayed in black. The high value is shown in white. The intermediate values are displayed as intermediate shades of gray, using the default number of gray levels. If you use an empty array ([]) for [low high], imshow uses [min (I (:)) max (I (:))]]; that is, the minimum value in I is shown in black and the maximum value is shown in white.

BLOCK DIAGRAM :



This is the block diagram of our project “3- image stitching using matlab”.

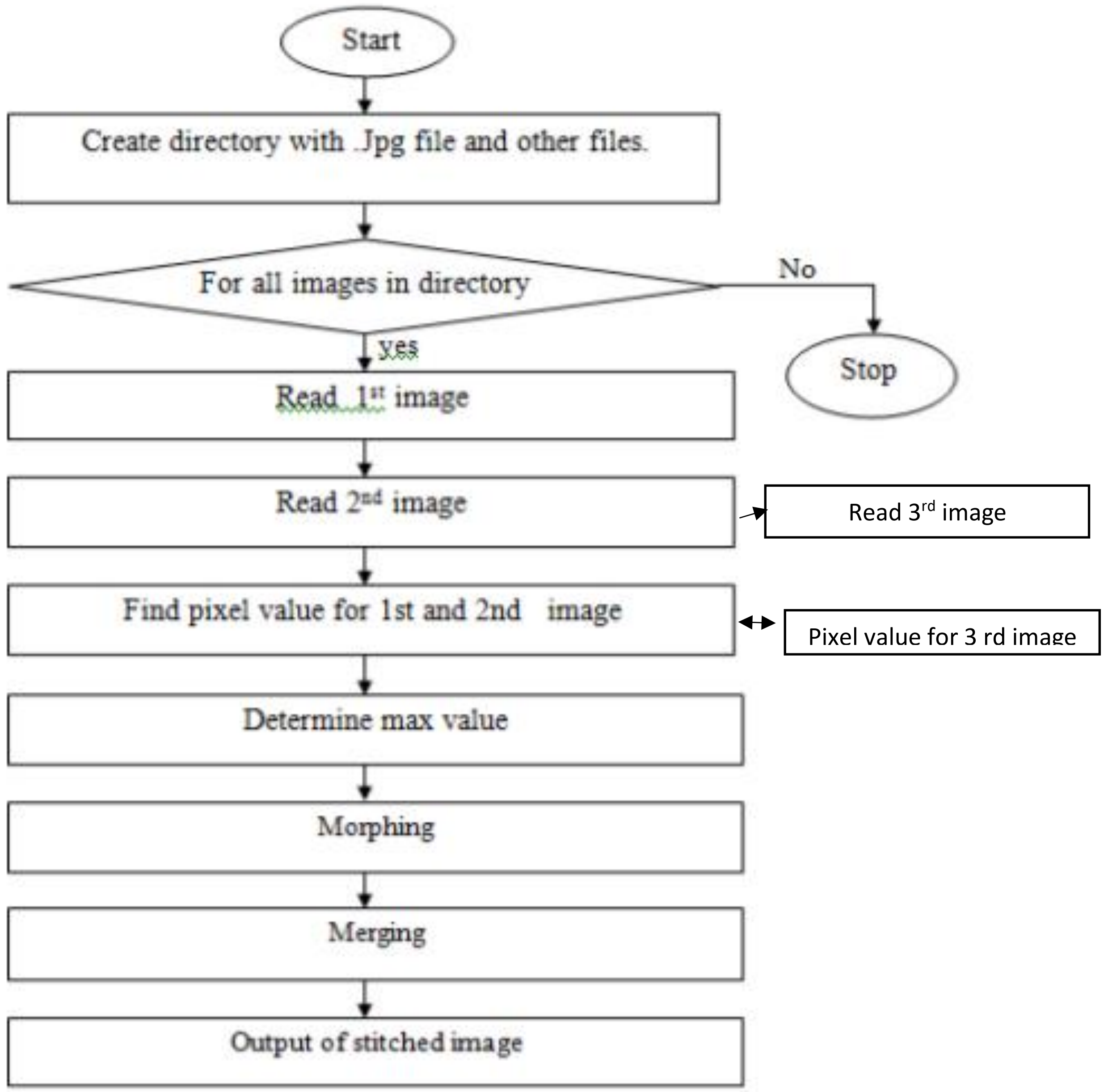
Firstly, images are taken during inputs and register the given input images and match the key points of the given input images and then align the images as per the code and blending the images finaly stitch the images.

