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Detection of Brain Tumor using NSCT Image Fusion

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Abstract
The main aim of the project is to detect the affected areas in the brain by using NSCT. The purpose of the non-subsampled contourlet transform (NSCT) is performed on medical image pairs to decompose the source images into high-pass and low-pass subbands. The high-pass subbands are integrated by a phase congruency-based fusion rule that can enhance the detailed features of the fused image for medical diagnosis. For diseases diagnosis multimodal medical image fusion is widely used. In our work a fusion technique has been introduced which can efficiently evaluate the relevant features of individual source images and integrate those into a single image. For evaluation and processing of significant non redundant information of low frequency sub-band (LFS), Discrete Cosine Transformation (DCT) followed by Discrete Fourier Transformation (DFT) approaches are applied. While merging the images, we go through K- means clustering based segmentation technique. From the results it can be observed that the fused image has higher visual clarity and better comparative metrics such as variance, mean square error, PSNR, standard deviation etc.

Indexterms: Computed Tomography (CT), Magnetic Resonance Imaging(MRI),Non Subsampled contourlet Transform(NSCT), Peak Signal to Noise Ratio(PSNR)

Introduction

Image Enhancement is the procedure of improving the information content of original data before processing. Common practices include contrast enhancement, spatial filtering, density slicing, and FCC.

Image fusion is a process in which salient features from multiple source images are combined to form a single fused image. The composite fused image, in biomedical applications, is expected to have better visual clarity, contrast and less noise. Since it is known that the multimodal images carry complimentary information of a particular object/organ, therefore, fusion of them helps the medical practitioners for planning the treatment properly. Medical imaging has become an important part of clinical diagnosis and treatment. Due to the different imaging principles, the feature information acquired by medical images of different modalities is not completely the same. Visible and infrared (IR) image fusion is carried out in surveillance applications, as the fused image enables improved detection.

As a powerful and fundamental tool, medical imaging plays an irreplaceable role in modern medical diagnosis and treatment. A number of medical imaging modalities, that include positron emission tomography (PET), computed tomography (CT), and magnetic resonance imaging (MRI), are implemented to address different lesions of cells or organs. Since each medical imaging modality has it own purposes, strengths, and limitations, one modality cannot usually provide sufficient information for a whole medical diagnosis. Medical image fusion encompasses a broad range of general image fusion techniques to integrate complementary information from different modalities of medical images. It

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offers a great diversity of image features for medical analysis, and often leads to the robust medical diagnosis. The additional information acquired from the integrated images can be well utilized to precisely discover the position of lesion.

Advantages of Image Fusion

• The advantages of image fusion include image sharpening, feature enhancement, improved classification, and creation of stereo data sets. Multi sensor image fusion provides the benefits in terms of range of operation, spatial and temporal characteristics, system performance, reduced ambiguity and improved reliability.

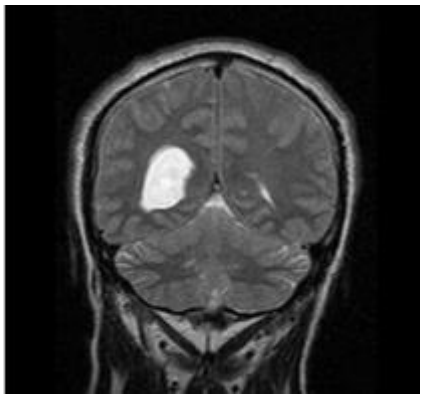

Figure1: CT Image

Computed Tomography, is likewise called as CAT check. Which is a therapeutic imaging approach that joins various number of X-beam projections being used from different edges to make inside and out cross-sectional pictures of territories within the body. CT pictures allow specialists to get exceptionally exact, 3-D viewpoint of exact parts of the body, for instance, fragile tissues, the pelvis, veins, the lungs, the cerebrum, the heart, guts and bones. CT is likewise frequently the preferential technique for diagnosing many diseases, for example, liver, lung and pancreatic malignant growths.

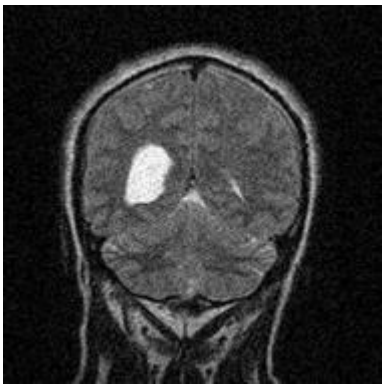

Figure2: MRI of Brain

The detailed images of organs and tissues are obtained by using radio waves and a magnetic field in medical imaging technology which is done by MRI images. This proven to be most effective in curing affected tissues from the clustered tissues which are having combination of both tissues. This makes magnetic resonance imaging the most trending technique in the field of the medical history at present.

