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EFFICIENT IMAGE FUSION OF PET-MRI BRAIN IMAGES USING WAVELET TRANSFORMS USING IMAGE PROCESSING

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Abstract— The target of this paper is to execute an imaginative picture combination framework for the discovery of cerebrum tumors. Melding pictures acquired from MRI and PET can precisely get to the tumor reaction. Key advance in multiresolution combination system is determination of combination rule in light of the fact that it will choose how to consolidate coefficients in proper way so that high caliber intertwined picture can be acquired. Picture combination method incorporates appropriate data from different modalities of information pictures into a combined particular picture where the resultant picture gives better data in correlation with the information pictures which are utilized for combination also, is progressively proper for visual discernment. This work presents a picture combination strategy which performs wavelet decay for both PET and MRI pictures with various action levels. This strategy creates promising combination results by differing the basic data in the dim matter region and the otherworldly data in the white issue territory to have better shading safeguarding. Besides, to deliver great ghostly goals, smoothing channels is connected to the low recurrence locale.

Index Terms— Image compression, Image recognition, SVM Technique, Classifier.

I. INTRODUCTION

As of today, there is an incredible enthusiasm of numerous combination of two or more images to form one image is called image fusion. The fusion is to extract the features from all the original images and combined them to form fused images. The applications of image fusion are satellite image fusion, medical image fusion, remote sensing, and computer vision robotics. Various medical imaging modalities, such as magnetic resonance imaging (MRI), positron emission tomography (PET), Computerized Tomography (CT), have been developed and widely used for clinical diagnosis. MRI provides highresolution anatomical information in gray intensity, while PET image reveals the biochemical changes in color without anatomical information. The complementary information that the images contain is reference to doctors so that a brain disease can be accurately diagnosed. Many methods for fusing PET and MR images have been proposed. HIS substitution method is used in obtaining fused images with rich anatomical structural information which has side effect of color distortion [2, 3]. To generate fused images with less color distortion multiresolution methods were proposed but having the problem of missing detailed structural information. The combination of IHS transform and retina inspired models is proposed which has best performance in fusing PET and MR images. [7] Good fusion result can be generated by adjusting the structural information in the gray matter (GM) area, and then patching the spectral information in the white matter (WM) area. The performance of our fusion

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method is better in terms of two metrics spectral discrepancy (SD) and average gradient (AG) than the performance of IHS+RIM fusion method.

II.EXISTING SYSTEM

a) Principal Components Analysis (PCA): PCA transformation is applied a on the low spatial resolution images, then first component is replaced by the high spatial resolution image. The fused images are obtained by applying an inverse PCA transformation on the new set of components

b) Intensity-Hue-Saturation Transformation (IHS): IHS transformation is applied on the low spatial resolution images, then the Intensity component is replaced by the high spatial with the corresponding resolution. We then apply an inverse pyramidal transformation to obtain the new fused images. [9]

III.PROPOSED SYSTEM

The proposed scheme first decomposes the MRI and PET images into low and high frequencies using à-trous wavelet. High and low frequencies are then fused separately according to defined criterion. The overall fused image in terms of high and low frequencies.

Fusion of Low Frequencies

Fusion of low frequencies and is critical and challenging task. Various schemes utilize different criterions for fusion of low frequencies. For instance, one choice is to totally discard the low frequencies of one image, another choice is to take average or weighted average of both and so forth. However, the schemes provide limited performance as they do not cater the spatial resolution image. The fused images are obtained by applying a reverse HIS transformation on the new set of components.

c) High Pass Filter (HPF): where we integrate the low spatial resolution image through mathematical operations such as subtraction, addition, multiplication or ratios, with the spatial information obtained using High Pass type filtering on the high spatial resolution image.

d) Wavelet transformation (WT): based on pyramidal transformation, first the high resolution image is decomposed into a series of low resolution images, and then replaced by low resolution images with the original multispectral images

properties of image. We have proposed fusion of low frequency using different weighting average for each pixel location. The weights are computed based on the amount of information contained in vicinity of each pixel.The weights are obtained by processing fuzzy outputs using center average defuzzifier.