Correlation-based stitching:

We don't need to extract functionality in a correlation-based assembly approach. This process depends on the relationship between two images. This is a variant of the rotation, scale and other transformations of the International Journal of Computer and Information Security. For accurate pre-processed images, the correlation approach is effective to apply. Determining the correlation values is the first step in this method. Matching points of interest on two uncalibrated images is a fundamental problem in computer vision. Correlations are generally used in many applications that require corresponding parts of the images. We calculate the correlation coefficient r between 3 image A,B,C using the correlation equation,

After determining the maximum correlation value of the 3 images, we need to find the maximum degree of the column vector. Merging is the next step. When the source pixels are assigned to the final surface, they are mixed to generate a panorama, and the stitch line is adjusted to reduce the visibility of the seams between two images.

FLOW CHART For 3-Image stitching :



Step 1 - Load Images

Step 2 - Register Image Pairs

Step 3 - Initialize the image

Step 4 - Create the stitched image

Step 5 – End

Working:

Step 1:

Receive the directory image If necessary, create a separate folder / directory that includes all text documents (.txt), .pdf, and .jpg. In our code, only .jpg files are extracted. Correlation values are determined for the images extracted in Step 2**.**

Second Image

Third Image

Step 2:

Determining Correlation Values Corresponding points of interest on two uncalibrated images is a fundamental problem in computer vision. Standardized mappings widely used in many applications that require matching parts of images. Traditional matching methods based on a normalized correlation can only handle the situation where there is only a mix between the two images. How to introduce a new image matching method based on standardized correlation, which can handle more complicated image conditions.

Step 3 and 4:

Select the highest degree of column vector Select the first two images to be sewn, then compare by column vector, which means you select the highest degree column of two images, the images are defined based on of the largest vector column size.

Step 5:

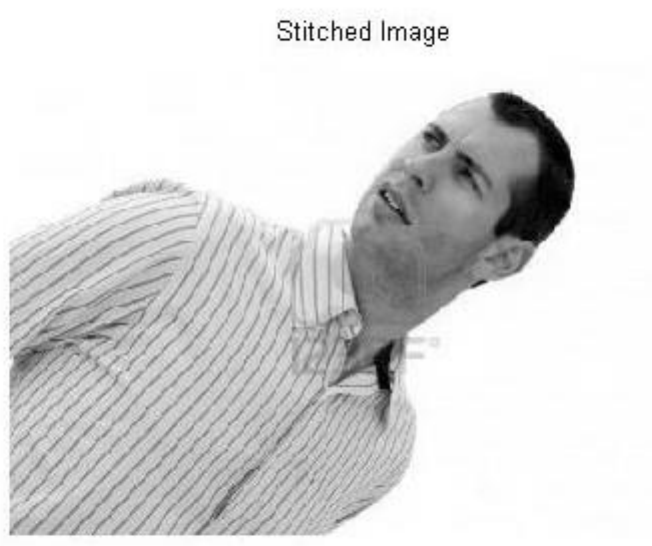
Match the correlation value of the current image with the remaining image

Step 6:

Morphing The basic principle of the morphing image is explained in this section. "Morphing" refers to the combination of generalized image distortion with cross dissolution between image elements. To transform between two images as defined by the corresponding control pixels in the source image I0 and the destination image I1 and image i3 Then define each intermediate frame I of the metamorphosis by creating a new set of control pixels by interpolating the control pixels from their positions at I0 to the positions at I1 and to the position i3. The two images I0 and I1 and i3 are distorted towards the position of the control pixels in JE.

Step 8:

stitched image



In the presented algorithm, the assembly is done only through image translation. The applied procedure can be called mosaic, mosaic, mortgage or sewing. The first step is the generation of relative positions of the acquired images and the creation of an empty network of images in the memory of the computer where these images will be placed. The next step is a search for the best correlation point which is carried out by dragging the adjacent edges of the image in both directions until the best match of the edge characteristics is found. This search process requires the choice of an optimal search space illustrated in Figure 1, in which a search for the best correlation is performed. Using too many pixels within this box makes the correlation process long, while too few pixels reduce the quality of the match. The choice of the number of pixels used is strongly linked to the dimensions of the features that are supposed to be visible in the image, which in turn depend on the quality of the focus, that is, the maximum spatial frequencies present in the image.

fig: stitching of figures based on pixel values.

