ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Spotting Of Ischemic Heart Ailments From MRI Images.

Meenakshisundaram Natarajan, and Vedanarayanan Venugopal*.

Department of Electronics &Telecommunications Engineering, Sathyabama Institute of Science& Technology Chennai-119

ABSTRACT

Ischemic heart disease diagnosis is a challenging task which requires expert knowledge. Existing methods for detection of predicting ischemic heart disease is by physical and clinical analysis by a physician, and scan test such as Heart MRI magnetic resonance imaging test, ECG, Stress Test etc. Health care industry deals with a large amount of healthcare data, which contains ambiguous information. To remove the uncertainty available with this data's and to improve the efficiency of prediction lot of techniques have been proposed. One such algorithm is proposed in this research work. The proposed work involves Watershed method for segmentation and multiresolution Discrete Wavelet for extracting features which correlate with the ischemic heart disease. The proposed approach aims for a better prediction based on image pre-processing steps thus enhancing the quality of the scanned image highlighting the affected region. Segmentation is performed by using the watershed algorithm and the features extracted by wavelets is utilized by Support Vector MachineSVM for classifying the disease.

Keywords: Ischemic heart disease, Magnetic Resonance Imaging, Image segmentation, Feature Extraction, Discrete Wavelet Transform,Support vector machine etc.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Cardiac Magnetic Resonance Imaging (MRI) has developed into a modality which can be used to perform cardiovascular interventions [10] than as a just examining heart region. Recognizing objects in real-world images is the primary goal for Computer vision. This is a challenging task due to more objects belonging to the same class [4]. Distortions from a background, a scale can change the appearances of even the same object to look different [11]. Further challenges can also arise from interclass similarity. Consequently, models for different classes must be flexible enough to suit the multiresolution property of the true objects present in the multi-object image [1]. These tough requirements of an object clustered with multiple different unwanted objects make the recognition process a difficult one. This research work aims for two goals such as ason object detection and recognition or image classification. The nature of image classification is to determine if an object class is present in an image or not an object detection localizes all object class of an image. The novelty of our approach is that the detection of heart contours by very simple shape dataset of line segments and ellipses, combined with a flexible method to learn those edges thus detected The shape feature has several attractive properties. First, unlike texture-based descriptors, they support abstract parallelism and adjacency. Also, unlike contour features, these data sets primitives are independent of object size and are represented by four parameters of a line and five parameters of an ellipse. Additionally, other matching data features can be computed like geometric properties [5]. Geometric properties are scale normalized. In contrast, contour fragments are not scaling invariant and introduce aliasing effects which degrade image resolution [8].

Researchers are proposed different segmentation techniques which play a pivotal role in medical Image processing. Fast marching method used to segment the dental images for 2D to 3D registration [14].Different segmentation techniques were analyzed in the view of dental images [15]. In recent research works, it is found that the line segments and ellipses can able to represent complex shapes and structures. While individually less distinctive, but by combining a good number of these feature exemplars, we can develop a good object recognition system. Consequently, differentiable combinations of complex line and edge contours can be used to define a particular object class. One can train this combination by distinguishing the shape, geometric, and structural patterns of an object property. Shape details describe the visual aspect of shape regions, while geometric constraints explain the layout of the object in a scene. Structural pattern details the orientation and dimensions of the object by the relationships of pixels in the neighborhood.

The scope of the paper

The image represents large amounts of data which contains more information [12]. Image segmentation is the main aspect of image analysis and is a fundamental step in understanding the image. The quality of the segmentation affects the performance of the vision system [2]. Therefore, a greater focus should be done on the evaluation of segmentation methodologies. In this proposed system, we classify the ischemic heart from MR Images. Ischemic Heart Disease is due to lesser blood supply from coronary to the heart muscle. The arteries are contracted or obstructed thereby leading to a reduced level of oxygen and nutrients to heart musculature. This leads to the rotting of the myocardium, called as AMI. Image segmentation is an important part to identify disease region. Pre-processing, Feature extraction, and classification are also used to identify the ischemic disease. Good segmentation results in b. Here we better classification. Watershed method for accurate image segmentation is used in this research work. This method segments the heart contour from the heart MRI. For the feature, extraction DWT is applied. DWT is a method that changes images from the spatial domain into the frequency domain. In this paper, a method for automated segmentation and enhancing abnormalities present in the heart. The suspicious areas in the image were highlighted so they could be analyzed further to determine whether the masses detected are affected by the disease

Existing System

Digital image processing is used in remote sensing, medicine, photography, film and video production, security monitoring. ISCHEMIC HEART DISEASE is one of the leading causes of morbidity and mortality. Evaluation of ischemic heart disease requires measurement of ventricular abnormalities. In the existing system, Myocardial Infarct image segmentation is attempted. The disadvantage is under segmentation problem

ISSN: 0975-8585

Proposed Methodology

Digital image processing deals with image enhancement and image based pattern recognition. Among the various image processing techniques, image segmentation plays a vital role in the analysis of the given image. Ischemic heart disease (IHD) is the leading cause of death worldwide. Segmentation using the watershed transforms works well if we can identify, the foreground objects and background locations [4][7].

