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A Study towards Segmentation based Intelligent Approach to Perform Image Fusion

Suman Lata[1], Noor Mohammed[2]

[1]M.tech. Scholar, Shekhawati Engineering College, Dundlod (Jhunjhunu)
21sumanlata@gmail.com

[2]Assistant Professor, Shekhawati Engineering College, Dundlod (Jhunjhunu)
s.noor.mohammed@gmail.com

Abstract

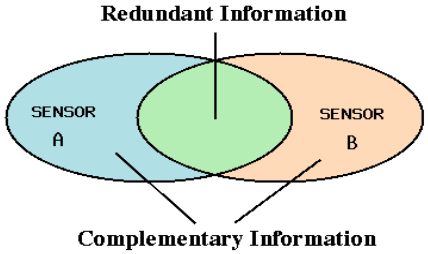
In this paper image fusion is performed by using the segmentation approach. For doing segmentation we have taken the wavelet transformation technique. In wavelet transformation firstly we take both the images on which fusion has to be done, and then segmentation is applied on them. Image fusion is the effective combination of multiple images into a single fused image.

The present work is particularly done on fusion. Fusion uses the similar and complementary information of the source images in order to obtain an informative depiction of the scene for further processing.

Keywords: *Fusion, segmentation, wavelet transformation, complementary, informative depiction.*

I Introduction

Definition of image fusion is: To produce a single image from a set of input images. The fused image should have more complete information which is more useful for human or machine perception. The fusion operation can be defined by the following figure:



Improve reliability
(By redundant information)

Advantages

1. Improve Reliability (by redundant information)

2. Improve capability (by complementary information)

II Related work

Rong Wang and Shu Yang have presented a paper on fusion method based on segmentation region. In this paper, first, the source images are decomposed by wavelet to get the approximate and detailed sub-images, and the segmentation by watershed method for these sub-images are used to get the regions of each level, these regions are used to guide fusion process.

The activity level and match degree measure of the wave-let coefficients of source images are carried out in these regions, and the maxi-mum value rule and the weighted average rule are respectively used to combine the coefficients of detailed sub-images and approximate sub-image. At last, the combination coefficients are inversely transformed by wavelet to get the final fusion image.

Ramesh Raskar has presented a scheme for image fusion techniques to automatically combine images of a scene captured under different illumination. Beyond providing digital tools for artists for creating surrealist images and videos, the methods can also be used for practical applications. For example, the non-realistic appearance can be used to enhance the context of nighttime traffic videos so that they are easier to understand. The context is automatically

captured from a fixed camera and inserted from a day-time image (of the same scene).

Tao Wan and Zeng chang Qin has presented a paper which present a study of three sampling patterns and investigate their performance on CS reconstruction. We then propose a new image fusion algorithm in the compressive domain by using an improved sampling pattern. There are few studies regarding the applicability of CS to image fusion. The main purpose of this work is to explore the properties of compressive measurements through different sampling patterns and their potential use in image fusion. The study demonstrates that CS-based image fusion has a number of perceived advantages in comparison with image fusion in the multi resolution (MR) domain. The simulations show that the proposed CS-based image fusion algorithm provides promising results.

Dr. Anna Saro Vijendran and G. Paramasivam has presented a paper which states that the existing fusion techniques based on either direct operation on pixels or segments fail to produce fused images of the required quality and are mostly application based. The existing segmentation algorithms become complicated and time consuming when multiple images are to be fused. A new method of segmenting and fusion of gray scale images adopting Self organizing Feature Maps (SOM) is proposed in this paper. The Self Organizing Feature Maps is adopted to produce multiple slices of the source and reference images based on various combination of gray scale and can dynamically fused depending on the application.

Zhiyun Xiao, Lijuan Xie and Lijun Shen has presented a scheme for the local correlation of wavelet coefficients is considered, which is not considered by traditional image fusion algorithm based on wavelet transform. Firstly, the fusing image is decomposed by wavelet; then, the high frequency components off used image are fused by using local region maximum absolute value, and the low frequency components are determined by the local correlation of wavelet coefficients; Finally, we obtained the fused image through the wavelet inverse transform.

III IMAGE PROCESSING

III.i. Problems in Image processing

There are various problems in image processing which include image noise, image sharpening etc.

Image noise**:** Image noise is the random variation of brightness or color information in images produced by the sensor and circuitry of a scanner or digital camera. Image noise can also originate in film grain and in the unavoidable shot noise of an ideal photon detector. Image noise is generally regarded as an undesirable by-product of image capture because it causes distortions present in the image that can obscure the subject of the photograph. Although these unwanted fluctuations became known as "noise" by analogy with unwanted sound, they are inaudible and can actually be beneficial in some applications, such as dithering.