Alignment may be necessary to transform an image to match the perspective of the image with which it is composed. Alignment in simple terms is a change in the coordinate system so that it adopts a new coordinate system that produces an image corresponding to the required point of view. The types of transformations that an image can go through are pure translation, pure rotation, a similarity transformation that includes translation, rotation and scaling of the image to transform, a related or projective transformation

The projective transformation is the most distant that an image can transform (in the set of transformations of the two-dimensional plane), where only the visible entities that are preserved in the transformed image are straight lines, while the parallelism is maintained in a transformation. refine

Projective transformation can be mathematically described as

x ’= H {\ display style \ c dot } \ c dot x,

where x are points in the old coordinate system, x 'are the corresponding points in the transformed image, and H is the homography matrix .By expressing the points x and x 'using the intrinsics of the camera (K and K') and their rotation and translation [R t] in the real coordinates X and X ', we obtain

x = K {\ display style \ c dot} \ c dot [R t] {\ display style \ c dot} \ c dot X and x '= K' {\ display style \ c dot} \ c dot [R 't'] {\ display style \ c dot} \ c dot X '.

Using the two previous equations and the homography relationship between x 'and x, we can derive

H = K ’{\ display style \ c dot} \ c dot R’ {\ display style \ c dot} \ c dot R - 1 {\ display style \ c dot} \ c dot K – 1.

The H homo graphy matrix has 8 parameters or degrees of freedom. Homo graphy can be calculated using direct linear transformation and single value decomposition where A is the matrix constructed using the coordinates of the correspondences and h is the one-dimensional vector of the 9 elements of the reformed homo graphy matrix. To get to h, we can simply apply SVD: A = U {\ display style \ c dot} \ c dot S {\ display style \ c dot} \ c dot V T Y h = V (column corresponding to the smallest singular vector). This is true because h is in the zero space of A. Since we have 8 degrees of freedom, the algorithm requires at least four point matches. In the case where RANSAC is used to estimate homo graphy and there are several matches available, the correct homo graphy matrix is the one with the maximum number of entries.

There are so many methodologies:

Scale Invariant Feature Transform (SIFT) algorithm proposed by Lowe is an approach to extract invariant characteristics of the images. Achievement applied to a variety of computer vision problems based on functional mapping, including object recognition, placement estimation, image recovery and many others. However, in real-world applications, there is still room for improvement. robustness of the algorithm with respect to correct match of SIFT Features.

Random sample consensus algorithm

The Random Sampling Consensus Algorithm (RANSAC) proposed by Fischler and Bolles is a general parameter estimation approach designed to deal with a large proportion outliers in the input data. Unlike most Robust estimation techniques such as M estimators and least squares that have been adopted by artificial vision statistical literature community, RANSAC has been developed from the computer vision community. RANSAC is a resampling technique that generates candidates solutions using the minimum number of observations (data points) necessary to estimate the parameters of the underlying model.

unlike conventional sampling techniques that use as much data as possible to get an initial solution, then prune outliers, RANSAC uses the smallest possible set and proceeds to expand this set with consistent data points

Calibration:

Image calibration aims to minimize differences between ideal lens models and the lens and camera combination used, optical defects such as distortions, differences in exposure between images, Camera response, and color aberrations . If feature detection methods were used to record images and the absolute positions of the features were recorded and saved, the sewing software can use the data for geometric optimization of the images in addition to positioning the images. Pano tools and its various derivative programs use this method in the pannosphere.

Alignment:

Alignment may be necessary to transform an image to match the perspective of the image with which it is composed. Alignment in simple terms is a change in the coordinate system so that it adopts a new coordinate system that produces an image corresponding to the required point of view.

Composition:

Image Composition is the process in which rectified images are aligned to appear as a single photo of a scene. Composing can be done automatically because the algorithm now knows which overlapping matches.