Work Flow

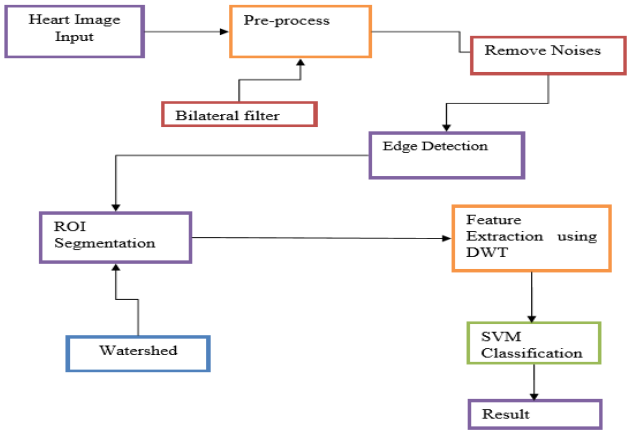

Fig 1: Work Flow

Modules Description

Image Preprocessing

The number of images is accumulated from any of the therapeutic administration's affiliation. To take the images MRI scan device are being used. A commotion decrease method is expected to enhance the nature of MRI images, in light of the way that there are a lot of ancient rarities (e.g. constrictions, spots, shadows and flag dropout) in MRI images [3]. A non-linear technique called bilateral filter which has been turned out to be a productive and powerful strategy for clamor decrease. This bilateral filter is used in the pre-processing stage to remove noises in an image.

Segmentation

Watershed-Based Image Segmentation may also be referred to as the watershed technique. It is one powerful mathematical morphological application related to segmentation of an image. Segmentation based on watershed is famous in certain areas such as medical and biomedical image processing used to easily identify the disease [2]. It is based on segmentation part of the feature extractions. Characterizing the part of interest and Image division are considered to be a vital methodology. Moreover, the utmost tedious piece of image investigation and preparation can isolate the images into various parts with specific differences.

Feature extraction

This module describes the details about the feature extraction process. DWT is a widely used image analysis method which performs the function of the decomposition of an image into high and low-frequency components. By applying DWT, we can decompose an image into the corresponding sub-bands. The DWT uses cascaded filter banks. Feature extraction process is done after segmentation of a region of interest, and then by using (PCA)Principal Component Analysis optimization of the feature set is done. The main use of PCA is to reduce the dimensional constraint of the wavelet coefficients thereby more efficient and accurate classifier is achieved. PCA is used to reduce the existing input features of a database with a large number of interconnected features [13].

ISSN: 0975-8585

Disease identification

This is last module disease identification, here using SVM technique It performed identification of ischemic heart disease. The segmented images are extracted based on the DWT feature Then the image was trained with SVM classifier [8]. Finally, based on SVM training, the classifier predicts the affected by or showing abnormalities stage such as low, moderate and high.

Watershed segmentation algorithm

Watershed-Based Image Segmentation may also have referred to as the watershed technique [2][5]. It is one powerful mathematical morphological application related to segmentation of the image. Segmentation based on watershed is famous in certain areas such as medical and biomedical image processing and in computer vision. And in a geographical context, watershed denotes a fold which divides the areas that are drained by varied systems of rivers and so, the technique has been named as Watershed Based Image Segmentation. If in case an image gets viewed as a geographical landscape, watershed lines determine boundaries that separate the regions of the image. The transformation of watershed segmentation calculates catchment basis and the ridgelines, also called watershed lines, wherein the catchment basins correspond to image zones while watershed lines correspond to region boundaries.

STEPS OF WATER-SHED SEGMENTATION

STEP 1: A segmentation criterion is identified.
STEP 2: Region of interest is considered as connected pixels with more or less same intensity. Unwanted background regions are totally dissimilar.
STEP 3: Adjust the segmentation criteria so that the object of interest is minimized and the non-interest region is maximized.
STEP 4: Compute foreground markers. These are connected blobs of pixels within each of the objects.

