IMAGE STITCHING

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ABSTRACT:

The process of merging two or more images into a single image is called as Image Stitching. It is often known as panoramic image. It is done in two ways, in the first approach we have to stitch images based on intensities of pixels this is popularly known as Direct technique, in the second one we have find features which define the image and combine the images based on them. It is usually performed through software of computer.The final image should look like a single image rather than overlapping of images. There are algorithms which does this process precisely delivering high definition images. Scale Invariant Feature Transform abbreviates as SIFT is one of them. Image stitching is an area in computer graphics. The output image is also known as mosaic.In these days electronic devices are equipped with these features giving wide-angle panoramic images. These images are used in maps and satellite photos. This paper helps you to get a clear idea on feature based image stitching.

Key-words:Image Stitching, panorama, SIFT, Direct technique, Mosiac.

1.INTRODUCTION:

In the beginning people used to stitch images manually which consumes more time and does not give the good quality image, with the advancement of technology we are able to get high quality images with the help of digital cameras and some mobile phones. Panorama is a Greek originated word, 'pan' means everything and 'horama' means view. The perfect overlap of consequtive images produce great results. Copying and attaching of ovetlapping images may give visible seams due to some errors, panoramic image stitching provide perfect results by cutting and blending the source image.

Feature based image stitching focuses on invariant features these are the features which does not change even if the image transformed, translated, maximized or minimized. This method has high computational speed and also gives high definition image. This technology is also used in Image classification also known as image processing, Virtual reality, satellite imaging, Constructing 3D image and in Medical analysis. In medical analysis they need microscopic details to know each and every aspect of the patient this technology helps to give complete image with high quality. It is used in treating patients with the disorder of heart, lungs, liver, pelvic, retina etc.

This process is mainly done in two steps the first one is Image registration in this process we find the correspondence between two images. In this we draft points between one image to matching points in other image geometrically, we have to take pictures from various electronic devices from different angles to obtain all possible perspectives

in 2D and 3D. The second step is Image blending in this process there must be a smooth transition between two images without any distortion. This is done with the help of alpha blending which focuses on image pixels or Gaussian pyramid which focuses on Frequency shift.

2. Literature survey

In past few years several researchers presented multiple image stitching processes. Weiss and Lewis came up with various cost functions for calculating the quality of image stitching. The goal of image stitching to provide high definition mosaics. The mosaics should be geometrically similar to source image and the two images should be blended perfectly without any seam. These are not considered fully in previous approaches. The quality of the image stitched is calculated by the Gradient Domain in the blended region. Scale Invariant Feature Transform known as SIFT algorithm given by Lowe in the year 1999. It is based on Invariant Features means features will not change even after transforming, scaling out or scaling in the image. These are called as key points and the around them is called as descriptor. The limitation of this algorithm is complexity as it considers 128 dimension feature vector. This reduces the computational efficiency. To overcome this problem SURF(Speed up Robust Features) is invented in the year 2006.

SURF is faster than the above algorithm. It has more computational power and relative robustness to SIFT. After many developments multiple image blending is developed. Its target is to blend low frequency to large special area and high frequenncy to small special area . Many algorithms used to find the seam between the overlapped images. Dynamic programming and many algorithms were used to reduce the seam i.e blend images perfectly. Many changes and modifications are involved to reach this stage.
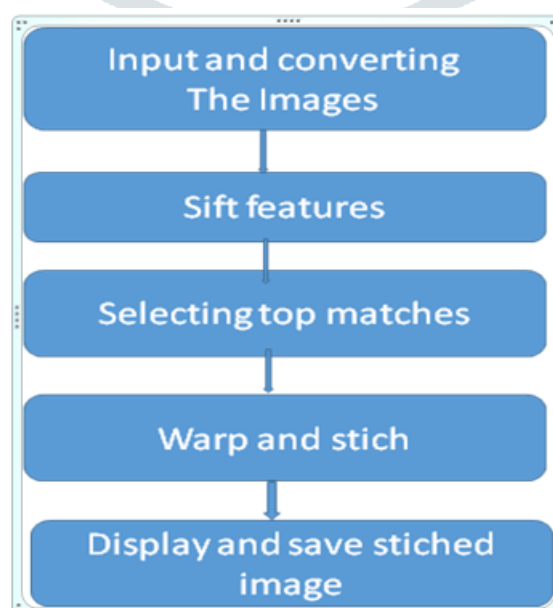
3. Problem statement:

In this project we take an image it is called as source image we have to crop the image into two parts be it in any ratio, now we have to stitch those two images using SIFT algorithm by following the stipulated procedure. After implementing we have to compare the final image to the source image and see the accuracy of images. Our aim is to stitch two images seamlessly.