Blending:

Image blending involves making adjustments determined during the calibration phase, combined with reassigning images to an output projection. Colors are adjusted between images to compensate for differences in exposure. If necessary, a high dynamic range merge with motion compensation and defrost is performed. The images are mixed and an adjustment of the seam line is made to minimize the visibility of the seams between the images.

CHAPTER 04

PROJECT DESCRIPTION

Software used:

MATLAB 16.0:

MATLAB (Matrix Lab) is a multi-paradigm digital computing environment and a proprietary programming language developed by MathWorks. MATLAB allows matrix manipulations, function and data tracing, algorithm implementation, user interface creation, and interface with programs written in other languages.

Although MATLAB is primarily intended for digital computing, an optional toolbox uses the MuPAD symbolic engine that allows access to symbolic computing capabilities. An additional package, Simulink, adds multi-domain graphical simulation and a model-based design for dynamic and integrated systems. which stands for Matrix Laboratory, is a state-of-the-art mathematical software package that is widely used in universities and industry.

It is an interactive program for numerical calculation and data visualization that, with its programming capabilities, is very useful for almost all areas of science and engineering. However, it is still one of the main software packages for numerical calculation.

The MATLAB program and script files always have a file name that ends in ".m"; the programming language is exceptionally simple because almost all data objects are assumed to be an array. A graphical output is available to complete the numerical result.

Designed By: Cleve Barry Moler

Developer: MATHWORKS.

Mat lab commands used

Clc;

Clears command window.

imread (file name)

This command reads a grayscale or color image of the file specified by the string file name. If the file is not in the current folder or in a folder in the MATLAB path, specify the full name of the path. The return value of the imread command is an array that contains the image data. If the file contains a grayscale image, it is an M-by-N matrix. If the file contains a true color image, it is an M-by-N-by-3 matrix.

imwrite (J, filename, map)

This writes the image data A to the file specified by file name, subtracting the file format from the extension. Imwrite creates the new file in its current folder, writes the image in the format specified by fmt, regardless of the file extension in the file name. You can specify fmt after the input arguments in one of the above syntax. The bit depth of the output image depends on the A data type and the file format.

uint8 (table)

intArray = uint8 (array)

converts the elements of an array to unsigned 8-bit (1 byte) integers of class uint8.

Input arguments: -

Matrix - Matrix of any numerical class, such as single or double. If the array is already of the uint8 class, the uint8 function has no effect.

Output arguments: -

Int Array-Array of class uint8. Values range from 0 to 28 - 1. The uint8 function assigns all values in the array that are outside the limit to the closest endpoint. For example, uint8 (2 ^ 8)% 2 ^ 8 = 256 returns ans= 255.

Correlation:

r = corr2 (a, b);

Calculate the correlation coefficient between a and b where a and b are the matrix of the same matrix. imshow (I) displays the grayscale image I. imshow (I, [low high]) displays the grayscale image I, specifying the display range for I in [low high]. The low value (and any value less than low) is displayed in black; the high value (and any value greater than high) is shown in white. The intermediate values are displayed as intermediate shades of gray, using the default number of gray levels.

If you use an empty array ([]) for [low high], imshow uses [min (I (:)) max (I (:))]]; that is, the minimum value in I is shown in black and the maximum value is shown in white. imshow (RGB) displays the true color RGB image. imshow (file name) displays the image stored in the file name of the graphics file. The file must contain a readable image imread or dicomread.

imshow calls imread or dicomread to read the image from the file, but does not store the image data in the MATLAB workspace. If the file contains multiple images, imshow displays the first image in the file. The file must be in the current directory or in the MATLAB path.

Strcat :

Combine Str = strcat (s1, s2, ..., s N)

Combine Str = strcat (s1, s2, ..., s N) horizontally concatenates strings in arrays s1, s2, ..., s N. Inputs can be combinations of single strings, strings in scalar cells, character arrays with the same number of lines, and arrays of cells of the same string size. If an entry is an array of cells, combine Str is an array of strings of cells. Otherwise combine Str is an array of characters.

