Impact Factor (SJIF): 3.632

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 3, Issue 3, March-2016

Detection Of Brain tumour From MRI Images Using Matlab

Prof. Raees Ahmad[1], Prerna Sawant[2], Pooja Baniya[3], Tejal Churi[4], Sarita Tandel[5]

[1]*Faculty, Department of Electronics & Telecommunication Engineerring, Theem college of Engineering, Boisar*
[2]*U.G. Student, Electronics & Telecommunication Engineering, Theem college of Engineering, Boisar*
[3]*U.G. Student, Electronics & Telecommunication Engineering, Theem college of Engineering, Boisar*
[4]*U.G. Student, Electronics & Telecommunication Engineering, Theem college of Engineering, Boisar*
[5]*U.G. Student, Electronics & Telecommunication Engineering, Theem college of Engineering, Boisar*

Abstract — Today's modern medical imaging research faces the challenge of detecting brain tumour through Magnetic Resonance Images (MRI). Normally, expert's use MRI images to obtain a soft tissue image of human brain. It is used for analysis of human organs and it is very useful to replace surgery. For brain tumour detection, segmentation of image is required. For image segmentation, the brain is partitioned into two distinct regions. This is considered as one of the most important and difficult part of the process of detecting brain tumour. Hence, it is highly necessary that the segmentation of the MRI images must be done accurately before asking the computer to do the exact diagnosis and analysis. Earlier, different types of algorithms were developed for segmentation of MRI images by using different tools and techniques. However, this paper presents a comprehensive review of the methods and techniques used to detect brain tumour through MRI image segmentation. Lastly, the paper concludes with a concise discussion and provides a direction towards the upcoming trend of more advanced research studies on brain image segmentation and tumour detection.

I. INTRODUCTION

Our human system is made up of different complex organs, among all brain is the first and the major controller of the human body. Excess amount of cells growing in an uncontrolled manner in brain is called as brain tumour. In this paper the tumour part is identified by various levels of operation's. First input taken is the tumour affected MRI image. This image is then pre-processed by using a median filter. The reason to select median filter is it completely removes the noise and it makes the tumour affected image very clear, whereas the Gaussian filter and linear filter does not. After pre-processing the edge of the image is detected using canny filter. The canny filter itself performs the functioning of Gaussian filter which is responsible for smoothening of the image. The next step is most important which is segmentation and in this process the tumour image is divided into four quadrants and in each quadrant different pixel values are taken. Histogram clustering is the process in which grouping of similar values of pixels are done and threshold value is set and is compared with the healthy brain image. Next technique in which the tumour affected image is superimposed on the healthy brain image give's a clear detection of the tumour. MATLAB software tools is used for image segmentation and all other image processing technique's.

1.1. Motivation

1.1.1. Brain tumour, is one of the most common brain disease's, it has affected and devastated many human lives. According to International Agency for Research on Cancer (IARC) approximately, more than 126000 people are diagnosed for brain tumour per year around the world, with more than 970000 mortality rate. Despite of consistent efforts to overcome the problems of brain tumours, statistics still shows low survival rate of brain tumour patients. Many tumour affected patient's can't afford the surgery due to high rates of hospital's and long procedure.To combat this, researchers are using multi-disciplinary approach involving knowledge in medicine, mathematics and computer science to better understand the disease and find more effective treatment methods.

All Rights Reserved, @IJAREST-2016

1.2. Problem definition

The two most common tests Magnetic resonance (MR) imaging and computer tomography (CT) scanning of brain image are undertaken to confirm the presence of brain tumour and to identify its location for selected specialist treatment options. Currently, there are different treatment options and methodology available for brain tumour detection. These options include surgery, radiation therapy, and chemotherapy. The choice for the treatment option depends on the size, type, and grade of the tumour present in the human brain. It also depends on whether the tumour is putting pressure on vital parts of the brain. Whether the tumour has spread to other parts of the central nervous system of body, and possible side effects on the patients concerning treatment preferences and overall health are important considerations when deciding the treatment options.

1.3. Objective

Scientists have classified brain tumour according to the location of the tumour, type of tissue involved, whether they are noncancerous of cancerous. World Health Organization classified brain tumour into 120 types. This classification is done on the basis of the cell origin and the behaviour of the call from less aggressive to more aggressive behaviour. Then according to this above description objective of our project is to study upon the different types of tumour and working out on a process which can be made applicable for all different tumours.

1.4. Existing system

The objective of this project is to avoid risk to human life and try to improve the current methodologies of brain tumour detection. Thousand of people's suffer from tumour which can be detected easily before it reaches to an major disease. The project is totally based on how to use an efficient way so that we can detect tumour at an early stage.

II. RELATED WORK

Today, there are a number of different methods by which we can detect tumour. In this section, brief of some recently used tumour detection techniques are given,
Few popular systems are:

2.1. Watershed Segmentation

Padmakant Dhage et al[1],in their paper they proposed a technique of watershed segmentation to separate the abnormal tissue from the normal surrounding tissue to get a real identification of involved and non-involved area that help the surgeon to distinguish the involved area precisely. This proposed system has four modules namely preprocessing, segmentation, CCL and multi parameter calculation. Preprocessing includes filtering of image. Segmentation is carried out by watershed algorithm. Using CCL location is found out and area is calculated of tumor in MR image. The advantage of this method is its simplicity and efficiency. It can remove salt and pepper noise, high frequency component from MRI without disturbing edges. It can more accurately localize activated brain adjacent to regions of abnormal tissue such as tumors. No automatic approach yet exists for automatically and accurately computing the area .Watershed segmentation with connected component labeling algorithm provides better segmentation results with area ,perimeter, eccentricity, entropy with value.