4. Process Flow:

First take the images as input and convert them into Grayscale, in Grayscale the image has colors as multiple intensities of grey based on the original color wavelength. Then find the sift features i.e key points and descriptors, then find the top few matches. Wrap and stitch the images based on the top matches. Then display the image by trimming the unnecessary part.

The process flow shows how the whole process of the project is done and the result is viewed. The following flow chart shows the process:

Input and converting
The Images

Sift features

Selecting top matches

Warp and stich

Display and save stiched
image

5. Methodology:

5.1 Installing the tools and libraries:

The algorithm required is performed on python programming platform.So we installed the python tool with help of Python Package Installer usually called pip. It is used to install packages from the python packages index.The version of python we installed for the project is Python3.7.8 to in order to be compatible and support the OpenCv which is installed next.

Now we need to install the Open Computer vision library (OpenCv) version 3.4.2.16 that is compatible with the above python version. After Installation we need to import the "cv2" and "numpy" libraries.These libraries are used to read, write, converting the data into other forms display and reshape the images in our project.
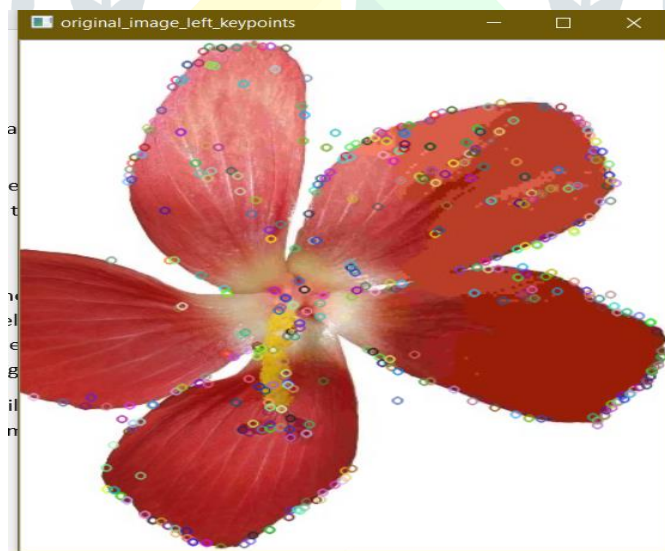
5.2 SIFT Algorithm

5.2.1 Identifying SIFT Keypoints and Descriptors:

scale invariant feature rework abbreviated as sift is employed to find the keypoints and reckon the descriptors.keypoint may be a circular image region with associate in nursing orientation. its represented by a geometrical frame of 4 parameters: the keypoint center coordinates x and y its scale the radius of the region and its orientation an angle expressed in radians .the sift detector is invariant or a lot of accurately covariant to translation rotations and re scaling of the image.