Size

Table dimensions

d = size (X) [m, n] = size (X) m = size (X, dim) [d1, d2, d3, ..., dn] = size (X),

d = size (X) returns the sizes of each dimension of the matrix X in a vector d with elements n dims (X). If X is a scalar, which MATLAB software considers as a 1 by 1 matrix, size (X) returns vector [1 1]. [m, n] = size (X) returns the size of the matrix X in separate variables m and n. m = size (X, dim) returns the size of the dimension of X specified by scalar dim. [d1, d2, d3, ..., dn] = size (X), for n> 1, returns the sizes of the dimensions of the matrix X in the variables d1, d2, d3, ..., dn, always The number of output arguments n equals n dims (X). If n is not equal to n dims (X), the following exceptions are valid:

n <n dims (X) di is equal to the size of the i-th dimension of X for, but dn is equal to the product of the sizes of the dimensions remaining from X, that is, dimensions n to n dims (X).

The size n> n dims (X) returns those of the "extra" variables, that is, those corresponding to n dims (X) +1 to n.

Opimg (open)

Open the file in the appropriate application.

output open (name) = open (name)

open (name) opens the file or variable specified in the corresponding application. output = open (name) returns an empty result ([]) for most cases. If you open a MAT file, the output is a structure that contains the variables in the file. If you open a shape, the output is an identifier for that shape.

MATLAB functions are similar to function c or to FORTRAN subroutines. MATLAB programs are stored in plain text in files whose names end with the extension ".m". these files are called, unsurprisingly, m files. Each m file contains exactly one mat lab function. Therefore, a collection of MATLAB functions can generate a large number of relatively small files. One difference between MATLAB and traditional high-level languages is that MATLAB functions can be used interactively. In addition to providing obvious support for interactive computing, it is also a very practical way to debug functions that are part of a larger project. MATLAB has two parameter lists, one for input and one for output.

Advantages of MATLAB:

- Test and implement algorithms easily
- Development of computational codes is easy.
- Debugging is easy.
- Use of large database with built in algorithms
- Processing of image and simulating of videos is easy
- We can call external libraries

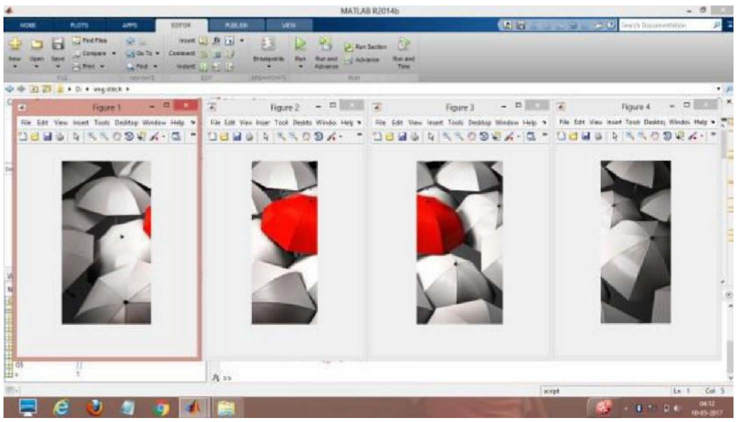
Disadvantages of MATLAB:

- MATLAB compiler SDK,Matlab compiler and packaging tools for add-on are not supported
- Xlsread and xlswrite will work only in basic mode.
- The cost of original license for MATLAB software is very high and unaffordable for many

