Efficient Disease Detection Approach Based on MRI and CT Images Fusion Technique

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***Abstract*— the objective of image fusion is to mix the first input pictures to supply a unique type of multiple images of component as associate degree output. The ensuing image contains additional data as compared to individual pictures. Multiple image fusion is a crucial technique employed in military, remote sensing and medical applications. The results of image fusion could be a new image that's appropriate for human & machine perception. The bar graph exploit methodology is useful in pictures with backgrounds and foregrounds that area unit each bright or each dark. Specially, the strategy will cause higher views of useful and structural elements in magnetic resonance imaging and CT pictures. Totally different strategies of image fusion area unit represented that has adaptation bar graph exploit. Supported this methodology, the system is evaluated and therefore the correct output are created. The fusion algorithmic program of foreground pictures and background pictures is studied. Here, the foreground image is magnetic resonance imaging and background image is CT image whereby the fusion rule choice is applied on them. In this paper, a novel enhanced method is presented which is based on Improved Adaptive Histogram Equalization method for fusion of CT and MRI images and then further detection of diseases from fusion image.**

Index Terms*— *Image Fusion, Functional Images, Anatomical Images, Adaptive Histogram Equalization, boundary detection, edge map, edge vector.

I. INTRODUCTION

The value of image processing and fusion has been investigated for diagnostic and prognostic purposes; It is still a less interventional radiological procedures tools studied. Registration and fusion radiological images are by no means a new post processing techniques. There are various modalities of imaging data and provide better health care for the patient to use to register several technical approaches described are two imaging data set aligns scattered from each other spatially spread out stretches out scattered overlaying and Visualizing them while Fusion as a image data to fix structural and functional sets Most of algorithms is defined as the registration or rigid parts such as spinal or brain is studied, but a registration or organs such as the lungs of the RS [1] [2]. The choice is defined in, some of the more difficult way of moving the neck area with major challenges relating to the assessment of Psycho physiological assessment of movements and abdominal interventional procedures non-rigid nature of the diagnosis and prognostic factors of speed of image fusion for Psycho physiological assessment of assessment is limited to practical implementation [3].

Image fusion with more information as possible, the same as an image of the scene is the process of merging two images. Image fusion in several different image processing fields, satellite imaging, remote sensing and medical imaging is as important advances in satellite image fusion study. Imaging has evolved to serve in and then it extended to the field of medical imaging. Many fusion algorithms curve let transform to propose extending the simple average. Wavelet fusion algorithm in both satellite and medical image is fusion applications successful. Wavelet fusion algorithm in curved shapes is of the basic range fusion [3].

Thus, there is another algorithm that can handle curved shapes a., curved object image fusion for curve let transform would result in a better application of fusion efficiency. Diagnosis possible, as more and more details to get a high resolution image with medical imaging is the main objective of MR and CT techniques in medical imaging techniques are both techniques to be imaged organ Special sophisticated symptom. So, it is expected that MR CT images in the same part of mergers and more would result in a unified image and more details. Having to deal with limited capacity due to the curved shapes, curved Wavelet transform for the application of MR Transform and CT image fusion is presented. Although is this approach also have suffered from various types of borders [4] [5].

As we studied that the objective of fusion is to combine information from multiple images of the same scene. The result of image fusion is a new image which is more suitable for human and machine perception or further image-processing tasks such as segmentation, feature extraction and object recognition. Multi-resolution Image fusion is the process of combining relevant information from two or more images into a single image. The resulting image will be more informative than any of the input images [6].

Both higher and higher spatial spectral information in a single image processing requires numerous conditions.

However, the instruments either by design or due to observational constraints are not able to provide such information; this is a possible solution for data fusion [7]. FIkitsa image fusion doctors a patient's CT and MRI medical

images to be a more accurate diagnosis can combine with a tumor, but it's inconvenient and tedious to finish this work and, more importantly, using the same images with different experiences darts inconsistent decisions. Thus, it reduced the workload of doctors and diagnosed to improve cohesion efficiently to develop automated image fusion system. The simplest way of image fusion is two images pixel by pixel average [10]. However, this method usually on the undesirable side effects leads to low contrast, such as due to Multi resolution transforms human visual system. A good mathematical model can contribute and vice versa can provide information on changes in the multi resolution image fusion technique has attracted more and more interest [8] [9].

