International Journal of Ethics in Engineering & Management Education
Website: www.ijeee.in (ISSN: 2348-4748, Volume 2, Issue 5, May 2015)

Wavelet Based Image Fusion for Detection of Brain Tumor

Ambika
Electronics &communication
Godutai Engineering college for women
Gulbarga, India
ambsingh005@gmail.com

Shivaganga Patil
Electronics and communication
Godutai engineering college for women
Gulbarga, Karnataka, India
shivagangabp@yahoo.co.in

***Abstract*— Image Fusion is a process of combining the relevant information from a set of images into a single image, where the resultant fused image will be more informative and complete than any of the input images. Image fusion techniques can improve the quality and increase the application of these data. The proposed work is to design a framework for the image fusion in order to increase the information in the final fused image. Image sets are used as primary sources from which the features as complementary information is extracted and put in single fused image in order to make the image more informative.**

***Index Terms*— Image processing, Image fusion, wavelet based, image fusion techniques, etc.**

I. INTRODUCTION

Brain tumor is caused due to uncontrolled growth of a mass of tissue, which can be fatal among children and adults. The national brain tumor foundation (NBTF) for research in United States estimates the death of 13000 patients while 29000 undergo primary brain tumor diagnosis every year [5]. Information Fusion is a naturally occurring phenomenon in most of the systems. Data from various sources are merged in order to make optimal decisions. International society of information fusion aptly defines it as – "Information fusion encompasses the theory, techniques and tools conceived and employed for exploiting the synergy in the information acquired from multiple sources such that the resulting decision or action is in some sense better than would be possible if any of these sources were used individually without such synergy exploitation"

Image fusion is the process by which two or more images are combined into a single image for retrieval of vital information from these images. Fused image has the maximum information content without producing details that are non-existent in the given images. With rapid advancements in technology, it is now possible to obtain information from multi source images to produce a high quality fused image with spatial and spectral information. Image Fusion can be used as a mechanism to improve the quality of information from a set of images.

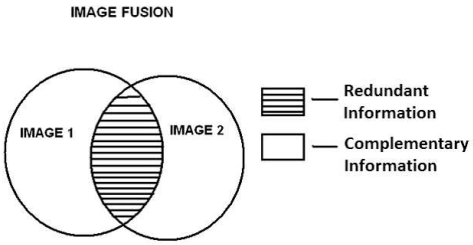

Figure 1: Image showing the image fusion process.

II. EXISTING SYSTEM

Image fusion method can be broadly classified into two groups

1. Spatial domain fusion method
2. Transform domain fusion

Spatial domain techniques directly deal with the image pixels. The pixel values are manipulated to achieve desired result. In frequency domain methods the image is first transferred in to frequency domain. It means that the Fourier Transform of the image is computed first.

All the Fusion operations are performed on the Fourier transform of the image and then the Inverse Fourier transform is performed to get the resultant image. The disadvantage of spatial domain approaches is that they produce spatial distortion in the fused image. Spatial distortion can be very well handled by frequency domain approaches on image fusion. The multi resolution analysis has become a very useful tool for analyzing remote sensing images. The discrete wavelet transform has become a very useful tool for fusion. The Author in "Image Fusion at Pixel Level Algorithm Is Introduced and the Evaluation criteria" [1] has said Image fusion at pixel-level means fusion at the lowest processing level referring to the merging of the measured physical parameters and its application is very wide. At this level it has the details on the information which other levels do not have. The data level fusion is also called pixel level fusion, which means the direct process of data taken from sensors. It is the foundation of high level image fusion and one important direction of present image fusion research. The merit of this fusion method is keeping the living original data as much as possible, which provides the details those other level fusion methods, cannot supply.

International Journal of Ethics in Engineering & Management Education
Website: www.ijeee.in (ISSN: 2348-4748, Volume 2, Issue 5, May 2015)

Disadvantages:

1. The main disadvantage of Pixel level method is that this method does not give guarantee to have a clear objects from the set of images.
2. Pixel level methods are affected by blurring effect which directly affect on the contrast of the image.
3. But spatial domain fusion my produce spectral degradation.

The Author in *"Wavelet for Image Fusion"* [2] has said The DWT fusion method may outperform the slandered fusion method in terms of minimizing the spectral distortion. It also provide better signal to noise ratio than pixel based approach.

Disadvantages:

In this method final fused image have a less spatial resolution.