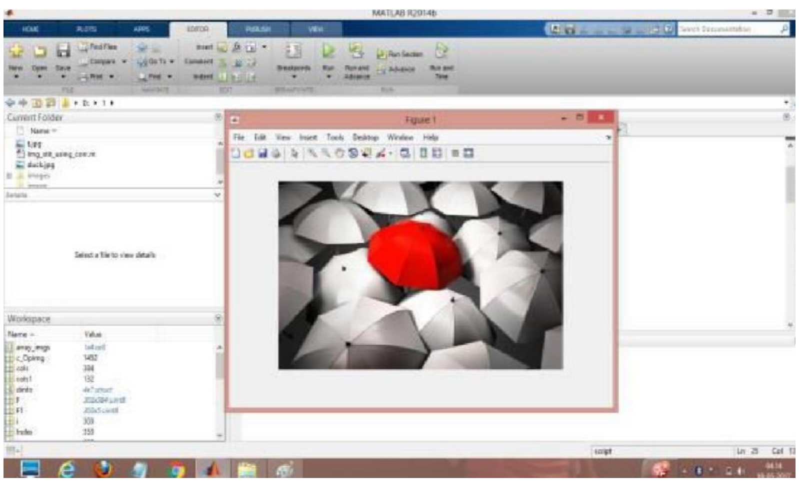
CHAPTER 05

RESULT AND DISCUSSION

The software project , 3-image stitching using matlab is working perfectly as per our objectives.it takes images input and detect the images and find the keypoint of three images and align the images and merge the three images and produce the output as shown on the figure window.



Input of 3 images



Final output (stitched image)

This is the final output of this project.

During the experiment, we found that the method takes longer but the correlation based method it takes less time so if these two methods are compared in terms speed, the correlation method is faster. Details for the the two methods are almost similar, since the images are mainly aligned from the initial phase

TABLE I. PERFORMANCE EVALUATION OF IMAGE STITCHING TECHNIQUES BASED ON ACCURACY RATE AND TIME

Input Image and its size	**Correlation-based Method**		**Feature-based Method**	
	Accuracy (%)	***Time (Sec)***	***Accuracy (%)***	***Time (Sec)***
Image Set 1 (480×475)	98.61%	0.3937s	96.44%	0.7166s
Image Set 2 (480×475)	98.86%	0.4672s	96.36%	0.9883s
Image Set 3 (480×475)	99.62%	0.4596s	98.16%	0.9081s
Image Set 4 (480×475)	99.71%	0.4011s	98.82%	0.8092s
Image Set 5 (480×475)	99.79%	0.4222s	99.05%	0.9951s
Image Set 6 (480×475)	99.09%	0.5716s	97.43%	1.6230s
Image Set 7 (480×475)	99.29%	0.8725s	98.53%	1.0128s
Image Set 8 (480×475)	99.29%	0.7938s	97.13%	1.7026s
Image Set 9 (500×475)	98.60%	0.7674s	96.65%	1.1427s
Image Set 10 (700×475)	99.59%	0.7571s	98.52%	0.9608s

So ,we finally conclude that correlation based stitching is faster and better than any other method of stitching

CHAPTER 06

ADVANTAGES AND APPLICATIONS

Applications of image stitching:

- Video stabilization
- Video summarization
- Video compression
- Video matting
- Panorama creation

CHAPTER 07

CONCLUSION AND FUTURE SCOPE

Conclusion:

The Image Stitcher offers a Flexible alternative to acquire panoramic images using a panoramic camera Panoramic images assembled by a Stitcher can also be used in applications where the camera is unable to get a full view of the object of interest. Full object view can be built using stitcher using overlapping regional images acquired for the object.

Image stitching is the process of forming a resolution (panorama) of the image combining two or More photos together. These input images have some overlapping region with a wide field of view to structure a segmented panorama There are different algorithms for functionality detection. The functionality-based method uses functionality. descriptors and the correlation-based method uses correlation values to create a panorama.

We have thoroughly studied the characteristics and based on correlation with precision and calculation time. The functionality-based method generally requires a longer computation time. But the correlation method is suitable if the two images are aligned means saved. The features are very useful for Good recording So, for high quality results in an unaligned environment, the functionality based method is optimal option.

The high-quality panorama also depends on the light. Exposure and lens distortion. So image calibration can be a additional part between image acquisition and image recording For a good visual feeling, we use alpha mixing method that can be replaced by a more robust method Technical Another complexity is the distortion of the photo that occurs. perspective transformation and can be enhanced by Method to correct lens distortion.

The image assembly has a wide arsenal of use. case. For this reason, there will be more and more research done to improve current algorithms and New development. After analyzing the main types of assembly algorithms, it is obvious that a Light algorithm is needed to get started real-time application type. There's also compromise between sewing speed and quality of stitched panoramic output.