In this paper new method is presented for efficient fusion of MR and CT images so that overall performance has to be improved and hence this fused image is the further used to detect or identify the diseases using Thresholding method. In next section II we are presenting the literature survey over the various methods presented for Disease detection. In section III, the proposed approach and its system block diagram is depicted. In section IV we are presenting the current state of implementation and results achieved. Finally conclusion and future work is predicted in section V.

II. LITERATURE SURVEY

There are several methods for CT and MRI images, which are listed below on some writers have suggested methods of Fusion:

- Wavelet transform time-frequency characteristic is successfully applied in image processing sector [3].
- However, one dimension to its excellent feature two dimensions or dimensions cannot be simply extended. Separable Wavelet which was spread by one-dimensional Wavelet directivity is limited [4].
- A range target, e. j. Candes and d. L. Donoho Curve let transform theory forward in 2000 [5]. Curve let transform Ridge let transform special filtering process and scale of this image properties fit well. However, Curve let transform digital realization was sub-band Division complex, block, normalization, smoothing the Ridge let analysis and so on.
- Curve lets pyramid decomposition unbound data redundancy [6]. the e. j. Candes Curve let Transform (FCT) fast forward to that second generation Curve let which is more simple and 2005 [7] was easily understood was transform. Its fast algorithm was easily understood Huihui Curve let transform based on the second-generation Li. [8] multi-focus image fusion research.
- Per year Van den Elsen et al. A single composite image of the same subject with different instrument images and diagnoses full proposed providing information. [11].
- H. Lee, B.S. Manjunath and s.k. Mitra Wavelet transform multisensory image fusion [12].
- The researchers also proposed wavelet based Fusion method retains the size of conversion and Tower [13, 14] inherits the main properties.
- Two dimensional wavelet images is Chief method by David discrete transform through the proposed merger to [15].
- Mallat and merging of wavelet coefficients coefficient Zhong preserved if a revision to undergo, because transform non-redundant [16] does the inverse transform quantization etc then proposed that amendment.
- Sveinsson et al. The proposed cluster feature extraction and data fusion in Wavelet domain [17].
- Gorzelli possibilities and limitations on image fusion [18] explained to use wavelets. Lau Wai Leung et al. entropy and image noise index (INI) [19] compared to using image fusion techniques.
- Chavez et al Multi resolution and multispectral data is [20] to merge the proposed three different ways.
- Rockinger, O'Brien, proposed new merger landslide feature [21] for the promotion of the maximum value selection rule approximation using shift invariant Discrete Wavelet transform coefficients (SIDWT) is based on the principle.
- Ramac, l. c., Uner, m. K, Varshney, p. Morphological filters and wavelet-based image k, fusion. [22].
- Nuñez, j., Multi resolution decomposition [23] proposed image fusion with wavelet-based additive.
- Tote, Alexander van Ruyven, JJ & Valeton, introduced a hierarchical scheme merger JM image based on multi resolution decomposition of a low-pass contrast pyramid [24] ratio.
- Vivek Joonki Paik Jeongho Maik, Shin and presented a pattern selective fusion method to identify the salient features in multiple source images and a single silicon image [25] through a combination of features in color images provides a mechanism for combining.
- Wayne Chen, Yunhao Doua various methods is [26] to reveal the nature of the relationship between the target image fusion methods.

III. PROPOSED APPROACH FRAMEWORK AND DESIGN

A. Problem Definition

Now-a-days, medical diagnosis in almost all areas are affected by digital image processing when processing an image for visual interpretation, how the human eye works well is a special method to judge. Radiotherapy planning, demanding clinical application example Images of various modalities, often benefit from the complementary information. Medical diagnosis, magnetic resonance image (MRI) is a medical imaging technique to visualize the Interior of the body structures in detail is used in Radiology. With more distortion MRI provides information on soft tissue better. Computed tomography (CT) low distortion with denser

tissue offers the best information on MRI and CT images fusion of widely different purposes are used for the main purpose is to detect the right diseases...

