

Scaling of Color Fusion in Stitching Images

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Summary

In this modern and information age, more than 80% of information accessed by human beings by viewing and observations of realities. Since now, everyone around the globe is going to be more and more familiar that video or images are two enormously important carriers of information which is obtained by people. Therefore, to get and process video or image becomes very important. Particularly, with the fast development of IT, Science & Technology: digital image processing, image correction, image fusion, and image stitching got high attention. This study heavily relies on Image Stitching of two images. Image stitching is the method of stitching multiple images to develop an image of high resolution which creates a visually probable mixture alike as the joint enclosed by the stitched images should be hidden. It requires nearly exact overlaps within images and identical exposures to process the logical results. The main object of this study is to develop a Matlab script that will stitch two images together to produce one image including the overlapping of region and plan of both images. In this context, a step called fuse has been used through which the colors of both corresponding images mixed to design a new or output image. For this, we captured different scenes from different aspects, angles, and finally selected two images as input or corresponding images. The input images have been evaluated through MATLAB code, analyzed the given task with the help of MATLAB programming, resulting stitching process completed.

Key words:

Image matching; image processing; image fusion; image stitching; MATLAB.

1. Introduction and Background

Data is a most used word in our daily life, almost in every field of science, art, social science, medical science including education, research, dissertation, synopsis, articles, and research paper used. There are different techniques are being used by scholars, researchers, academician to collect data in the form of numbers, symbols, images, voice, videos, character (quantitative + qualitative). Compare with character and voice, images and video are the best carriers to record the objective world, and also the best ways to feel information except personally on the scene. Nowadays, information technology is highly developed, with the continuous development of microelectronics technology, all kinds of devices for taking photos and

videos have entered the everyday life of ordinary people. Limited by scales of a single image or video equipment, we need to zoom lens and adjust the focal length of the lens to take pictures and videos of big sight scene, but this will reduce the resolution of the images, drop the image sharpness and influence effects of watching [1]. But even, we can't use one lens to take pictures of some oversize scene in some conditions, like aerospace and deep-sea exploration area. Although we can use rotary equipment and fisheye lens to make up for the inadequacy that sight is too narrow to some extent, the costs of these two kinds of equipment are too high and it is not easy to operate, non-professionals don't know how to use it. Besides, pictures and videos were taken by this equipment often come out with obvious edge distortion; hence they are not welcomed by common users. So, the technology that reconstructs a new picture from the original picture is developing quickly along with the development of virtual reality technology. In fact, before the emergence of the electronic computer, related applications of video image mosaicking had come out. At the beginning of the 20th century [2]. Intake capacity of single image taking equipment, big vision image can only be got by the way that professionals joining together with the same part of the images in a manual way, and this is the early image matching technology, it also can be called the earliest ancestor of image matching technology [3]. Later, along with the rapid development of remote sensing, people are much interested in high resolution and wide vision images and demand more and more. So, modern image matching technology came out [4]. The first step of matching image is to match a group of image sets that have the same parts, and then fuse the paired images. In the case of the preliminary work in the two feature-based and camps direct. Feature-based methods are used to take-out salient features alike as corners and edges and apply a small portion of available information (i.e., image patch, correlation of a small) to establish similarities [5]. To get whole pixels, direct methods are applied to get all values accordingly, that helps to align images iteratively. Later-on an imaging science, image processing evolved, in which the form of an input is the image, alike as a photograph/video frame; the output of an image processing can be either an image or the set of characteristics or

parameters relevant to an image. Normally, most of image-processing methods process the image as a two-dimensional signal and standard signal-processing methods are used to process them. Image processing is not limited to only digital-image processing, it also used to process analog and optical image processing as well [6].

The image processing is tightly related to computer graphics and computer vision. In computer vision, images are usually treated as the high-level image to process out of which a computer/machine/software intends to decode the sequence of images or a physical content of an image (i.e., 3D magnetic resonance full-body scans or videos) [7]. on the other hand, computer graphics images are processed manually with objects of lighting, physical models, and environments, instead of being acquired via imaging devices (i.e., cameras) by natural scenes, as in most animated movies. Image processing is a method, that is used to form data from a raw-image and are converted to digitized data, several mathematical processes are used to process that data. A digital system (i.e., computer, smartphone, etc) are used to develop an enhanced image that attracts to a human observer or to perform some of the interpretation and recognition tasks mostly performed by humans. It is very commonly applied technique and remarkable work is being done in this field. There are various applications as this is a very vast field. Most common areas of research in this field are Digital Image processing, Image restoration, Image recognition, etc. Moreover, image fusion is the procedure of combining relevant information in multiple images of a scene into a single highly informative image. There are three methods are being used for image fusion.

- Low-level (pixel - based)
- Mid-level (region - based)
- High-level (description - based)

Cutting and smoothly stitching together parts of different images of a scene into a single highly informative image is invoked as Image Compositing [8]. Furthermore, photo/image stitching is the method of adding multiple digital images with overlapping fields of view to generate a high-resolution image or a segmented panorama. Commonly performed through the use of application-software, most approaches need nearly exact overlaps to image stitching within identical exposures and images to generate logical results [9–12].

The main objective of this study is to stitch two images along with the overlapping of their regions and plans. The resulted image should be as this was taken by one shot. In addition to that, with the help of Color Transfer method fuse the colors of two corresponding pixels.

2. Analysis of task

In order to achieve the main objective of this study, we had used MATLAB application, also captured many images from a different aspect of scenes and angles having a variety of backgrounds. Finally, for this study, the sample of two images namely Image X , Image Y have been selected, which are here been given as input in the MATLAB, later on, given instructions processed in the MATLAB Software, through image stitching method, produced a new image named as Transfer Image.