Fusion of High Frequencies

Let represent a wavelet plane of the resultant image . This ensures that only those high frequency components are used for image fusion, which are not already present in . By the virtue of this, the proposed scheme not only avoids redundancy of information but also results in improved fusion results as compared to early techniques. The fused high frequency image isNote that is not dependent on the bands because is gray-scale image.

The Image fusion plays an important role in digital image processing and is used to fuse images captured from multiple sensors to enhance the content of image.

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Local Features

LV is used to evaluate the regional characteristics of image and is defined as :where is the mean value of window centered at pixel. Note that image containing sharp edges results in higher value (and vice versa).
LB is computed using local Rényi entropy of image. Let be the probability (or normalized histogram) having intensity values within a local window (of size) centered at pixel.
High values of and show that contain more information and need to be assigned more weight as compared to image.

Fuzzy Inference Engine

Let high and low Gaussian Membership functions (MFs) having means , and variances , for LV be Similarly let high and low Gaussian MFs having means , and variances , for LB. The inputs and are mapped into fuzzy set using Gaussian fuzzifier aswhere and are noise suppression parameters. The inputs are then processed by fuzzy inference engine using pre defined IF-THEN rules as follows. : IF is high and is high THEN is high. : IF is low and is high THEN is medium. : IF is high and is low,THEN is medium. : IF is low and is low THEN is low.The output MFs for high (having mean and variance), medium (having mean and variance), and low (having mean and variance) are defined asThe output of fuzzy inference engine

Local variance (LV) and local blur (LB) features are used with fuzzy inference engine to compute the desired weights for fusing low frequencies.

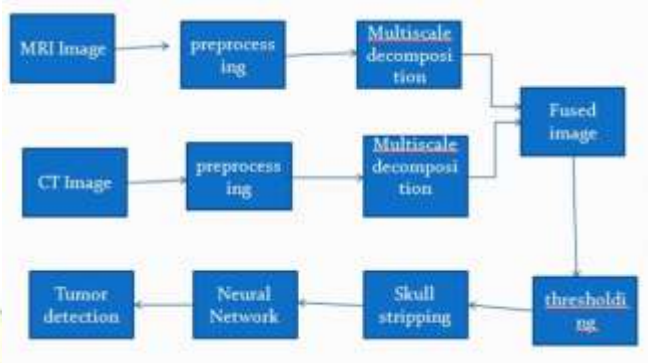

FIG 1 BLOCK DIAGRAM

IV.MODULES EXPLAINATION

Image acquisition:
Image acquisition is basically creation of database to feed into the system for training as well as for testing and classification of images. We acquired our images online from various sources.

Image pre-processing:
For preprocessing the images are converted into 256x256 pixels and which is later on transformed into CIElab color space. The Lab color space describes mathematically all perceivable colors in the three dimensions L for lightness and a and b for the color opponent's green–red and blue–yellow.

Image Segmentation:
Image segmentation is the partition of an image into a set of non-overlapping regions whose union is the entire image. In the simplest case, one would only have an object region and a background region.
A region cannot be declared a segment unless it is completely surrounded by edge pixels. It is not an easy task to make it known to a computer what characteristics constitutes a"meaningful" segmentation. For this reason, a set of rules in general segmentation procedures is required:

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• Region interiors should be simple and without many holes.
• Adjacent regions of a segmentation should have significantly varying values with respect to the characteristic on which they are uniform.
• Boundaries of each segment should be simple, not ragged, and must be spatially accurate.