B. The proposed architecture

In this project novel enhanced method is presented which is based on Improved Adaptive Histogram Equalization method for fusion of CT and MRI images and then further detection of diseases from fusion image, which gives the good results than other method such as PCA and DWT.The practical simulation of this work will carry using the MATLAB toolkit, during the simulation we will perform our practical analysis over CT and MRI images and measure its performances in terms of structural similarity index, MSE,mutual information, PSNR etc.

C. Vector Image and Edge Map Based Boundary Detection Mode.

Once the input image is received it is given to average edge vector field model through an initial position section. The initial position is used to determine a good initial position of edge in the contour model. For an input image f(x, y), the average edge vector field is computed as,

$$e\ (i, j) = 1/k\ (M_x\ (i, j)\ i + M_y\ (i, j))\ j$$

Where,

$$k = \max i, j\ (\sqrt{(M_x(i,j)^2 + M_y(i,j)^2}$$

$$M_x\ (i, j) = -\ G_y\ x\ (x, y)$$

$$M_y\ (i, j) = G_x x\ (x, y)$$

And G_x and G_y are the difference masks of the Gaussian weighted image moment vector operator in the x and y directions.

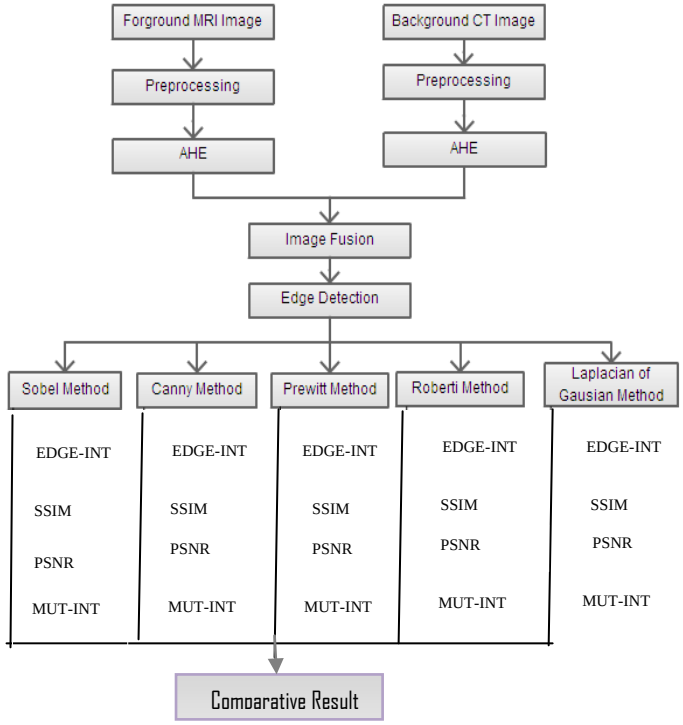

Fig.1: Proposed System Architecture

IV. EXPERIMENTAL RESULT

In this section we are discussing the practical environment, scenarios, performance metrics used etc. The proposed algorithm for the fusion of Complementary Fusion Image (MR and CT images) are tested and compared to the traditional methods

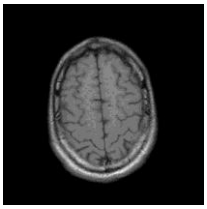

Fig. 1 MRI Image

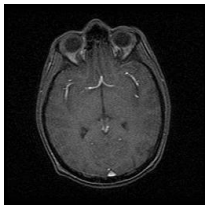

Fig. 2 CT Image

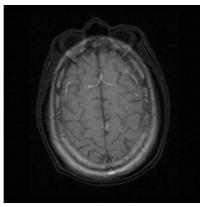

Fig. 3 PCA Fusion of Fig. 1 & 2

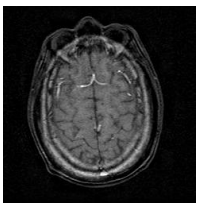

Fig. 4 DWT Fusion of Fig 1 & 2

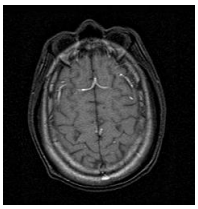

Fig. 5 Adaptive + DWT Fusion of Fig 1 & 2

Table: Image Fusion Results of fig.1 and 2

PCA Method			
	Sobel	Canny	Proposed
Edge Intensity	0.3536	0.8008	0.9360
Structural Similarity Index	0.2232	0.2247	0.2265
Peak Signal to Noise Ratio	11.9995	12.0107	12.0137
Mutual Information	0.0397	0.0731	0.0735

