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Panoramic View Creation using Image Processing

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Abstract: ***The method of integrating many photographs with overlapping fields of view to create a segmented panorama or high-resolution image is known as image stitching or photo stitching. The term "stitching" refers to the process of utilising a computer to combine small images into a larger one, ideally without leaving any trace that it was produced artificially. Among the first and most popular in computer vision are algorithms for aligning images and creating seamless photomosaics. The high quality photomosaics utilised to construct today's digital maps and satellite images are made using image stitching algorithms. They may be used to produce stunning extreme wide-angle panoramas and are included with the majority of digital cameras on the market and satellite imagery.***

Keywords: Image Stitching, Computer Vision, Panorama.

I. INTRODUCTION

The method of combining photos with overlapped sections to create an image with a broad field of view and high resolution is known as image stitching. Image stitching is a common topic in photographic cartography, computer vision, image processing, and computer graphics nowadays since it plays such an important part in digital image processing.An image that has been well-stitched should be clear, have smooth edges, and have a high resolution. Feature matching, registration, and seam removal make up the bulk of the image stitching process.

The figure below shows an example of a stitched image:

1) This is the Left Image



Left image

2) This is the Right Image



Right image

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3) Then, The Stitched Output Will Be



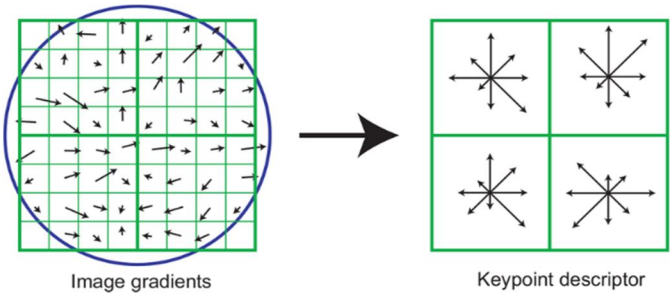
Stitched image

A. Algorithms used Yet

1) KAZE: KAZE exploit non-linear scale space through non-linear diffusion filtering. This makes blurring in images locally adaptive to feature-points, thus reducing noise and simultaneously retaining the boundaries of regions in subject images. KAZE detector is based on scale normalized determinant of Hessian Matrix which is computed at multiple scale levels.

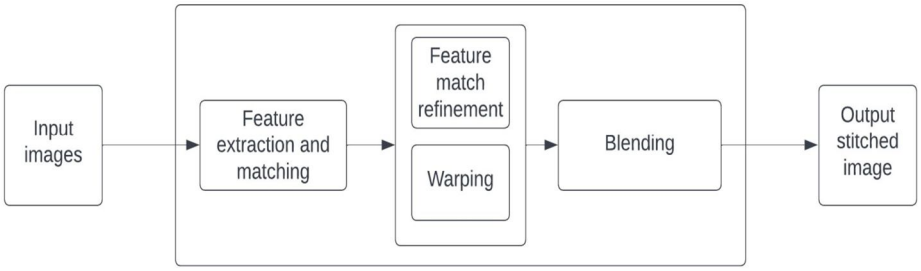
2) AKAZE: Stands for Accelerated-KAZE. The AKAZE algorithm is a typical image registration algorithm that has the advantage of high computational efficiency based on non-linear diffusion.

3) SIFT: Stands for Scale Invariant Feature Transform. It is one of the most famous feature detection and description algorithms. SIFT detector is based on Difference-of-Gaussians (DoG) operator which is an approximation of Laplacian-of-Gaussian (LoG). Feature-points are detected by searching local maxima using DoG at various scales of the subject images. The description method extracts a 16×16 neighbourhood around each detected feature and further segments the region into sub-blocks, rendering a total of 128 bin values.



