International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-3 Issue-2, December 2013

Survey of Image Fusion Techniques for Brain Tumor Detection

S.L. Jany Shabu, Dr.C. Jayakumar, T. Surya

Abstract: ***Image Fusion is the process of combining relevant information from two or more images into a single composite image. Image fusion is used to detect the tumor by integrating two or more medical images. In this paper, we propose Genetic algorithm to detect the brain tumor, which generate solutions to optimization problems using techniques, such as selection, crossover and mutation. Before applying genetic algorithm, features of the images are extracted. Feature Extraction is a form of dimensionality reduction and it can be either general feature, such as extraction of color, texture and shape features.***

Keywords: Feature Extraction, Genetic Algorithm, Image Fusion.

I.INTRODUCTION

Brain tumor is a growth of abnormal cells. Brain tumors are typically categorized as primary or secondary. Primary brain tumors originate in the brain and can be benign or malignant. Secondary brain tumors are malignant and are more common. A benign brain tumor consists of cells that grow slowly and do not spread to other areas of the brain or body. They have distinct boundaries. Surgery alone may cure this type of tumor. A malignant brain tumor is life-threatening and it is malignant because of its location. Image fusion method is used to detect tumor by combining the complementary and redundant information from multiple images and generate a single image which is more informative than the input image.

Image fusion utilizes the Multi-modality images such as Computed Tomography (CT) image, Magnetic Resonance Imaging (MRI), positron emission tomography (PET), and single photon emission computed tomography (SPECT) for detection of tumor. To detect the brain tumor many image fusion methods have been developed. In this paper, we proposed genetic algorithm for image fusion. Genetic algorithm takes input as extracted images and fuses those images to detect tumor.

Feature Extraction is used to extract the features. Feature extraction is a special form of dimensionality reduction. When the input data to an algorithm is too large to be processed then the input data will be transformed into a set of features. Transforming the input data into the set of features is called feature extraction. After feature extraction genetic algorithm is applied to extracted features to detect the brain tumor.

Manuscript published on 30 December 2013.
***** Correspondence Author (s)
S.L. Jany Shabu, Computer Science and Engineering, Sathyabama University, Chennai, India.
Professor. Dr. C. Jayakumar, Computer Science and Engineering, R.M. K. Engineering College ,Kavaraipettai, India.
T. Surya, Computer Science and Engineering, Sathyabama University, Chennai, India.

II.RELATED ARTICLES

Vivek et al. (2013) have developed a novel method for Wavelet Based Image Fusion to detect brain tumor. Image fusion is performed by using multimodality scanning images such as Computed Tomography (CT) image, Magnetic Resonance Imaging (MRI), positron emission tomography (PET), and single photon emission computed tomography (SPECT). Image segmentation is performed for better tumor detection.

A non-stationary signal fails to be analyzed by Fourier Transform. So, a novel wavelet based image fusion was developed. Wavelet transforms are performed by analyzing the components of a non-stationary signal. They implemented wavelet transform, for decomposition and fusion of image. Wavelet based fusion algorithm for image fusion is efficient compared to segmentation. They achieved a better result when the algorithm is decomposed with fourth level decomposition.

Anjali et al. (2013) have developed an image Fusion Method based on integration of Wavelet and Fast Discrete Curvelet Transform. They identified that the wavelet transformation does not provide clear information about edges. So they implemented integration of wavelet and fast discrete curvelet transform which analyses feature of images in a better way and also gave clear edge information. Integration of both methods preserves both high spatial and high spectral quality contents of an image.

Chetan et al. (2011) have developed Pixel based and wavelet Based Image fusion method for fusion two medical images. Pixel level image fusion methods affect the contrast of the image. This problem of pixel based image fusion is resolved by use of wavelet based fusion approach. Wavelet based image fusion decomposes the input image into various decomposition levels by discrete wavelet transform and then the decomposed images are fused by wavelet fusion algorithm. The original image can be obtained by performing the inverse wavelet transform.

Paresh et al. (2011) have developed hybrid image fusion using wavelet. They implemented wavelet filter to preserve the edges and to reduce in multi focus images. Compared to conventional methods the hybrid image fusion has minimized errors and also has presented better result. The multi-focus images are fused based on a maximum selection scheme and weighted average scheme. The regions from each input image are chosen by simple maximum which selects the greatest value for each pixel that results in high quality output.

Kannan et al. (2010) have developed feature Level fusion of Multi-focused images.

In Laplacian Pyramid suffers from blocking effects and lack of flexibility and Wavelet transform suffers from lack of shift invariance and poor directional selection. To overcome those two disadvantages they implemented feature level fusión of multifocused images using Discrete, Stationary and Dual Tree Complex wavelet transforms. Feature level algorithm segments the image into small región and fuse the regions. Various performance measures like Root Mean Square Error (RMSE), Peak Signal to Noise Ratio are used for performance evaluation.

Susmitha et al. (2009) have developed Wavelet based Image Fusion. Pixel based fusion method does not take some edge information and Region based fusion reduce the contrast of images. To overcome these problems, a hybrid algorithm is proposed. A hybrid fusion method integrates both pixel and region based rules in a single fused image with wavelet transform which preserves information of the fused image.

Tanish et al. (2009) have developed region based image fusion. Pixel based fusion affect the contrast of image. They implemented region based image fusion, which have better contrast and less noise. They applied region based image fusion on two types of MR images to extract information. Segmentation is applied on source image to get more accurate information. In result they proved that region based approach will present better results than pixel based approach.

