RESEARCH PAPER | IT | Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

"A Block And Pixel Level Parametric Fuzzy Technique To Improve Fusion Process on Temporal Images"

KEYWORDS: block analysis, image fusion, similarity analysis, temporal image

Ravi Kant	Mukta Goel	Rohit Goel
M.Tech Scholar, TIT&S Bhiwani,	Asst. Prof., IT Dept., TIT&S Bhiwani,	Asst. Prof., ECE Dept., TIT&S Bhiwani,

ABSTRACT *Capturing the temporal images in bad weather conditions, results in the partial damaged or distorted images. An uncertain image distortion can have remarkable impact on its usage in computer vision systems. In this paper, a block and pixel level parametric fuzzy technique is defined to congregate information for recovering partial damaged parts of temporal images. In this technique, fuzzy block analysis is defined on various parameters to identify the damaged block sequence on which reconstruction is required. The parameters used are similarity analysis, visibility analysis, intensity analysis and temporal vector analysis. When the damaged blocks are identified, pixel based fusion process is applied for the result image. The work is applied on temporal images and obtained results show the effective improvement in fusion process.*

INTRODUCTION:

When an image is captured from some camera, there are some chances that the image is not in proper format because of bad weather conditions; it means the image can have some kind of distortion or the noise over the image, so to avoid the information loss we take multiple images of the same view based on temporal vector, such images are called temporal images [1]. In such cases, some kind of pre-processing over the image is required to repair the image. These approaches are called image enhancement, image impainting or image restoration. One of such approach to repair or restore the image is Image Fusion. Image fusion is the process that combines information from multiple images of the same scene [2]. It is the approach to repair the partial distorted image by using two or more images from the same view point where each of such images is partially distorted. By using the image fusion, these distorted images will construct a new restored image that does not having any distortion or the noise over the image. Image fusion has many image processing application areas such as real time image processing, medical image processing etc. [3], [4]. The fusion process is divided into two levels: Image analysis; and Reconstruction of result image.

Image fusion technique is the most effective technique of the reconstruction of the result image under different areas of its requirement. The fusion requirement areas include image noise, image distortion, missing sequence image, color imbalancing, partial object occlusion [5], [6].

Image fusion can be applied on two or more images at three different levels. There are three most commonly used approaches for image fusion are: block level fusion; component level fusion and pixel level fusion [1]. In block level fusion, the images are divided in small size blocks instead of performing the analysis and fusion on each pixel [7], [8]. The efficiency and accuracy of block level fusion depends on block size. The component level fusion is based on the component analysis. In object specific images, this kind of fusion is applied to extract all the image components. The pixel level fusion is worked on same pixel value analysis for all the input images for fusion process. This kind of processing is effectively slow.

In this paper, a block & pixel level parametric fuzzy approach is defined to perform image fusion on temporal images. In this section, an introduction to image fusion is given to explore the associated problems and solutions. In section II, the proposed fusion model for image fusion is defined. In section III, the results obtained from the work are presented and discussed. In section IV, the conclusion and future of the work is discussed.

BLOCK & PIXEL LEVEL FUZZY PARAMETRIC FUSION PROCESS MODEL:

In this paper, the fuzzy rule based multi-parametric block analysis technique is defined to improve the image fusion process for temporal images. The temporal images are the images that are captured at different time stamps for same view point. This fusion process model is able to remove the distortion over the temporal images and here this model is applied on a large dataset of temporal images. The fusion process model is divided into 3 stages as shown Figure 1.

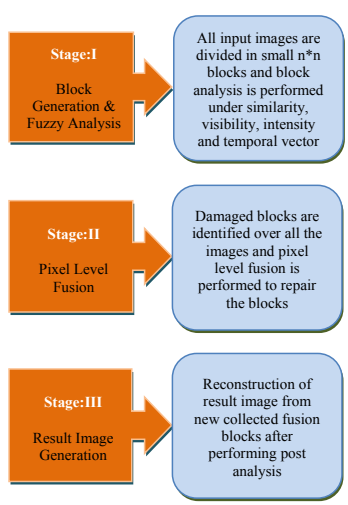

Figure 1: Block & Pixel level Fuzzy Parametric Fusion Process Model

Stage I:

Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

In this stage, all the input temporal images are divided in smaller n*n size blocks. Each block is analysed under the visibility and content based parameters. The parameters used are similarity analysis, visibility analysis, intensity value analysis and temporal vector analysis. The fuzzy rule is applied on same position block for multiple temporal images. The first priority is given to similarity analysis. If the blocks on different images are non-similar only then the fusion process can be applied over it. The similarity analysis also reduce the dataset size so that the improve analysis can be performed over it. The similarity analysis is here performed under cosine distance, Euclidean distance and normalized distance based parameters. These parameters are collectively used to generate the effective block sequence under fusion process. The second vector considered under the Fuzzy Min rule for temporal vector analysis. It is the time stamp analysis to perform the fusion on image with nearest temporal image. The Fuzzy High operator is applied to identify the maximum visibility and maximum intensity value of the image block.

Stage II:
At this stage, the fusion required blocks are identified and then the next work is to perform the pixel level fusion over the block of different images. The intensity based pixel level analysis is performed on each block pixel and obtained the average intensity value as the pixel value for result block. The pixel selection from the particular block is done under the average intensity based analysis. This kind of analysis will avoid the low intensity pixels and will generate a new fusion block based on pixel value analysis.

Stage III:
As the fusion process is performed on each damaged block and new fusion blocks are constructed. The next work is to collect these blocks and generate the result image. Now the post analysis over the image is performed to verify the unequal brightness contrast problem over the image.

RESULTS:
The presented work is about to apply the block and pixel level parametric fuzzy based fusion approach on temporal images to improve the quality and to repair the distortions over the images. The work is here applied on temporal images collected from random web sources. The images are of jpg or bmp format and of different size and properties. As shown in the Table-1, two numbers of damaged images of each dataset are shown. Both the images are partially distorted. The distortion is here observed in terms of blurriness and of the partial visibility over the image. The view of these damaged images and the reconstruction result images obtained from the work are shown in Figure 2.

Figure 2: Dataset Images and Result Image

Here the result analysis has been done under two main parameters called MSE (Mean Square Error) and PSNR (Peak Signal to Noise Ratio). The work here tested on a large image set to perform the analysis in terms of visual quality. All the collected images are in jpg or bmp format. The results show that the visual quality of reconstructed images is improved. The result analysis of this sample 3 set of images is presented here in the form of MSE and PSNR values. The MSE & PSNR value results obtained from the work is shown in Table-1.

TABLE – 1
MSE & PSNR VALUE ANALYSIS

Image Set	MSE	PSNR
Image Set1	0.00059	80.3909
Image Set2	0.00041	81.9302
Image Set3	0.00240	74.2520

The MSE value represents the error or the distortion found in result object when it is compared with input object. Lesser this distortion value more effective the results are considered. The results obtained from the work show that the work has provided the effectiveness against the image distortion or error.
Another parameter considered in this work for analysis is PSNR measure. This measure performs the robustness check of result image against any kind of noise attack. Table-2 shows that the PSNR value obtained from work is higher than 70. Higher the PSNR value, more robust the results are.

CONCLUSION & FUTURE WORK:
In this paper, a two level analysis approach is defined for effective image generation from fusion process. The analysis is here performed at two different levels called block based analysis and pixel based analysis. The block analysis is performed under multiple parameters using fuzzy logic. Once the individual image analysis is done, the next work is to identify the damaged blocks on which the reconstruction is required. At the final stage, the pixel level analysis is performed for regeneration of the block. The work is tested on multiple temporal images. The results show that the work has improved the visual quality of the distorted images. Analysis of work is here performed under MSE and PSNR values. The work can be extended in future by performing same on multiple complicated images such as medical images and the same work can be optimized in future by including some optimization algorithm such as neural network.

Volume : 4 | Issue : 10 | October 2014 | ISSN - 2249-555X

REFERENCE [1]André Mora, José Manuel Fonseca, and Rita Ribeiro (2013), "Real-time Image Recovery Using Temporal Image Fusion." IEEE International Conference on Fuzzy System, 1-5. | [2]Shih-Gu Huang, "Wavelet for Image Fusion." | [3]Peer Smuda, R. Schweiger, H. Neumann, and W. Ritter (2006), "Multiple Cue Data Fusion with Particle Filters for Road Course Detection in Vision Systems." Intelligent Vehicles Symposium, 400-405. | [4]Na Li, Chu He*, Lei Yu, and Hong Sun (2007), "Pixel-level Image Fusion Based on Multi-to-multi Turbo Iterative." Synthetic Aperture Radar, 793-796 |