SIFT

II. METHODOLOGY



The basic steps of working of the project involves giving the left, right and the rear-view image of the vehicle in the application as input. After this, the features are extracted from a pair of images, i.e., either left image and rear image or right image and rear image. Then, the features are matched in both of those images. After getting ample amount of common features, the rear image is transformed according to the features present in the side (left or right) image. The images are then stitched and the final output is displayed.

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A. Example run of the Application

The images used in this run of the application are shown below:

1) Left Image

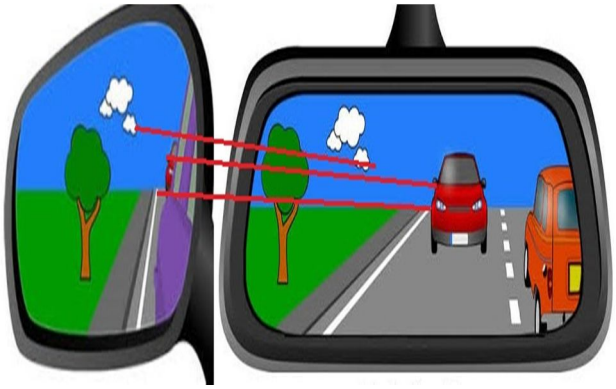


2) Rear Image



a) These images are fed into the system. After which, the process of selection of features is started.

b) The features are selected by the algorithm used in the project. The algorithm aims at finding the common features present in both of the images. The common features present in both of the images are displayed by small circles as displayed below.



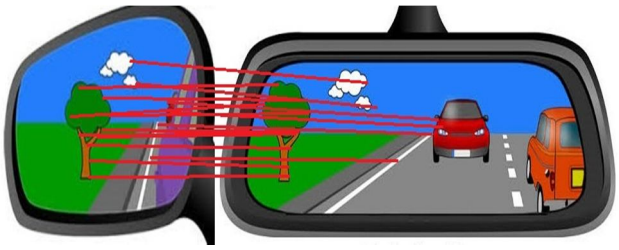
Common features displayed

The features are linked to each other with a red line. This means that the red line links the common features present in the two images.

3) We can also make the algorithm look for more common features present in the images. For this, after the "Keypoint Matches" window (shown above) appears, we will press the 'escape' button. This is result in the window appear again but this time with more common features present in the images. We can repeat this process multiple times till we are satisfied with the number of discovered features. We can press the 'Q' button to exit from this window. After repeating the above mentioned process a few times, we can see the following result:

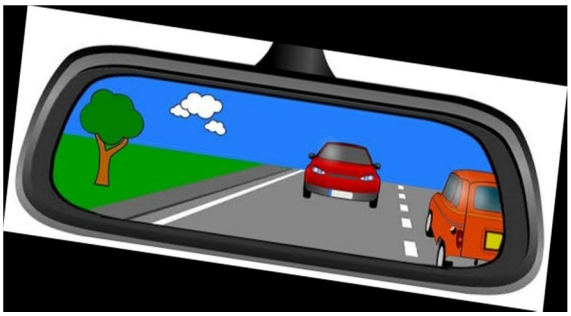
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Here, we can clearly see that the number of common features found in both of the images in this iteration is more than the previous iteration.



More common features displayed

4) After finding the features present in both of the images, the application then transforms one image with respect to the other. Here, the application will transform the rear image with respect to the left image. The transformed result is shown below:



Transformed image

5) Hence, the output would be:



Final Output

III. APPLICATIONS

Using Image Stitching, we can create an image with a larger Field of View which covers all the blind spots behind a vehicle. This helps in better vision of the surroundings for the driver and results in a safer driving experience. The process will combine images on both sides of the vehicles to create a bigger image. Other applications of Image Stitching are satellite imagery. Satellites capture multiple images of their subjects which are then “stitched” together to create a complete image.

IV. CONCLUSION

Image stitching or photo stitching is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama or high-resolution image. Using this technology, there will be a reduction in crashes and accidents occurring in vehicles and will promote to a safer driving environment.

