ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Segmentation of Ovarian Tumour Using Spatial Fuzzy C-Mean Clustering Techniques.

Srilatha K[1]*, and Ulagamuthalvi V[2].

[1]Dept of Electronics and Communication Engineering, Sathyabama Institute of Science and Technology. Chennai, India.
[2]Dept of Computer Science and Engineering, Sathyabama Institute of Science and Technology. Chennai, India.

ABSTRACT

Ovarian cancer is well-known to be the main stumbling block which counts as the leading mortality cause for women. Right and well-timed diagnosis can be prevented the person lifespan to an increased. Segmentation is one of the significant methods to find out the location and dimension of tumour in the Ovary. Automotive cancer identification in MR Image is very important in now a day's health scenario which encouragement the required medical tumour diagnosis. The major obstacle in MR Images is sensitivity and lucidity for an enhanced rich image. In modern ages, technology has exposed a wide range of possibilities to improve and understand segmentation of ovarian tumour. The diagnosis technique involves of preprocessing of MRI Ovarian (Magnetic Resonance image) in which noise is removed from the images using erosion, dilation and also median Filter, Morphological, Segmentation of Ovarian MR image in which tumour is identified by using Spatial Fuzzy C-Mean Clustering (SFCM) and labeling the tumour.

Keywords: Ovarian tumour, median filtering, morphological opening, spatial fuzzy c-mean algorithm, Texture features, Co-occurrence matrix, object labeling.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Cancer is made up of irregular cells that grow although body does not want them. When cancer cells is in the body change and grow out of control. In mostly tumours, the abnormal cells matures to form a mass. If cancer cells grows in the body long enough and also nearby areas. They extent to other parts of the body or metastasis. Ovarian tumour is very dangerous killer for women which are not specific sign indications of cancer and typically it identify in the last stage. All the cases are being diagnosed at final stage because of poor identification practices Hemita Pathak et al [11]. In the ovarian tumour mass prediction plays key role, it can be diagnosed from the ultrasound image that tumour mass is benign lesion or malignant lesion or metastatic. The MR image in medical application and other several fields is enormous. It has a number of benefits medical imaging modalities over other. There are different mode of inputs are obtainable for diagnostics like Computed Tomography, Ultrasound imaging, Magnetic Resonance Imaging, Positron Emission Tomography. This proposed system are used MRI images for ovarian tumor detection. Therefore, the ovarian cancer diagnosis in an appropriate time is very indispensable. Most of the time the intention of segmentation is to partition the image into principal region, non-overlapping, clusters, and subsection that are homogeneous with heighten to intensity and texture.

Related Work

V.Ulagamuthalvi, G.Kulanthaivel [5] proposed a new approach medical brain images and region classification algorithm are used with the aim of separate the abnormal and normal regions in the medical brain images which is exclusively independent and has the know-how to separate various kinds of abnormalities.

Geetika Gupta [8] proposed an approach of watershed segmentation, CNN (convolution neural system), k-Means grouping algorithm. The execution time for k-means grouping was less compared with another clustering technique.

Per Rahimeh Rouhi et al [4] described segmentation of the cancer area is done by computing cellular neural network by the aid of using by automated region growing. Various classifier for instance KNN, SVM, Decision Trees, Random Forest are used for calculating the performance with proposed method. Region growing algorithm is the initial step followed by the second technique which can be accomplished by cellular neural network (CNN). The resulting step is pre-processing, which contains intensity feature extraction keep an eye on by artificial neural network (ANN) that gives the threshold for segmentation.

S.Melissa, K.Srilatha [10] described loaded medical input image has noised so they have to preprocess image for enhancement and noise reduction. Median filter used for pre-processing, then segmentation is done by using fuzzy based edge detection method (FIS) and feature is extracted from segmented image. Depends upon its feature the images have classified in relation to its types.

Selvakumar et al [4] described to compute area of cerebrum brain MRI and recognition of brain tumor segregating using K-mean clustering is miscarry while dataset become large. So described algorithm for detection of region and the tumor size in brain MR images. Brain tumor is presented in the view of the measure of region from the clustering.

METHODS AND MATERIALS

The main motive of this system is to identify the region of tumour and to ensure the complete diagnosis of that cancer which will be used in treating the detailed of tumour patient about the proposed method is given below.