DWT Method			
	Sobel	Canny	Proposed
Edge Intensity	0.3670	0.8400	0.8833
Structural Similarity Index	0.1793	0.1799	0.1800
Peak Signal to Noise Ratio	13.1504	13.1613	13.1625
Mutual Information	0.0397	0.0652	0.0711

Adaptive with DWT Method			
	Sobel	Canny	Proposed
Edge Intensity	0.3678	0.8469	0.8786
Structural Similarity Index	0.1957	0.1963	0.1964
Peak Signal to Noise Ratio	13.1277	13.1389	13.1399
Mutual Information	0.0400	0.0665	0.0709

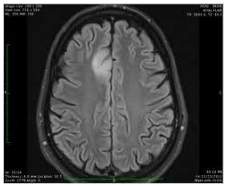

Fig. 6 MRI Image.

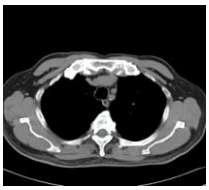

Fig. 7 CT Image

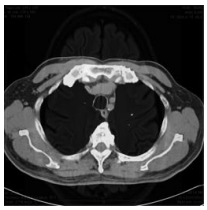

Fig. 8 PCA Fusion of Fig 6 & **7**

Fig. 9 DWT Fusion of Fig 6 & 7

Fig. 10 Adaptive + DWT Fusion of Fig 6 & 7

Table: Image Fusion Results of fig.6 and 7

PCA Method			
	Sobel	Canny	Proposed
Edge Intensity	0.3257	0.7150	0.9423
Structural Similarity Index	0.1468	0.1471	0.1494
Peak Signal to Noise Ratio	10.0651	10.0696	10.0718
Mutual Information	0.0457	0.0486	0.487

DWT Method			
	Sobel	Canny	Proposed
Edge Intensity	0.3305	1.0483	1.1493
Structural Similarity Index	0.1099	0.1109	0.1111
Peak Signal to Noise Ratio	10.1258	10.1324	10.1332
Mutual Information	0.0223	0.0264	0.0265

Adaptive with DWT Method			
	Sobel	Canny	Proposed
Edge Intensity	0.3462	1.0439	1.0945
Structural Similarity Index	0.1179	0.1190	0.1192
Peak Signal to Noise Ratio	10.4506	10.4577	10.4587
Mutual Information	0.0180	0.0204	0.0284

V. CONCLUSION AND FUTURE WORK

Now days the fusion techniques are majorly used for various purposes under the real time applications such as medical disease diagnosis. In this paper we have addressed one such area using the efficient fusion technique and edge detection approaches for disease detection. In this paper we have introduced the image fusion using AHE and PCA technique for MRI and CT images, after that different types of edge detection techniques investigated for disease detection. The performance of all these techniques are measured and then based on these performances best prediction method will claim in near future. The results presented in this paper are showing the current state of work. For the future work we suggest to adopt this framework under the real time settings and observe its performance.

REFERENCES

[1] Prof.P.Natarajan, Prof.N.Krishnan, Soniya, N. "by Adaptive histogram equalization enhancement MRI and CT Brain images fusion", section 4, points 1 & engineering research scientist, Jan-2013 ISSN 2211-5518 international journal.

[2] Smt. Mamatha (PhD), G. L. Gayatri, an image fusion using Wavelet and advanced engineering technologies, Vol1, Curve let Transform Global magazine issue 2, 2012, ISSN: visited 2292-6370.

[3] abhijit Somnathe, Ujwal harode, a novel approach based on wavelet transform image fusion and Curve let transform, International Conference, workshop on recent & Trends in (TCET).

[4] Rafael c. E. digital image processing Gonzalez, Richard woods, Pearson Education Addison-wesley.an mark 1 version.