III. Motivation

Information Fusion is a naturally occurring phenomenon in most biological systems, remote sensing systems etc. Data from various sources are merged in order to make optimal decisions. Image Fusion is a similarly inspired effort to merge relevant visual data sets which are dependent and yet have disparity to certain extent in order to come up with a smaller data set apt for a better semantic interpretation of data for a given application. Multi-sensor image fusion has become a discipline which demands more general formal solutions to a number of application cases. Several situations in image processing require both high spatial and high spectral information in a single image. This is important in remote sensing, medical imaging and military applications. However, the instruments are not capable of providing such information either by design or because of observational constraints. One possible solution for this is image fusion. Image Fusion is applied in every field where images are ought to be analyzed. And it has become an important and useful technique for image analysis, computer vision, concealed weapon detection, remote sensing, medical imaging and robotics.

IV. Proposed Framework

In the proposed framework as follows

1. A framework for image fusion.
2. Method for selection of features from the image.
3. Method for fusion of features to generate a fused image.
4. To demonstrate our framework on suitable datasets.

V. Architectural Overview

K source images (X1,... Xk) □ true scene S from different sensors of the same basic type or from different types of sensors. Our aim is to create a fused image F from these images which is going to be perceptually enhanced. The

composite image should contain more useful description of the same scene than provided by any of the individual source. This fused image should be more useful for human visual or machine perception. This task of combining images and form one better image is called image fusion.

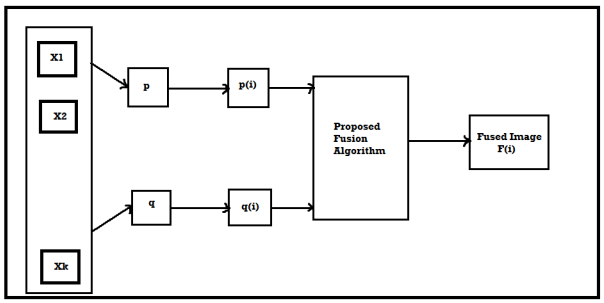

Figure 2: Architectural Overview of the proposed system.

Where,

X1, X2..XK are the images in dataset,

p and q are the images selected for fusion,

p(i) and q(i) are the information from images which contain suitable features extracted[4][6] from p and q respectively for fusion,

A fusion algorithm is applied on these images to get F,

Where, F(i) is the information content in the final fused image

$F(i) = p(i) + q(i)$.

VI. Fusion Techniques

The following are the fusion techniques which are been proposed here.

Fusion techniques:

1. Data/ Information fusion (low-level fusion),
2. Feature fusion (Intermediate-level fusion),
3. Decision fusion (High-level fusion).

Data fusion combines several sources of raw data to produce new raw data that is expected to be more informative and synthetic than the input data. Feature fusion brings together multidimensional features to provide a better / efficient /reliable feature set. Decision fusion uses a set of system inputs to provide a better and unbiased result. The High-level fusion or Decision fusion is obtained by fusing information, data and then maximizing the same. Here used intermediate level fusion as data fusion (low level) would be a raw approach for fusion and decision fusion would be a complex approach to follow.

VII. Expected Outcomes

These are the outcomes expected from the proposed framework and the methods used in here.

1. A possible Research work on this topic.
2. A foundation for further work on Image fusion.

References

[1]. Wu, K .Wang ,C .and Li , L .(2010) , "Image Fusion at Pixel Level Algorithm Is Introduced and the Evaluation criteria" , International Conference on Educational and Network Technology (ICENT 2010) , pp.585-588.
[2]. Shih-Gu Huang, "Wavelet for Image Fusion".
[3]. Yufeng Zheng, Edward A. Essock and Bruce C. Hansen, "An Advanced Image Fusion Algorithm Based on Wavelet Transform – Incorporation with PCA and Morphological Processing".
[4]. "A novel multi-focus image fusion algorithm based on feature extraction and wavelets" Rodrigo Navaa, Boris Escalante-Ram´ırezb and Gabriel

Crist´obalca Posgrado en Ciencia e Ingenier´ıa de la Computaci´on, Universidad Nacional Aut´onoma deM´exico, M´exico

[5]. S. Kor and U. Tiwary, "*Feature level fusion of multimodal medical images in lifting wavelet transform domain*," IEEE International Conference of the Engineering in Medicine and Biology Security 1, pp. 1479–1482, 2004.

[6]. A. H. Gunatilaka and B. A. Baertlein, "*Feature-level and decision-level fusion of non coincidently sampled sensors for land mine detection,"* IEEE Transactions on Pattern Analysis and Machine Intelligence 23(6),pp. 577–589, 2001.

[7]. *Different Image Fusion Techniques –A Critical Review"* International Journal of Modern Engineering Research (IJMER) www.ijmer.com Vol. 2, Issue. 5, Sep.-Oct. 2012 pp-4298-4301 ISSN: 2249-6645.

[8]. "*Hybrid Transform Domain Algorithm for Medical Image Fusion"* International Journal for Science and Emerging ISSN No.(Online):2250-3641Technologies with Latest Trends" 8(1): 23-27 (2013) ISSN No. (Print): 2277-8136.