FUTURE SCOPE:

- Image stitching is most widely used topics in computer vision and graphics.
- It is closely associated with people's daily life, such as building beautiful panoramas with smartphone apps, creating wide field of view (FOV) videos to monitor and assist cars.
- Image assembly algorithms create a wide field of view from a sequence of images
- Compared to video stitching, image stitching attracts high attention

Image stitching is widely used in modern applications, such as the following:

- Mosaic of documents
- Image stabilization function on camcorders that use frame rate image alignment
- High resolution photomosaics in digital maps and satellite images.
- Medical images
- Super resolution images from multiple images
- Video Montage
- Inserting object

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APPENDIX

Project code:3-Image stitching using correlation in Mat lab

```
clc;
clear all;
close all;

% Reading all three images
F = imread('E:\Paresh\SIFT\threeimagesstitchingcode\man_1.jpg');
S = imread('E:\Paresh\SIFT\threeimagesstitchingcode\man_2.jpg');
V = imread('E:\Paresh\SIFT\threeimagesstitchingcode\man_3.jpg');

%Converting color images to Grayscale
F = im2double(rgb2gray(F));
S = im2double(rgb2gray(S));
V = im2double(rgb2gray(V));

[rows cols] = size(F);
Tmp = [];
Tmp1 = [];
temp = 0;

% Saving the patch(rows x 5 columns) of second(S) & third(V) images in
% S1 & V1 resp for future use.
for i = 1:rows
    for j = 1:5
        S1(i,j) = S(i,j);
        V1(i,j) = V(i,j);
    end
end

% Performing Correlation i.e. Comparing the (rows x 5 column) patch of
% first image with patch of second image i.e. S1 saved earlier.
for k = 0:cols-5 % (cols - 5) prevents j from going beyond boundary of image.
    for j = 1:5
        F1(:,j) = F(:,k+j);% Forming patch of rows x 5 each time till cols-5.
    end
    temp = corr2(F1,S1);% comparing the patches using correlation.
    Tmp = [Tmp temp]; % Tmp keeps growing, forming a matrix of 1*cols
    temp = 0;
end

[Min_value, Index] = max(Tmp);% Gets the Index with maximum value from Tmp.

% Determining the number of columns of new image. Rows remain the same.
```

```
n_cols = Index + cols - 1;

Opimg = [];
for i = 1:rows
    for j = 1:Index-1
        Opimg(i,j) = F(i,j);% First image is pasted till Index.
    end
    for k = Index:n_cols
        Opimg(i,k) = S(i,k-Index+1);%Second image is pasted after Index.
    end
end

[r_Opimg c_Opimg] = size(Opimg);

% Performing Correlation i.e. Comparing the (rows x 5 column) patch of
% second image with patch of third image i.e. V1 saved earlier.
for k = 0:c_Opimg-5% to prevent j to go beyond boundaries.
    for j = 1:5
        Opimg1(:,j) = Opimg(:,k+j);% Forming patch of rows x 5 each time till
cols-5.
    end
    temp = corr2(Opimg1,V1);% comparing the patches using correlation.
    Tmp1 = [Tmp1 temp]; % Tmp keeps growing, forming a matrix of 1*cols
    temp = 0;
end

% Determining the size of third image for future use.
[r_V, c_V] = size(V);

[Min_value, Index] = max(Tmp1);

% Determining new column for final stitched image.
% Rows remain the same.
n_cols = Index + c_V - 1;

Opimg1 = [];
for i = 1:rows
    for j = 1:Index-1
        Opimg1(i,j) = Opimg(i,j);% Previous stitched image is pasted till new
Index.
    end
    for k = Index:n_cols
        Opimg1(i,k) = V(i,k-Index+1);%Third image is pasted after new Index.
    end
end
% Determining the size of Final Stitched image.
[r_Opimg c_Opimg] = size(Opimg1);

figure,
subplot(2,3,1);
imshow(F);axis ([1 c_Opimg 1 r_Opimg])
title('First Image');

subplot(2,3,2);
imshow(S);axis ([1 c_Opimg 1 r_Opimg])
```

```
title('Second Image');

subplot(2,3,3);
imshow(V);axis ([1 c_Opimg 1 r_Opimg])
title('Third Image');

subplot(2,3,[4 5 6]);% Final Stitched image should get most of the space in
subplot.
imshow(Opimg1);axis ([1 c_Opimg 1 r_Opimg])
title('Stitched Image');

% End of Code
```

3 - Image Stitching Using Matlab

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