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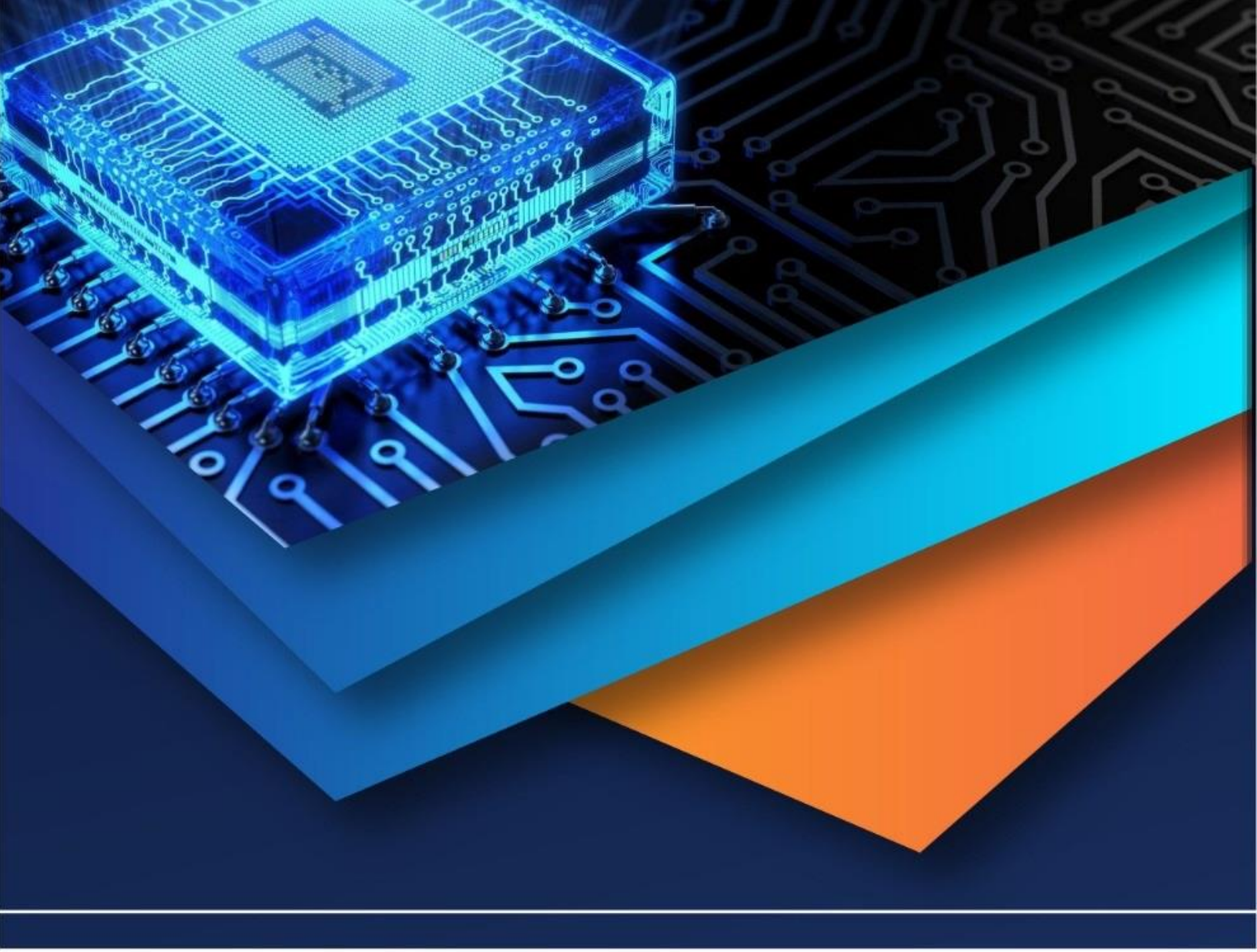
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