An Approach through image fusion for the Detection of Cancer

Rohit K. Atyali[1], Prof. S. R. Khot[2]

Abstract— **Cancer is the most common disease in the world. The main purpose of the system is to develop the diagnosis of cancer using two different modality images. The proposed system combines, segments & classifies tumor that helps to increase the survival rate. It includes preprocessing on fused image using filters & uses region growing segmentation approach to detect the tumor. Morphological features such as radius, area, roundness, compactness, irregularity index are extracted. The extracted features will then be fed to classifier to classify the tumor as benign or malignant.**

Index Terms— **Fusion, Principle Component Analysis, Discrete Wavelet Transform.**

I. INTRODUCTION

Medical imaging offers powerful tools that help physicians in the diagnosis process. In recent days, there are many medical modalities that give very important data about different diseases. These hardware equipment's are controlled by software programs which offer image processing function. Relevant data are offered by these modalities. For example, CT scan gives best data or content information about hard tissue and MRI provides better information on soft tissue. These complementarities have led to idea that combining images acquired with different medical devices will generate an image that can offer more information than each other separate. Likewise, the resultant image can be very useful in the diagnosis process, because of this image fusion has become an important research field. Different techniques are used for image fusion through the evolution. On this many techniques are used. They are of Spatial-domain like IHS, PCA, averaging, etc and other type is Transformation-domain is like pyramid, wavelet, curvelet transformation, etc. The disadvantage of spatial domain approaches is that they create spatial distortion in the fused image. Spectral distortion becomes a negative factor while we go for further processing of image fusion such as classification problem. 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 method for fusion. This paper presents method of cancer detection using pixel level and used a data set of two modalities CT/MRI images to fuse to get a relevant and redundant information by using the DWT & PCA techniques.

Thus to detect the cancer tumor PCA with DWT based fusion technique is the efficient tool for medical approach.

II. PROPOSED SYSTEM

The projected fusion system involve following steps as shown in the Fig.1.

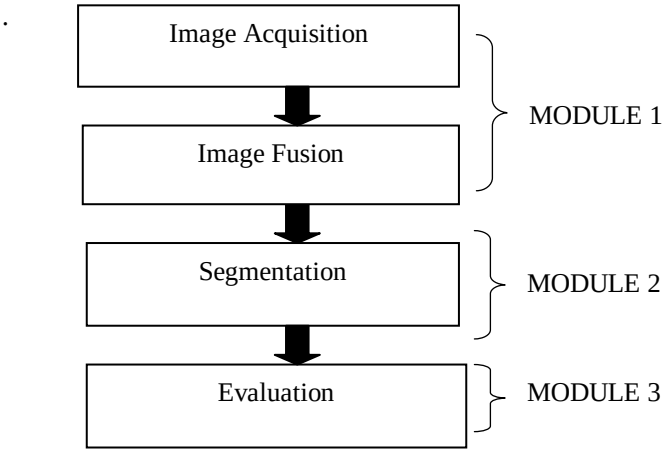


Fig A. Proposed system

A. Module 1

In module 1 the two different image modalities undergo a fusion method to enhance the capability of an image. In image fusion technique two images are provided which are fused together to produce a better informative image. Here for image 1 we are providing CT image while for image 2 we are providing MRI image. These images are firstly registered so that the sharpening of image and alignment of corresponding pixels is performed. The registered images are considered for undergoing fusion process.

Module 1 is done by following steps

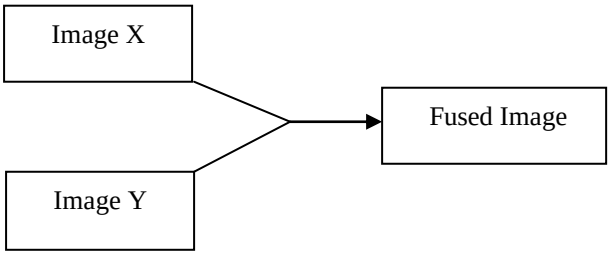


Fig B: Image Fusion process

ISSN: 2278 – 7798

1. Image acquisition:

The main source of input to the prototype is the ultrasound image. Different ultrasound images are acquired from various internet websites, radiologists, pathological labs, hospitals etc. The images acquired are originally in the format of DICOM, TIFF, GIF, JPG, JPEG, BMP, PNG etc.These images are not compatible with the proposed system hence; they need to be converted into a standard format. Thus, the Images are converted into uint.8 is a standard format where the image is converted into integer value & the further pre-processing could be carried out on it.

2. Image Fusion:

In image fusion technique two images are provided which are fused together to produce a better informative image. Here for modality image x we are providing CT image while for modality image y we are providing MRI image. These images are firstly registered so that the sharpening of image and alignment of corresponding pixels is performed. The registered images are considered for undergoing fusion process. Fusion process can be carried out using techniques such as Discrete Wavelet Transform (DWT), Principal Component Analysis (PCA), Averaging, and Select Minimum. After implementing one of the above fusion rule for the two modality images we get a more robust image.