[5] e. j. Candes, d. l. Donoho. A surprisingly effective no adaptive representation Curve lets: [J] for objects with edges in: c. Rabut a. Cohen, l. l. Schumaker. Curves and surfaces. Nashville, TN: Vanderbilt University Press, 2000.105-120.

[6] Candes, d. l. Donoho. Curve lets and singularity [J] new optimal representations of objects with tight frames. Commun. On the net and Appl. Math .2004, 57 (2): 217-252.

[7] Demanet Candes, l. L. Donoho et al. fast discrete Curve let transforms [r]. Applied and computational mathematics. California Institute of technology, 2005.1.

[8] LiuHang GuoLe LiHui-Hoo, I, I. Image fusion based on curve let transform research on the second generation [J]. Acta Optical Sonica, 2006,26(5): 657 ~ 662l

[9] Paul Scheunders, Member, IEEE. An orthogonal Wavelet representation of multivalued images. Image processing, vol 12, no. 6, June 2003 IEEE transactions.

[10] Shaohui Chen, Hongbo Zhang Renhua, Su, senior member, IEEE, Jing Tian, Jun Xia, SAR and Multispectral image fusion based on IHS transform à Trous Wavelet using normalized and EMD Decompositions. IEEE sensors journal, VOL 10, no. 3, March 2010.

[11] Zhao Zong-gui "an introduction to data fusion method." the first time the Institute of Ministry of electricity 28. 1998.

[12] JIA Yong-Hong Kong, Jia Li, Sun de-ren-bing "Multidimensional data from remote sensing imagery fusion" remote sensing technology and applications 2005, 15 (1): 41-44.
[13] A Y "merge and discrete two-dimensional Wavelet transform image data through fusion" David J. Opt. Soc.An. Am. A 1995, 12 (9): 1834-1841.
[14] S. Mallat, a Wavelet tour of signal processing "academic press, Second Edition, 1998.
[15] Svensson, r. J, m. O. Ulfarsson & Jak. Benediktsson, "cluster-based feature extraction and data fusion in Wavelet domain", in: IEEE International Geosciences and remote sensing Symposium Pro., pp. 859-869.
[16] Garzelli, A "possibilities and limitations of using Wavelets in image fusion." in: IEEE International Geosciences and remote sensing Symposium Pro., 2002.
[17] Lau Wai Leung, Bruce King and conquer Vohora, "comparison of image fusion techniques uses Entropy and INI", in: Pro. Remote sensing, 5-9 November 2001, 22 Asian Conference.
[18] Chavez, PS, sides, s. c. Anderson, J.A., "Multi resolution and Multispectral data merge to compare three different ways: Land sat TM and spot panchromatic, Photogrammetric engineering and remote sensing, 57295-303.
[19] Li Weiguo Lu, Jian you Jiangsheng, ET. Al. "Conversion" to match the image translation rotation and uniform scaling radon 0-8186-8821-1/98, 1998 IEEE.
[20] Lau Wai Leung, Bruce King and conquer Vohora, "comparison of image fusion techniques uses Entropy and INI", in: Pro. Remote sensing, 5-9 November 2001, 22 Asian Conference.
[21] Rockinger, o., "image sequence using shift invariant Wavelet transform fusion," proceedings of the International Conference on image processing, 1997.
[22] Ramac, l. c., Uner, m. K, Varshney, p. K, "Morphological filters and wavelet-based image fusion concealed weapon detection," proceedings of the SPIE, 4006, 1998.
[23] Nuñez, j., "Multi resolution image fusion with Wavelet Decomposition, additive-based" on Geoscience and remote sensing, IEEE Transactions 37 (3), 1999.
[24] Tote, Alexander van Ruyven, JJ & Valeton, j.m., "thermal mergers and a contrast flat by Visual images", optical engineering, 28 (2), pp. 789-792.
[25] Vivek Joonki Paik, Jeongho Shin and Maik, "selective image fusion Focus Image to rebuild the pattern", Caip 2005, LNCS 3691, pp 677-680, 2005.
[26] Wayne Doua, Yunhao chain, "a better image fusion method with high spectral fidelity, photogrammetric, remote sensing and spatial information sciences XXXVII. Vol. International Archives. Part B7. Beijing 2008.