This is mainly divided into five steps such as preprocessing (Median filter, Thresholding and morphological) median filter is which removes the noise portion of MR image, Thresholding is which used to extract the objects from the background by choosing a threshold T. and morphological operation eliminate the pelvis part of an image. Partitioning is bring about by Spatial Fuzzy C-Mean Clustering (SFCM). Object labeling procedure is to distinguish the tumor region. Each and every stage of proposed system is described below.

ISSN: 0975-8585

Pre-processing

MRI image is given as an input image. For getting exact results preprocessing is done on MRI image. First MR image have converted into contrast image which provides fine image. At that moment preprocessing is done by using median filter, thresholding, erosion and dilation. Each and every method are give details below:

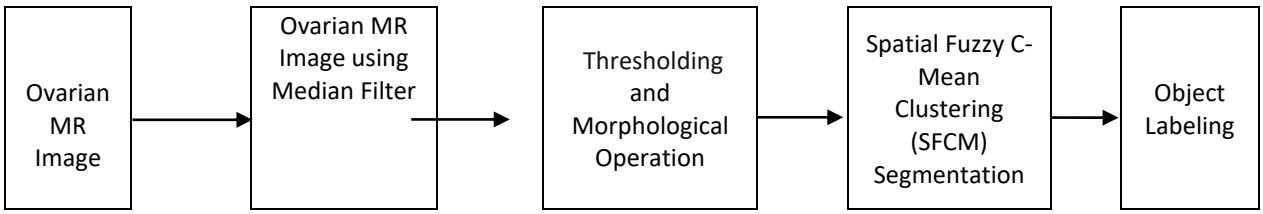


Fig 1: Block diagram of proposed system

A. Median filter

Ovarian MR images are usually corrupted by Noise like Poisson and Gaussian noise. The huge majority of the denoising algorithms what if additive white Gaussian noise (AWGN). There are some of the systems that planned for Gaussian noise elimination, for instance edge preserving non-local means, bilateral filter and total variation [1].Median filter which is a nonlinear filter that is accustomed as a helpful technique for eliminating noise when preserving edges. It is worked by scrolling the pixel of the image with a pixel, substituting each value with the median value of the neighborhood pixels.. It is specifically effective for eradicate salt and pepper noise. Pixels are considered from the first sorting of all pixel values of neighbor in the order, and at that time substitute the pixel while viewed by a half pixel value. It is capable of removing noise without degrading the sharpness of the MR image.

$$y[u,v]=\text{median}\{x[i,j],(i,j)\varepsilon\ k\} \qquad (1)$$

Where k is a neighborhood well-defined by the user, centered all over the place location [u,v] in the MR image.

B. Thresholding of the image

Thresholding is accustomed to extract the tumour from the background by choosing a threshold value T. Some point (x, y) in the MR image in which f(x, y) >T is named an object point, or else the point is known as a background point. When T constant is applicable over entire image, the process is known as global thresholding. While the value of T variations over MR image, the term variable thresholding or from time to time mentioned to as local regional thresholding. If T calculate on the spatial point (x, y) themselves then and there variable thresholding is frequently mentioned to as adaptive or dynamic thresholding.

C. Morphological Operation

Morphological operation is removing the anterior aspect of the female pelvis, anterior superior aspect of the female pelvis. Pelvis removed is done by using morphological process is used only with MR Ovarian images. It filters the MR image to eliminate abnormalities, detects edges in the MR image, and achieves morphological erosions and ovarian dilation. It also does exterior cleaning and image masking. In fig. 1. Illustration the morphological operation. It often takes a binary image and essential element as input and in mishmash with the use of a switch likewise intersection, complement, union, inclusion. Mathematical details are explicated in mathematical morphology. Moving over the image, and each and every pixel of the MR image in its totality, is matched through a set of base pixels.

Opening: Together through closing, the opening helps in computer vision and image processing as a basic good worker of morphological noise removal. Opening removes small substances in the foreground of MR images by assigning in the background, when closing is removing minor holes in the foreground and changing the background of minor islets in the foreground. These approaches can be used to find out detailed pathways in the MR image.

$$A^{o}B = (A \ominus B) \oplus B \qquad (2)$$

Where Θ indicate erosion and ⊕indicate dilation.

Closing.