Image sharpening: Sharpening an image increases the contrast between bright and dark regions to bring out features. The sharpening process is basically the application of a high pass filter to an image. The following array is a kernel for a common high pass filter used to sharpen an image:

$$\begin{bmatrix} -1/9 & -1/9 & -1/9 \\ -1/9 & 1 & -1/9 \\ -1/9 & -1/9 & -1/9 \end{bmatrix}$$

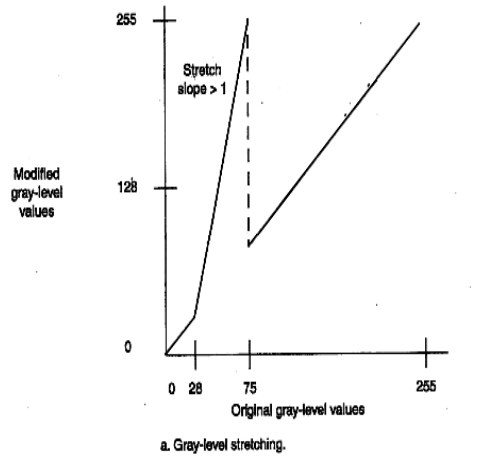
Sharpening is one of the most impressive transformations you can apply to an image since it seems to bring out image detail that was not there before.

III.ii. Gray-scale modification:

Gray-scale modification (also called gray-level scaling) methods belong in the category of point operations and function by changing the pixel's (gray-level) values by a mapping equation The primary operations applied to the gray scale of an image are:

1. To compress- Compress gray-level ranges that are of little interest to us.
2. To stretch- Stretch the gray-level ranges where we desire more information.

The linear equations corresponding to the lines shown on the graph represent the mapping equations.



a. Gray-level stretching.

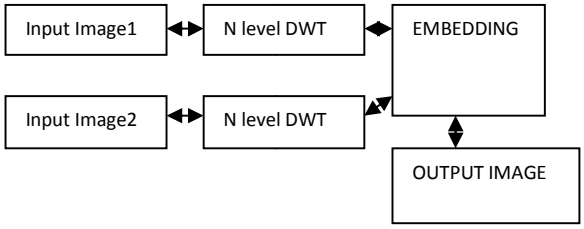
III.iii. Raster image types

Each pixel of a raster image is typically associated to a specific 'position' in some 2D region, and has a value consisting of one or more quantities related to that position. Digital images can be classified according to the number and nature of those samples:

- binary
- grayscale
- color
- false color
- multi-spectral
- picture function

Image processing modifies pictures to improve them (enhancement, restoration), extract information (analysis, recognition), and change their structure (composition, image editing). Images can be processed by optical, photographic, and electronic means, but image processing using digital computers is the most common method because digital methods are fast, flexible, and precise. An image can be synthesized from a micrograph of various cell organelles by assigning a light intensity value to each cell organelle. The sensor signal is “digitized”--converted to an array of numerical values, each value representing the light intensity of a small area of the cell. The digitized values are called picture elements, or “pixels,” and are stored in computer memory as a digital image. A typical size for a digital image is an array of 512 by 512 pixels, where each pixel has value in the range of 0 to 255. The digital image is processed by a computer to achieve the desired result

IV Proposed Methodology



In segmentation both the particular images are divided into segments (equal parts) & then wavelet transformation is applied on both the images, and then finally we get the fused image.

A digital image is a numeric representation of a two-dimensional image using ones and zeros (binary). Depending on whether or not the image resolution image is fixed, it may be of vector or raster type. Without qualifications, the term "digital image" usually refers to raster images also called bitmap images. Raster images have a finite set of digital values, called picture elements or pixels. The digital image contains a fixed number of rows and columns of pixels. Pixels are the smallest individual element in an image, holding quantized values that represent the brightness of a given color at any specific point.

Typically, the pixels are stored in computer memory as a raster image or raster map, a two-dimensional array of small integers. These values are often transmitted or stored in a compressed form.Raster images can be created by a variety of input devices and techniques, such as digital cameras, scanners, coordinate-measuring machines, seismographic profiling, airborne radar, and more. They can also be synthesized from arbitrary non-image data, such as mathematical functions or three-dimensional geometric models; the latter being a major sub-area of computer graphics. The field of digital image is the study of algorithms for their transformation.

Applications of Image Fusion

(i) Intelligent Robots

(ii) Medical Image
(iii) Manufacturing
(iv) Military & law enforcement
(v) Remote Sensing

Conclusion

In this paper we have define the Image fusion. Then how its processing is done like wavelet transformation, problems in images, gray scale modification. Then we have define the proposed methodology for it. In last we list its applications & then references.

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