3. Algorithm for the Fusing of Images

After the text edit has been completed, the paper is ready for a variable-exposure image sequence is an aligned series of images of a common scene, representing distinct bands of its dynamic range. Here we describe a fusion algorithm for image sequences. The algorithm is positioned on fusion in the Laplacian pyramid domain. The core of this algorithm is a simple maximization process in the Laplacian domain, for this process, there are a number of parameters which need to be considered. To implement Laplacian pyramid ecomposition, one must first define two elementary scaling operations, generally referred to as shrink and extend. A low-pass filter is applied for shrink operation to the image that resulted in down-samples it through a factor of two. Furthermore, a predefined extended operation is employed to interpolate the method and up-samples the images by a factor of two. The result of the Laplacian-domain fusion is post-processed to maximize its contrast and detail visibility.

3.1 Algorithm Outlines

By given the variable, the complete fusion algorithm is outlined through the following steps by [13]

1. A Laplacian Pyramid L_i is generated for each of the images I_i .
2. Merge the pyramids L_i by taking the maximum at each pixel of the pyramid, obtaining the Laplacian pyramid representation L of the fusion result.
3. Reconstruct the fusion result I from its Laplacian pyramid representation.
4. Normalize the dynamic range of the result so that it resides between the range of [0, 1], and execute the additional post-processing techniques as necessary.

3.2 Algorithm Method in Detail

The first step of the algorithm is to generate Laplacian pyramids for each of the input images when color images are involved, the Laplacian pyramid is generated independently for each channel. Laplacian pyramid decomposition introduces two parameters which may affect the fusion result. First, an appropriate low-pass filter must be selected. Second, the number of levels in the pyramid should be chosen; this determines the size of the low-frequency approximation level.

The second step is the actual fusion process. Here we must define some selection rule for determining the value of each pixel in the resulting pyramid. The selection rule may generally be different for the approximation level and for the detail levels. For the detail levels, each pixel in the resulting pyramid is determined by selecting the maximum among all the corresponding pixels in the input pyramids. Maximization is the most natural operation for the detail levels as we want to maximize the detail in the output image. Once the pyramids are merged, the fusion result is reconstructed from its pyramid representation. According to the nature of the fusion process, the resulting image could have a dynamic range extending beyond the valid [0, 1] range.

Two parameters which affect the result of the fusion process are the choice of a smoothing filter and the number of levels in the pyramid. It is recommended that the smoothing filter is of an odd length so that the kernel has a defined central pixel (this ensures that the filtering result is not biased); using an even-length filter tends to cause artificial shadowing effects in the result. For best performance, the smoothing filter should be chosen alike that the filtering process approximately removes the higher half of the frequency spectrum, maintaining the lower half.

3.3 Analysis of Images

Analysis of this study has been made on the following images; the source code interpreted in MATLAB, the following snaps represents the input to the source code.

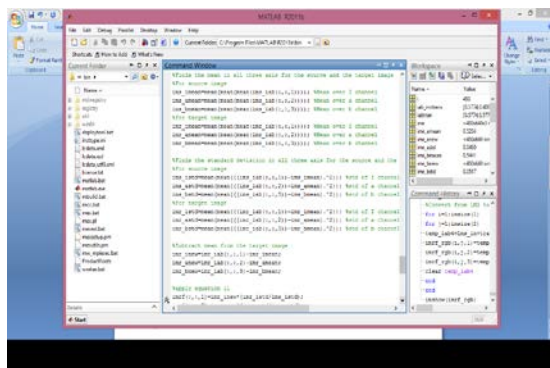


Fig. 1 Algorithm Outline.

Here we also showed a snap, where we successfully executed our program and named as execution.



Fig. 2 Image (X).

Both the above images, namely Image X Fig. 2 and Image Y Fig. 3 has been given as input with the help of MATLAB, in the first step we did Color Fusion of above cited corresponding images, the results we get as under and mentioned as Image Z Fig. 4. It is necessary to mention here that some snaps of executed instructions have also been incorporated in this report. The same could be used for reference only.



Fig. 3 Image (Y).

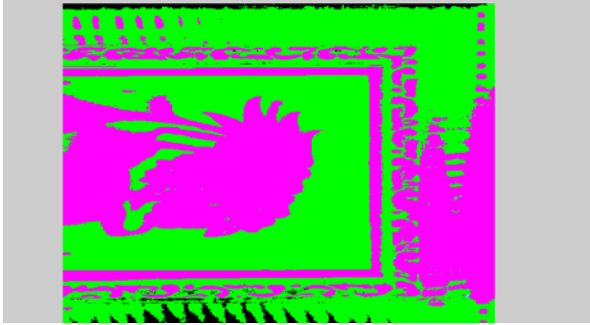


Fig. 4 Image (Z) is the resultant of fused of input images.

In the next step, we had made efforts to stitch both corresponding images, the results are as under.



Fig. 5 Stitched Image ($X + Y$).

4. Results and Discussion

We have tested our method on many sequences of images, and some sample results are presented in Fig. 2, Fig. 3, and Fig. 4 i.e. (X , Y), and $X + Y$. All results were produced automatically, applying the recommended default settings. As could be seen, the resulting images contain all the details appearing in an input order, with no added artifacts or visible noise amplification. Color information is not entirely preserved, but its quality is acceptable. The left and center images in 1st row form a pair of input images, and the right image is the fusion result. It demonstrates the behavior of the algorithm along object borders, as well as the performance of behavior for overlapping objects. It should be noted that post-processing was disabled for all tests. As can be seen from these tests, the algorithm is stable under transformations of the input and produces no visible artifacts or edges in the result. As expected, brightness accuracy is lost during the fusion process, however, all the details in the input images are maintained.

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