A SIFT descriptor may be a 3D spatial bar chart of the image gradients in characterizing the looks of a keypoint. The gradient at every picture element is thought to be a sample of a three-dimensional elementary feature vector, shaped by the picture element location and also the gradient orientation. Samples are weighed by the gradient norm and accumulated in an exceedingly 3D bar chart h, that forms the SIFT descriptor of the region.
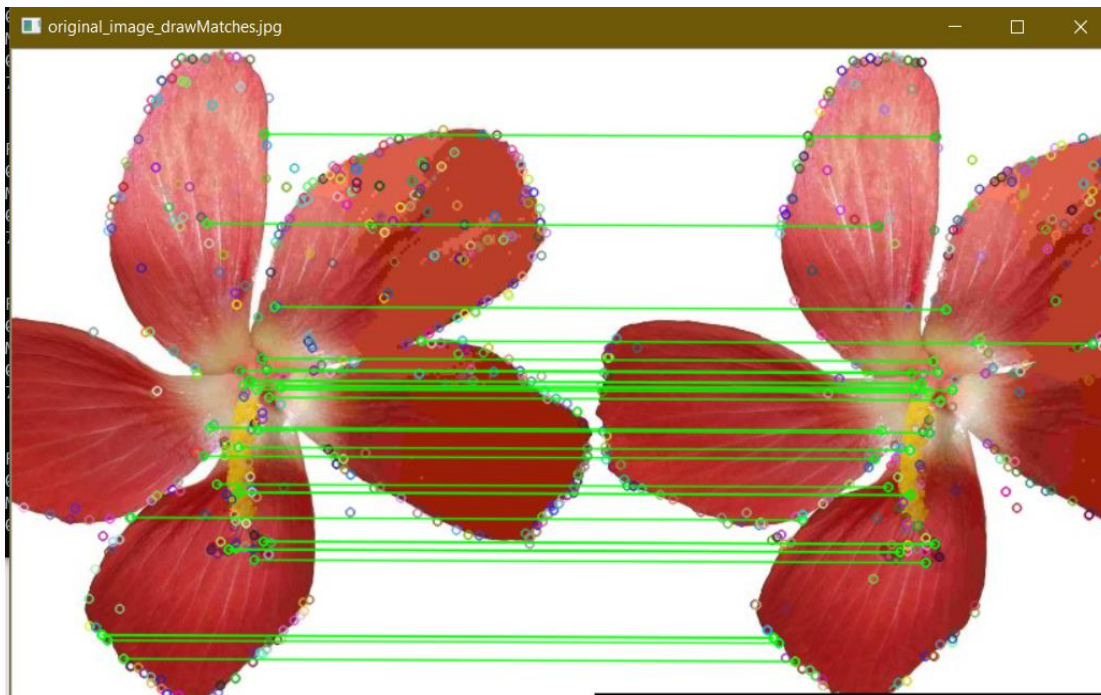
Now these keypoints and descriptors are detected and computed by the built-in perform called "detectandcompute()".It returns the list of keypoints and descriptors an

5.2.2 Finding the top Matches:

After the descriptors are known we have a tendency to calculate the space between every descriptor to all or any different descriptors in image. currently we have a tendency to establish the correspondences as a result of so as to mix 2 pictures we want to seek out the overlapping points.These overlapping points can provide US a concept of the orientation of the second image per initial one. And supported these common points, we have a tendency to get a concept whether or not the second image is greater or smaller or has it been turned then overlapped, or even scaled down/up then fitted. All such info is yielded by establishing correspondences.

So for matching we have used BFMatcher methods (Brute Force). It takes the descriptor of one feature in primary set and is matched with all other features in secondary set using some distance calculation, and the closest one is returned. For BFMatcher() first we have to create the object for BFMatcher() using cv2.BFMatcher(). It takes two optional parameters, first one is normal type it specifies the distance measurement to be used. Second parameter is Boolean variable, which is false by default. If it is true Matcher returns only those matches with value i and j. Such that i-th descriptor in the set A has j-th descriptor in set B as the best match and vice-versa.

5.2.3 Assess homography:

After the matrices are calculated , the algorithm attempts to form a homography matrix between the two images using four of the matching keypoints. This homography is then used to determine which keypoint matches are valid and which ones are not based on the error between the projection of appoint in image 1 with its corresponding point in second image. Using a predetermined threshold are considered as inliners, and all others as outliners. The number of inliners determines the quality of the predicted homographic matrix.

5.2.4 Stitching images

Finally we have to stitch the images by trimming the borders. Borders are nothing but the unnecessary overlapping black region.

6. Results:

We will get the desired image with optimum seaming with image blending smoothly. The output image will be same as source image.

7. Conclusion:

Image stitching is of creating a high quality panoramic image by amalgamating two or more images. It is a present research area in the domain of CG. It has various algorithms for feature detection. In this paper we discussed about stitching of two images by SIFT algorithm, We also discussed about Image Registration and Image Blending. Scale invariant feature transform algorithm provides invariant features which does nt change at any cost. We also discussed various steps involves in SIFT algorithm.

References:

[1] Yanfang Li, Y.W.(2008). Automatic Image Stitching using SIFT

[2] Lowe, D.G.(2004). Distinctive Image Features From International Journal of Computer Vision

[3] Ke Yan and Rahul Sukthankar, "PCA-SIFT: A more distinctive representation for local image descriptors", IEEE Computer Society Conference on Computer Vision and Pattern Recognition, vol. 2, 2004.

[4] "OpenCV Stitching example (Stitcher class, Panorama)", Study.marearts.com, 2013. [Online]. Available: http://study.marearts.com/2013/11/opencv-stitching-example-stitcher-class.html.