V.P.S. Naidu, et al.(2008) has developed Pixel-level Image Fusion using Wavelets and Principal Component Analysis.Simple averaging fusion algorithm degrades the performance of fused image. So, they implemented wavelet transform. Wavelet Transform method allows the image decomposition in different kinds of coefficients preserving the image information combining that coefficient to obtain new coefficients, so that the information in the original images is collected and then the final fused image is achieved through the inverse discrete wavelets transform (IDWT). For better performance Principal Component Analysis(PCA) also implemented with wavelet transform. Resultant image contained both high spatial resolution and high quality spectral content.

III.EXISTING SYSTEM

Many image fusion techniques are developed for brain tumor detection. Wavelet based image fusion resultant fused image may have a less spatial resolution and also there is no guarantee that images have clear objects. Image Fusion using wavelets and principal component analysis may produce degradation and distortion between fused images and original images. In wavelet fusion during image decomposition, the fused image does not preserve the original data. By using the low pass filter the contrast in fused image is decreased. Laplacian Pyramid loses small object part in the fused image. To overcome the above problems of various fusion algorithms we proposed a Genetic algorithm which takes input as the extracted feature of image for fusion process.

IV.PROPOSED METHODOLOGY

The proposed image fusion algorithm is used to detect the tumor. Preprocessing is done on input image to reduce or suppress noise and other small fluctuations in the image. Image Enhancement is also done in preprocessing to used to sharpen image features and in turn improves the quality of the input images. After the preprocessing operations, the input images are subjected to feature extraction. Feature Extraction is used to transform the image into a set of feature. Genetic algorithm is applied in extracted features of the image to fuse the images.

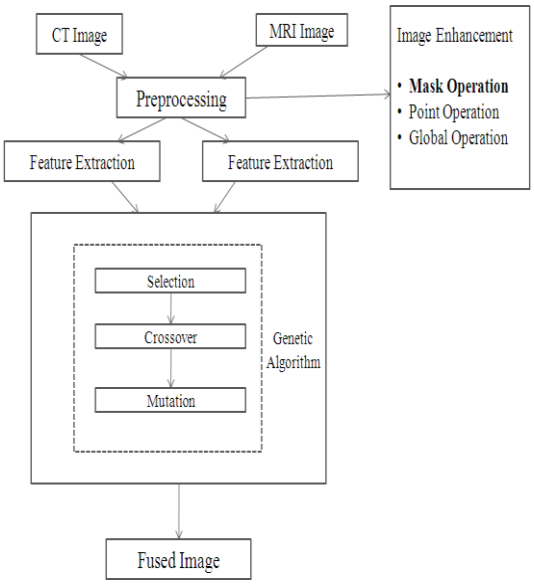

Figure1: Proposed Block Diagram

The block diagram of proposed method is shown in Figure 1. First, preprocessing is applied on both input images. It removes unwanted artifacts and noise. Image Enhancement is applied to improve the quality of the image. Then feature Extraction is used to extract features from images. After feature extraction genetic algorithm is applied in extracted features. E parameters (Energy, Entropy), texture parameters are used for feature extraction. The extracted features are considered as the population of chromosomes. The fitness function is calculated for the chromosomes, Uniform crossover. Single, Two point crossovers are used to generate offsprings. The offsprings are then mutated to generate the fused image. Three types of crossovers are used to compare the quality, accuracy of the fuse images.

V.CONCLUSION

This paper presents the review and comparison of various image fusion methods. We have find out various issues in different techniques and to remove that Genetic Algorithm is used. In this paper, detection of brain tumor is considered based on extracted features from input images. Proposed method used to remove the limitations of existing fusion methods. Proposed algorithm is the very good technique for the image fusion provides high quality fused image.

REFERENCES

[1] Vivek Angoth, CYN Dwith, Amarjot Singh, "A Novel Wavelet Based Image Fusion for Brain Tumor Detection", International Journal of computer vision and signal processing,2(1),2013.

[2] M .Chandana, S. Amutha, and Naveen Kumar, "A Hybrid Multi-focus Medical Image Fusion Based on Wavelet Transform". International Journal of Research and Reviews in Computer Science Vol. 2, No. 4, August 2011.

Published By:
Blue Eyes Intelligence Engineering
and Sciences Publication (BEIESP)

[3] Chetan K. Solanki Narendra M. Patel,"Pixel based and Wavelet based Image Fusion Methods with their Comparative Study". National Conference on Recent Trends in Engineering & Technology, May 2011.
[4] K.Kannan, S.Arumuga Perumal and K.Arulmozhi. "The Review of feature Level fusion of Multi-focused images using Wavelets,Recent Patents on Signal Processing, 2010, 2, 28-38
[5] V.P.S. Naidu and J.R. Raol, "Pixel- level Image Fusion using Wavelets and principal Component Analysis". Defence Science Journal, Vol. 58, No.3, May 2008.
[6] SusmithaVekkot, and Pancham Shukla "A Novel Architecture for Wavelet based Image Fusion". World Academy of Science, Engineering and Technology, 2009
[7] V. Jyothi,B. RajeshKumar, P.Krishna Rao, D.V.RamaKoti Reddy "Image Fusion using Evolutionary Algorithm", Int. Journal of Comp. Tech.Appl.
[8] B.K Saptalakar, et al, "Segmentation based detection of brain tumor". International journal of Computer and Electronics Research.vol 2,issue 1,February 2013.
[9] Tanishzaveri, et al, "Region based image fusion for detection of Ewing Sarcoma", international conference on advances in pattern Recognition, 2009.
[10] Pareshrawat, et al, "Implementation of hybrid image fusion technique using Wavelet Based Fusion rules",International journal of Computer Technology and Electronics Engineering,vol.1,2011.
[11] Ahmed Kharrat, et al, "Detection of brain tumor in medical images". International Conference on Signals, Circuits and Systems, 2009.

Published By:
Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)