Simulation results

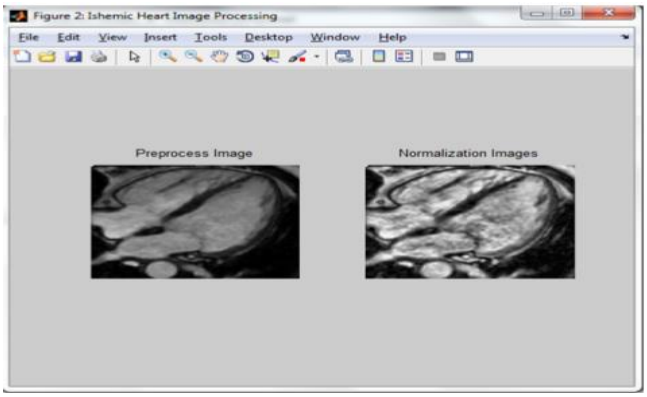

Fig 2: Normalized Image

Figure 2 shows the normalized process image. This process is used to remove noises in the input image.

ISSN: 0975-8585

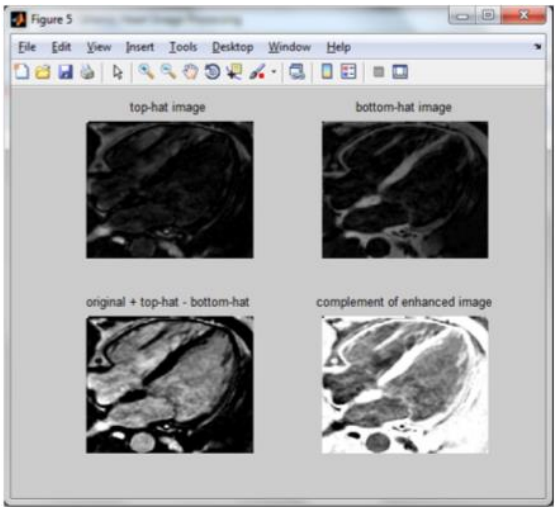

Fig 3: Segmentation process

Figure 3 shows the process of top-hat and bottom-hat image process for segmentation. After this process based on the watershed method image will be decrypted.