When processing MR images, closing together by the opening, the basic good worker of morphological is to eradicate the noise. Opening is removing minor items, when closing removes minor holes.

$$A^{o}B = (A \oplus B) \ominus B \qquad (3)$$

Where Θ indicate erosion and ⊕indicate dilation.

D. Spatial Fuzzy C-Mean Clustering (SFCM)

Image Segmentation is the method of segregating a MR tumour image into manifold regions or groups of pixels. Image segregating is group of tumour objects through unlabeled data. Fundamentally, in image partitions are dissimilar tumour objects which obtain the similar texture. The aim of partitioning is to abridge variation the representation of MR tumour image into something that is very important and easier to inspect. The result of MR image segmentation is a set of that laidback cover the complete MR Ovarian image, or group of counters take out from the MRI Ovarian image .It is partitioned image into various clusters. Spatial Fuzzy C-Mean Clustering (SFCM) is time consuming method.

The Spatial Fuzzy C-Mean Clustering (SFCM) is applied to the cancerous region which provides the region of interest (ROI) with sharp edge. This technique is a hybrid of some pre-existing approaches. The segmentation differentiates the usual tissues from background.

It is an unaccompanied clustering procedure in which various classes based on intrinsic distance from each other which is categorized from given data. It consist of the spatial function to revise association function to acquire the perfect result by examining local neighborhood data. In spatial fuzzy c mean clustering SFCM integrate association function with spatial data for clustering. Co-occurrence matrix is a matrix that is well-defined over MR image to be the portion of Co-occurrence pixel. Ovarian MR image with x pixel values will give x*x Co-occurrence matrix. A Co-occurrence matrix (CCM) can determine by computing how repeated value 'j' forms the detailed spatial connection with 'I'. The spatial relationship is well-defined as the pixel of interest by evasion and the physical connection can be stated among the pixel of interest and the pixel to it is instantaneous right. Each constituent (i, j) in the consequential CCM is humbly the summation of the number of intervals that the pixel with j happened in the quantified spatial association to a pixel through i in the input MR Ovarian image. The amount of gray levels in the MR image governs the mass of the CCM. Morphological process are applied on segmented MR image for smoothening the ovarian tumour portion. Dilation and erosion procedure will used to improve the tumour area by eliminating the undesirable pixels from outer area of tumour portion. These morphological process are achieved on base on contours. It is designed by constituting the portion. It is a matrix which involves of 0's and 1's where 1's are known as neighborhood pixels. The determination of output pixel through using the giving out neighborhood pixels.

E. Object Labeling Algorithm

Object Detection is a modern technology which is related to image processing and computer machine vision that treaties with identifying occurrences of semantic things of a certain class in digital images. Given a MR image, Tumour detection is to identify whether or not the specified tumour is existed and if present determine the region and sizes of each tumour. The MR image data is looked over for a specific condition. In

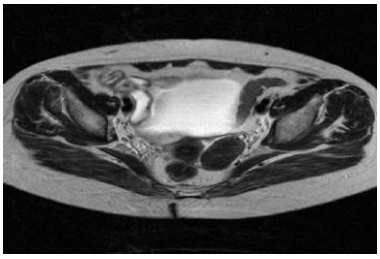
ISSN: 0975-8585

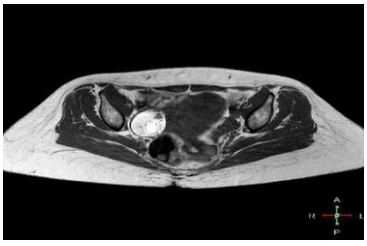
Object labeling stage, binaries MR image is labeled by Object Labeling procedure. The purpose of this procedure is to label different tumour within the MR image. Identify the tumor area from labeled MR ovarian image. The tumor occupies maximum range in the labeled image, so there is precisely one label in the labeled MR image whose regularity value will be the all-out.

Footsteps of object labeling procedure:

S-1: Let there are m labels {l0…l (m-1)} in the labeled MR image. Compute occurrence of each label from the labeled MR image.
S-2: Exploration max f (m-1) let this occurrence is o max.
S-3: Exploration for the label from the group which have the occurrence value o max.
S-4: Execute 8 adjacency with respect to l*k in the labeled image.
S-5: Produce binary MR image from the labeled.