Out of above some techniques Principal Component Analysis with Discrete Wavelet Transform is used for the fusion of both modalities. This method gives the better peak signal to noise ratio (PSNR) and mean square error (MSE)

2.1Principal Component Analysis:

The PCA consist of a mathematical procedure that transforms a number of correlated variables into a number of uncorrelated variables. The first principal component accounts for as much of the variance in the data as possible and each succeeding component accounts for as much of the remaining variance as possible. First principal component is taken to be along the direction with the maximum variance. The second principal component is constrained to lie in the subspace perpendicular of the first. This component points the direction of maximum variance within this subspace. The third principal component is taken in the maximum variance direction in the subspace perpendicular to the first two and so on. The PCA is also called as Karhunen-Loève transform or the Hotelling transform. The PCA does not have a fixed set of basis vectors like FFT, DCT and wavelet etc. Its basis vectors depend on the data set. PCA is also a linear transformation that is easy to be implemented for applications in which huge amount of data is to be analyzed. PCA is widely used in data compression and pattern matching by expressing the data in a way to highlight the similarities and differences without much loss of information.

2.2 Discrete Wavelet Transform*:*

Wavelet transforms are multi-resolution image decomposition tool that provide a variety of channels representing the image feature by different frequency sub bands at multi-scale. It is a famous technique in analyzing signals. When decomposition is performed, the approximation and detail component can be separated 2-D Discrete Wavelet Transformation (DWT) converts the image from the spatial domain to frequency domain.

.

B. Module 2

In module 2 fused image will be classified and the decision according to classification is taken. The fused image is provided as input for diagnostic system. This is further taken for pre processing which involves contrast management to improve quality of image. Pre-processing can be implemented.

This can be implemented using following steps,

1. Pre-processing

Images usually contain one or more type of noise and artifact. Thus, noise suppression or noise removal becomes an important task in image processing. The fused image is provided as input for diagnostic system. This is further taken for pre processing which involves contrast management to improve quality of image. There are various different types of filters available like wiener filter, averaging filter, median filter etc.

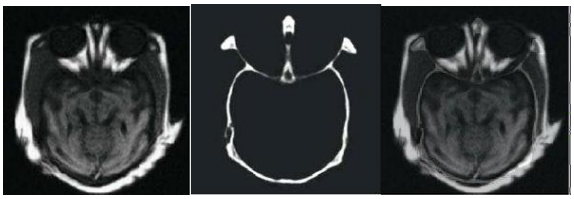
2. Segmentation

The pre-processed output is taken for segmentation which partitions an image into homogenous regions which is grouping of pixels according to classes or subsets. Segmentation is broadly classified as Edge based and Region based approach. Edge based approach is concerned with limits between the region. Its aim is finding the object boundaries and segmenting regions enclosed by the contours. Region based approach is applied by identifying all the pixels belonging to object depending upon intensity of pixels.

C. *Module 3*

Under module 3 feature extraction and evaluation is done. Once the features are extracted, these are then given to train the classifiers. ANN- using Error Back Propagation Algorithm, SVM- Scalar Vector Machine, K means, Fuzzy logic are some of the Decision Making classifiers that will give the result as to benign or malignant. This part will be implemented in the future work.

III. RESULTS



(a) (b) (C)

Fig C: original MRI Image (a), original CT Image (b), Fused Image by proposed method (c).

ISSN: 2278 – 7798

The quantitative matrices of above results are given in following table 1.

Quantitative Analysis		
1	PSNR	23.6481
2	MSE	5105.28
3	AD	50.2153
4	MD	254
5	NAE	0.9799
6	SC	5222.87

Table 1: Parameter analysis

IV. FUTURE WORK

The Module 1 is implemented are satisfactory results are obtained. And Implementation of Module 2 & 3 is in progress.

V. CONCLUSION

Cancer, the most common disease amongst human being proves to be a serious threat to health. It is usually detected at a very late stage due to which mortality rate is increased. Hence, to diagnose the cancer earlier & to provide appropriate treatments, the presented system is used. They help the physician as well as the radiologist to identify the suspicious nodules of cancers, increasing the sensitivity, specificity, accuracy & efficiency of the diagnosis. Thus, the process was implemented accordingly & the work under Module 2 & 3 is in progress.

REFERENCES

[1] Anna Wang, Haijing Sun, and Yueyang Guan – "The Application of Wavelet Transform to Multi-modality Medical Image Fusion" *IEEE 2006*.

[2] Sonali Mane, Prof S D Sawant – "Image fusion on MR and CT using wavelet transform And DSP processor" *International Journal of Engineering Trends and Technology (IJETT) – Volume 4 Issue 10 - Oct 2013*.

[3] Nisha Gawari, Dr. Lalitha Y S – "Comparative analysis of PCA, DCT and DWT based image fusion techniques" *IJERMT, Volume 3, Issue 5, May 2014*

[4] Ashishgoud Purushotham G. Usha Rani Samiha Naik. – "Image Fusion Using DWT & PCA" *IJARCSSE, volume 5,Issue 42015*

[5] D. Yalamanda, V. Phani Bhushan – "medical image fusion based on improved wavelet transform" International Journal of Innovative Research in Electronics and Communications" *(IJIREC) Volume 1, Issue 9, December*

[6] Ravi Kumar Munish Rattan – " Analysis Of Various Quality Metrics for Medical Image Processing" *IJARCSSE, Volume 2,Issue 11,Nov 2012*

Mr. Rohit K. Atyali has completed his B.E. in Electronics and Telecommunication. Currently he is pursuing master degree in Electronics and Telecommunication in D.Y Patil College of engineering and technology, Kolhapur.

Prof. S. R. Khot is currently working as associate professor at D. Y. Patil College of engineering and technology, Kolhapur. He has completed his M.E. in electronics and has large teaching experience. His area includes image processing, signals and systems.

ISSN: 2278 – 7798