II PROPOSED METHOD

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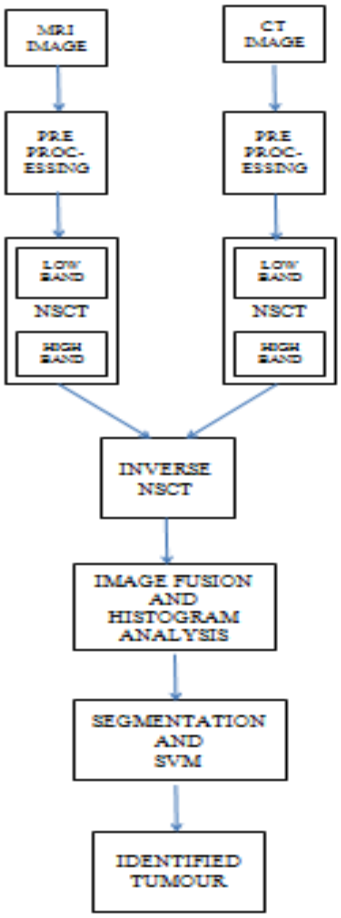


Figure3:Proposed Work

1. Input image: The Image dataset are implemented as input image (CT and MRI images).
2. Preprocessing: The collected images are subjected to preprocessing. In the Preprocessing step we can implement the image Resize.
3. It is based on NSCT Method using Image Fusion
4. The proposed fusion rule can simultaneously integrate two key components for the fusion of low-pass sub bands.
5. The fused high-pass and low-pass sub bands are inversely transformed to obtain the fused image.
6. After that we applied K- means clustering segmentation technique. Image segmentation is the process of partitioning an image into multiple segments.
7. The goal of segmenting an image is to change the representation of an image into something that is more meaningful and easier to analyze.
8. We are using SVM (Support Vector Machine) to identify the brain tumour boundaries.
9. In the comparative experiments, three categories of multi-modality medical image pairs are used to verify the effectiveness of the proposed method
10. Performance Estimation: In this step, we can analyses the some performance metrics like PSNR, SSIM, MSE and MAE.

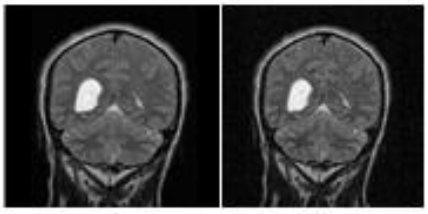


Figure4: Input CT and MRI Images

Figure5: Fused Image

Finally, classification using svm classifier is done. It is a machine learning approach used for classification and regression analysis. Supervised learning model and trained by learning algorithm. Analyses large amount of data and find pattern from them. Divides into two categories by a clear gap.(Partitioning by a plane called hyper plane).SVM creates hyper planes that have the largest margin in a high dimensional space. Larger margin implies lower error of the classifier.

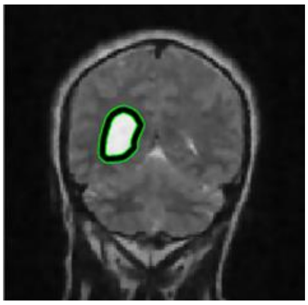
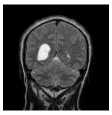
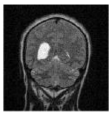
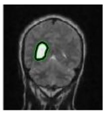
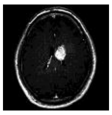
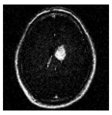
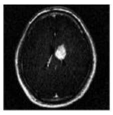
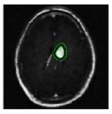
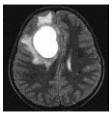
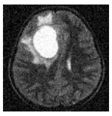
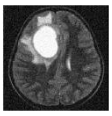
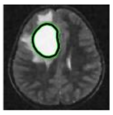
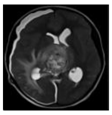
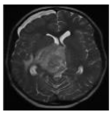
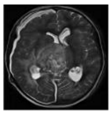
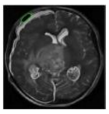
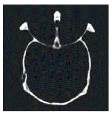
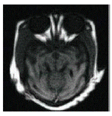
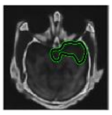


Figure 6: SVM Classifier

III EXPERIMENT ALANALYSIS

In this paper, for the purpose of detection of braintumor, we have chosen medical cases with patients who have suffered from different brain tumors, wherein the tumor is diagnosed in fused image of CT and MRI of a same patient. The proposed algorithm is developed using MATLAB.

Input CT Image	Input MRI Image	Fused Image	Segmented Tumour	RESULT
				Tumour Detected
				Tumour Detected
				Tumour Detected
				Tumour Detected
				Tumour Detected

V. CONCLUSION

Medical imaging techniques became crucial for medical diagnosis. CT and MRI image fusion technique is more precise than either by CT alone or by MRI. MRI-CT fusion can reduce the uncertainty of brain tumor detection. The proposed system helps in easy diagnosis of normal and abnormal brain.

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