RESULTS AND DISCUSSION



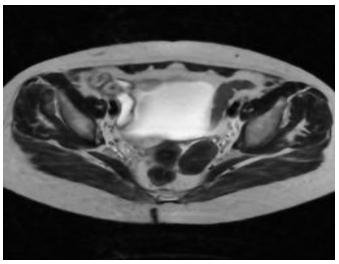


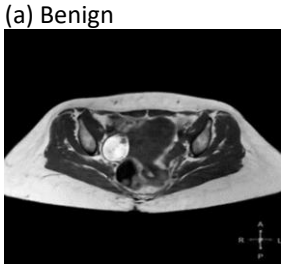
(a)Malignant

(c)

(a) Benign

(a) Metastatic

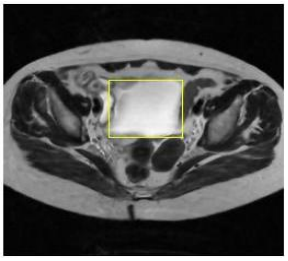


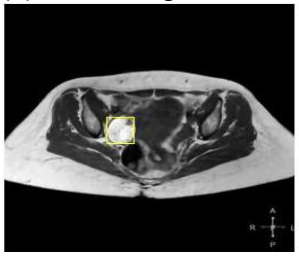


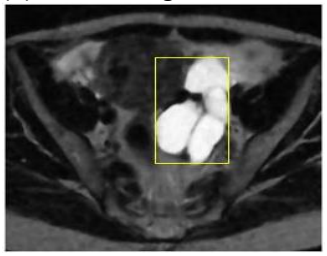
(b)Filtered Image

(b)Filtered Image

(b)Filtered Image



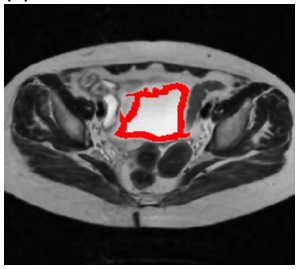


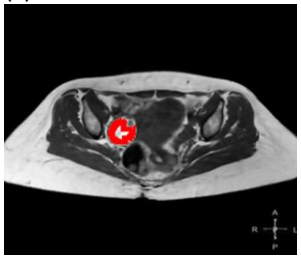


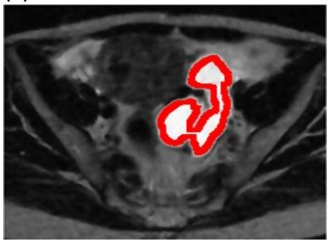
(c) Identified Tumour

(c) Identified Tumour

(c) Identified Tumour

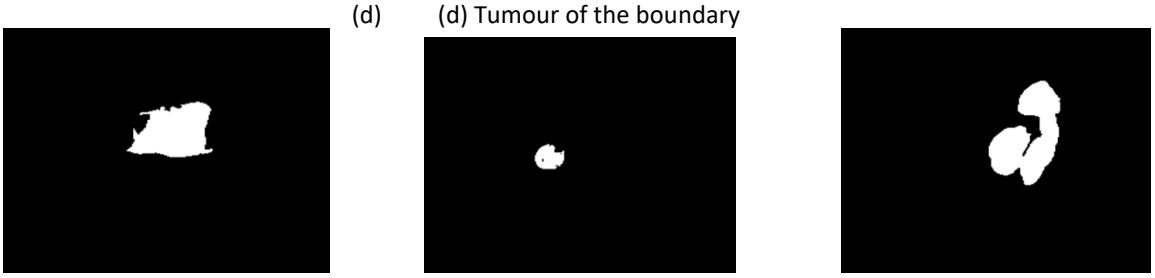






ISSN: 0975-8585

(d) (d) Tumour of the boundary



Tumour of the boundary (d) Tumour of the boundary

(e) Extracted Tumour (e) Extracted Tumour (e) Extracted Tumour

Fig 2: Output image of Ovarian MR Image

The tumour areas are obtained from MR image where solid white is affected tissues in ovary. The Spatial Fuzzy C-Mean Clustering (SFCM) segmentation is used occurrence matrix which has two classes, target class and output class. This matrix is used to classify for various classifications like malignant and benign. The occurrence matrix is named as confusion matrix or unsupervised machine learning and for supervised machine learning. It is also named as matching matrix. For occurrence matrix plot, the rows indicate target class and columns indicate output class. Matching of output class and target class is presented in the diagonal cell. The off-diagonal cells express not matching. The bottom row indicate target class accuracy and the right on the side column indicates output class exactness. The uploaded the MR ovarian images as an input as shown Fig.2. Then convert it into contrast image for improve the feature of MR images and also enhance brightness image. Apply median filter for noise removing as shown Fig.2. Later apply morphological operation for anterior aspect and superior aspect of the female pelvis removing. Next it will be converted it into Spatial Fuzzy C-Mean Clustering (SFCM) for segmentation of images as malignant, benign and metastatic as shown Fig.2. Then execute the object labeling procedure for cancer detection.

CONCLUSION

A new approaches for Spatial Fuzzy C-Mean Clustering based on Object Labeling has presented, tumour segmentation and processing the ovarian MR images. The Spatial Fuzzy C-Mean Clustering based on Object Labeling is a good way to segment the medical ovarian images for detecting the diseased regions such as cancer, infected fleshy tissue and this method comprises the effortlessly segment the medical ovarian images and segmented the MR image and extract tumour regions in an image by using median Filter, Morphological, SFCM and labeling the tumour. The implemented result gives the better infected region separation rather than others. So, it is very essential to find out an efficient and collective form of segmentation to aid the women society for advancement.