Feature Extraction:

Feature extraction is done after the preprocessing phase in character recognition system. The primary task of pattern recognition is to take an input pattern and correctly assign it as one of the possible output classes. This process can be divided into two general stages: Feature selection and Classification. Feature selection is critical to the whole process since the classifier will not be able to recognize from poorly selected features. Criteria to choose features given by Lippman are: "Features should contain information required to distinguish between classes, be insensitive to irrelevant variability in the input, and also be limited in number, to permit, efficient computation of discriminant functions and to limit the amount of training data required" Feature extraction is an important step in the construction of any pattern classification and aims at the extraction of the relevant information that characterizes each class. In this process relevant features are extracted from objects/ alphabets to form feature vectors. These feature vectors are then used by classifiers to recognize the input unit with target output unit. It becomes easier for the classifier to classify between different classes by looking at these features as it allows fairly easy to distinguish. Feature extraction is the process to retrieve the most important data from the raw data. Feature extraction is finding the set of parameter that define the shape of a character precisely and uniquely. In feature extraction phase, each character is represented by a feature vector, which becomes its identity.

VI.CONCEPT OF IMAGE PROCESSING

Image preparing is a technique to change over a Image into advanced structure and play out certain tasks on it, so as to get an upgraded Image or to separate some helpful data from it. It is a sort of flag agreement in which input is Image, similar to video edge or photo and yield might be Image or qualities related with that Image. Generally Image Processing framework incorporates regarding Images as two dimensional signs while applying effectively set flag handling techniques to them.

It is among quickly developing advancements today, with its applications in different parts of a business. Image Processing shapes center research territory inside designing and software engineering disciplines as well. In imaging science, Image preparing is any type of flag handling for which the info is a Image, for example, a photo or video outline; the yield of Image preparing might be either a Image or a lot of qualities or parameters identified with the Image. Most Image preparing methods include regarding the Image as a two-dimensional flag and applying standard flag handling procedures to it.

Image handling generally alludes to computerized Image preparing, however optical and simple Image handling likewise are conceivable. This article is about general systems that apply to every one of them. The securing of Images (delivering the information Image in any case) is alluded to as imaging.

Firmly identified with Image preparing are PC designs and PC vision. In PC illustrations, Images are physically produced using physical models of items, conditions, and lighting, rather than being obtained (by means of imaging gadgets, for example, cameras) from characteristic scenes, as in most vivified films. PC vision, then again, is frequently viewed as abnormal state Image preparing out of which a

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machine/PC/programming plans to translate the physical substance of a Image or a grouping of IMAGEs (e.g., recordings or 3D full-body attractive reverberation filters).

In present day sciences and advances, Images likewise increase a lot more extensive degrees because of the consistently developing significance of logical perception (of frequently substantial scale complex logical/exploratory information). Precedents incorporate microarray information in hereditary research, or constant multi-resource portfolio exchanging fund.

Image handling essentially incorporates the accompanying three stages.

• Importing the Image with optical scanner or by advanced photography.

• Analyzing and controlling the Image which incorporates information pressure and Image improvement and spotting
designs that are not to human eyes like satellite photos.

• Output is the last stage in which result can be modified
Image or report that depends on Image examination.

Purpose of Image preparing:

The reason for IMAGE preparing is separated into 5 gatherings. They are:

1. Visualization - Observe the articles that are not obvious.

2. Image honing and rebuilding - To make a superior Image.

3. Image recovery - Seek for the Image of intrigue.

4. Measurement of example – Measures different articles in a
Image.

5. Image Recognition – Distinguish the items in a Image.

VII.SOFTWARE USED

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar noninteractive language such as C or FORTRAN.
The name MATLAB stands for matrix laboratory. MATLAB was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects.
MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis.
Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others.

VIII.CONCLUSION

The image fusion helps in having useful information from multiple images in a single image. The fusion of PET and MRI brain

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disease images for the proposed method produces the higher average gradient by which the spatial resolution of image is higher. The spectral discrepancy for dataset 1 and dataset -3 produces same result as the existing method only dataset -2 is changes to lower values. Hence the spatial resolution of the image is higher when used our proposed method. However different techniques may be developed to improve the spectral quality of the image.

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