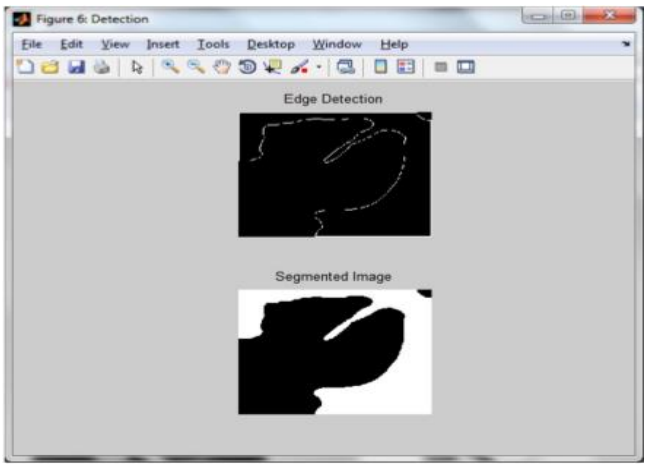

Fig 4: Segmented Image

Fig 5: Feature Extracted Image

ISSN: 0975-8585

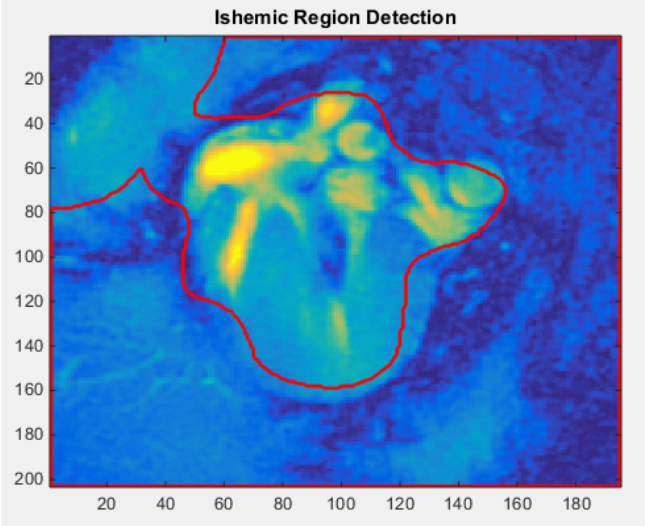

Fig 6: Ischemic region Detection

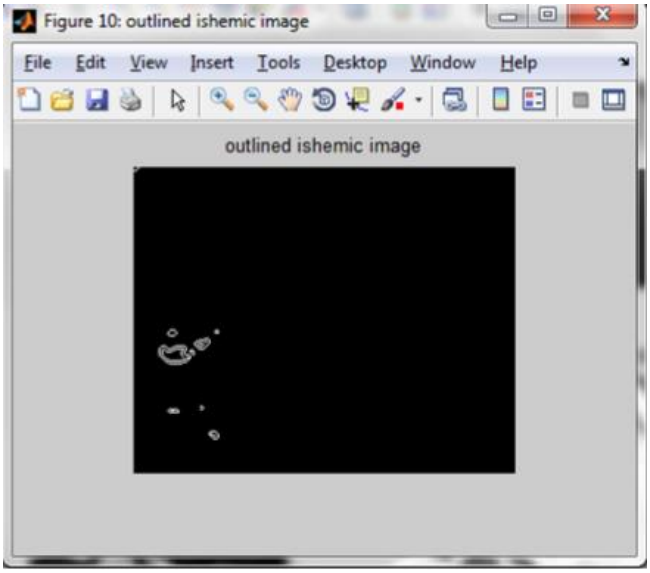

Fig 7: Classified Image

Figure 7 shows classified as ischemic heart disease from MRI image.

CONCLUSION

Our proposed System implements a system to efficiently analyze ischemic heart images using watershed segmentation. watershed segmentation method is used to segment heart MRI image. The segmented images are extracted based on the DWT feature.

REFERENCES

[1] B. Ayed, H.-m. Chen, K. Punithakumar, I. Ross, and S. Li, “Max-flow segmentation of the left ventricle by recovering subject-specific distributions via a bound of the Bhattacharyya measure,” Med. Image Anal., vol. 16, no. 1, pp. 87–100, 2012.

[2] Dr.S.Kannan, VairaprakashGurusamy, G.Nalini "review on image segmentation techniques"the year of 2014.

[3] P.Keerthana, P.Thamilselvan, J.G.R. Sathiaseelan "performance analysis of data mining algorithms for medical image classification"the year of 2013

[4] Li Haitao and Li Shengpu An Algorithm and Implementation for Image Segmentation year of 2014.
[5] C. M. Nambakhsh et al., “Left ventricle segmentation in MRI via convex relaxed distribution matching,” Med. Image Anal., vol. 17, no. 8, pp. 1010–1024, 2013.
[6] K.Punithakumar, J. Yuan, I. B. Ayed, S. Li, and Y. Boykov, “A convex max-flow approach to distribution-based figure-ground separation,” SIAM J. Imag. Sci., vol. 5, no. 4, pp. 1333–1354, 2012.
[7] SamanehMazaheri, RahmitaWirza, PuteriSuhaizaSulaiman, MohdZamrinDimon, Fatima Khalid and RohollahMoosavi Tayebi " Segmentation Methods of Echocardiography Images for Left Ventricle Boundary Detection" the year of 2015.
[8] ShashikantGhumbre, Chetan Patil, and Ashok Ghatol "Heart Disease Diagnosis using Support Vector Machine"the year of 2015
[9] R. Yildizoglu, J.-F. Aujol, and N. Papadakis, "A convex formulation for global histogram based binary segmentation," in Energy minimization methods in Comput. Vision and Pattern Recognition. NewYork: Springer, 2013, pp. 335–349.
[10] Samah, B., Signal Processing: Image Communication(2017), http://dx.doi.org/10.1016/j.image.2017.03.022
[11] M. K. Leung, S. Rahardja, D. Rajan, A. Y. Chia, "Object Recognition by Discriminative Combinations of Line Segments, Ellipses, and Appearance Features", IEEE Transactions on Pattern Analysis & Machine Intelligence, vol. 34, no. , pp. 1758-1772, Sept. 2012, doi:10.1109/TPAMI.2011.220
[12] Li Haitao and Li Shengpu “An Algorithm and Implementation for Image Segmentation” International Journal of Signal Processing, Image Processing and Pattern Recognition Vol.9, No.3 (2016), pp.125-132
[13] El-Sayed A. El-Dahshan, Heba M. Mohsen, Kenneth Revett, Abdel-Badeeh M. Salem "Computer-aided diagnosis of a human brain tumor through MRI: A survey and a new algorithm" http://dx.doi.org/10.1016/j.eswa.2014.01.0210957-4174/2014 Elsevier Ltd.
[14] Megalan Leo L, Kalpalatha Reddy T, “Dental Image Segmentation using Fast Marching Method for 2D to 3D Registration”, Research Journal of Pharmaceutical, Biological and Chemical Sciences(RJPBCS), Volume 8, Issue1, January –February 2017, ISSN: 0975-8585,pp.1906-1910.
[15] L.Megalan Leo, T.Kalpalatha Reddy,”Digital Image Analysis in Dental Radiography for Dental Implant Assessment: Survey”, International Journal of Applied Engineering Research (IJAER), Volume 9, Number 21, 2014, ISSN 0973-4562.