REFERENCES

[1] Pim Moeskops, Max A. Viergever, A. M. Mendrik, L. S. de Vries, Manon J.N.L. Bendris and Ivana Isgum, “Automatic segmentation of MR brain images with a convolutional neural network,” IEEE transactions on medical imaging, vol. 35, no. 5, pp. 1252-1261, 2016.

[2] Rahimeh Rouhi, Mehdi Jafari, Shohreh Kasaei and Peiman Keshavarzian, “Benign and malignant breast tumors classification based on region growing and CNN segmentation,” Expert Systems with Applications, vol. 42, no. 3, pp. 990-1002, 2015.

[3] Sheikh, Karishma, Vidya Sutar, and Silkesha Thigale. "Clustering based Segmentation Approach to Detect Brain Tumor from MRI Scan." International Journal of Computer Applications 118 (8),2015 .

[4] Selvakumar, J., A. Lakshmi, and T. Arivoli. "Brain tumor segmentation and its area calculation in brain MR images using K-mean clustering and Fuzzy C-mean algorithm." Advances in Engineering, Science and Management (ICAESM), 2012 International Conference on. IEEE, 2012.

[5] Ulagamuthalvi V., Kulanthaivel G.: An novel approach for segmentation using brain images. International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT), IEEE, 2017.

[6] L. Zhao and K. Jia, “Multiscale CNNs for Brain Tumor Segmentation and Diagnosis,” Comput. Math. Methods Med.,vol. 2016, p. 8356294, Mar. 2016.
[7] E. Abdel-Maksoud, M. Elmogy, and R. Al-Awadi, “Brain tumor segmentation based on a hybrid clustering technique,” Egyptian Informatics Journal, vol. 16, no. 1, pp. 71–81, Mar. 2015.
[8] Gupta, Geetika, et al. "Analysis and comparison of brain tumor detection and extraction techniques from MRI images." International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol 3.2014.
[9] M. Havaei et al., “Brain tumor segmentation with Deep Neural Networks,” Med. Image Anal., vol. 35, pp. 18–31, Jan. 2017.
[10] S.Melissa, K.Srilatha,” A Novel approach for Pigmented Epidermis Layer Segmentation and Classification” International Journal of Pharmacy & Technology, March-2016,Vol.8,Issue No.1, pp.10449-10458, 2016.
[11] Hemita Pathak, Vrushali Kulkarni: Identification of Ovarian mass through Ultrasound Images using Machine Learning Techniques. IEEE International conference on research computational intelligence and communication networks (ICRCICN),pp-137-140.2015.
[12] A. Rajendran, R. Dbanasekaran, "Fuzzy Clustering and Deformable Model for TWllor Segmentation on MRI Brain Image: A Combined Approacb", Procedia Engineering,Vol. 30,pp- 327 - 333.2012.
[13] Pal, Nikhil R., et al. "A possibilistic fuzzy c-means clustering algorithm." IEEE transactions on fuzzy systems 13.4,pp-517-530,2005.