2.2 Modified Texture Based Region Growing And Cellular Automated Edge Detection

Charutha S.et al[02]in their paper they presented an automated and efficient brain tumour detection technique implementing on Magnetic Resonance Imaging (MRI)images, which integrates two image segmentation methods such as modified texture based region growing and cellular automata edge detection .2D cellular automata based on more neighbourhood model is used .Proposed system consists of 3 stages .In the first stage pre-processing: noise removal and contrast enhancing is done. The second stage is segmentation. The third stage is feature selection and extraction .It is found that 2D cellular automata provide clear and exact edges compared to other classical edge detection methods.
The future Scope of the proposed work is that it can be extended to the tumours in other parts of the body. Also a classification based on artificial neural network can be done to classify the cells as tumorous or not.

All Rights Reserved, @IJAREST-2016

2.3 Clustering Based Detection

R.Manikandan, G.S. Monalisa and K.saranya et al[03] In their paper ,they presented a MR Image segmentation is done through clustering..Clustering is a method of grouping a set of patterns into a number of clusters Proposed system mainly consists of four stages, image pre-processing, Skull stripping processing technique, Removal of noise, segmentation through K-mean clustering, Extraction of image. In this paper the MRI images are segmented through cluster based methods. K means is a simplest unsupervised learning technique that solves the well known clustering problem. It is an algorithm to classify or to group your objects based on attributes/features into K number of group. K is positive integer number.

The grouping is done by minimizing the sum of squares of distances between data and the corresponding cluster centroid. In our project medical image analysis is includes the image to be segmented in terms of a few parameters and into smaller sizes or regions to address the different aspects of analyzing images into anatomically and pathologically meaningful regions. Classifying regions using their multi parameter values makes the study of the regions of physiological and pathological interest easier and more definable for future enhancement .

In future, the system could be improved by adapting more segmentation algorithms to suit the different medical image segmentations. The time for analysis could be made lesser and execution of the process can be made much easier and user friendly. The execution time and accuracy level can be analyzed with other clustering algorithms for effective measures. Further, the work in three dimensional domains can also be enhanced with its necessary algorithm.

2.4. Neural-Network Multi-Criteria Optimization Image Reconstruction Technique

Warsito & Marlin[04] in the paper they proposed a ECVT technique developed earlier for real-time and volumetric imaging of brain activity, to detect the presence of brain tumour. The ECVT sensor system measures the capacitance of electrical signals of the brain on the cortex, and generates a volumentric map of the brain activity on the cortex and inside the brain through a tomography image reconstruction algorithm based on a neural-Network Multi-criteria Optimization Image Reconstruction Technique(NN-MOIRT).The ECVT is able to detect brain tumours through an examination of the brain functional abnormalities, as the tumours block the propagation of neuro –signals and cause abnormalities in the brain activity image. The ECVT sensor design has been optimized for the detection of the brain tumours in different sensitivity regions of the brain. The study has shown a great feasibility of the 4D imaging technique as a complementary alternative for a high speed non-radiation technique for brain cancer detection and functional imaging. We propose in this work a novel technique to diagnose the presence of tumours in the brain using the ECVT through imaging of the brain activity. ECVT measurement can be divided into two steps:1)a forward problem of capacitance measurement and 2)an inverse problem of image reconstruction. The capacitance measurements are carried out between pairs of electrodes placed on the outside wall of the sheet covering the head, installed within the helmet-shaped sensor. a possibility of the 4D imaging technique to become an alternative for relatively low cost, high-speed, non-radiation technique for brain tumour screening. Further work to locate the brain tumours from the brain activity map. Xiao et al[5] proposed an approach to estimate features from the correlation between brain lateral ventricular (LaV)deformation and tumour and the extracted features are applied for tumour segmentation of MR images. Proposed technique mainly consists of four stages: pre-processing ,feature extraction, segmentation and classification. In the first stage, the issue of non standardization of intensity, geometric non uniformity and redundant data in the background image and skull are addressed .

Lateral ventricular deformation is used for feature extraction. In the segmentation part ,unsupervised segmentation methods are used to for the evaluation of LaV deformation feature on the(KNN)and conventional Fuzzy connected C-mean(FCM).The experimental results show the relevancy between LaV deformation and tumour location. Comparative experiment study on tumour segmentation suggests that, tumour segmentation accuracy improves when the extracted features are accurate. In the proposed system the Specificity and Sensitivity obtained is 100%.The proposed brain tissue segmentation has the disadvantage of wrongly assigning a non CSF pixel to the cluster CSF. To remove this undesired pixel, a global mask is applied, there by leaving the region as extracted. Future scope of this paper is that, by incorporating the LaV deformation as an additional features can be obtained for pattern recognition segmentation, there by improving brain tissue segmentation.

No.	AUTHOR	YEAR	METHODS USED	LIMITATIONS	ACCURACY
1.	Padmakant dhange	2015	Thresholding, clustering & watershed algorithm	More sensitive to noise and only 2 classes are generated	85%
2.	Charutha S	2014	Integrating modifies structure based region growing and egde	Region growing performance can be affected by selection of threshold values	96%

All Rights Reserved, @IJAREST-2016

			detection		
3.	R.Manik andan, G.S Monolis and K.Sarany a et al	2013	K-means clusturing	Sensitive to noise	96.5%
6.	Nandagopal and Rajamony	2013	SVM is used for segmentation. A combinat ion of WST and WCT is used for featuree xtraction.	Whenever there is change in image data set, it need training set for gaussian SVM classifier.	97.5
7.	Kalbhani et al	2013	2D DWT of the input image is calculated 1st .	They cannot model asymmetric with respect to the sign of past values.	97.62% and 98.21%
8.	Sindhu mol et al	2013	It is based on spectral angle based on feature extraction and spectral clustering treatment.	Low threshold value can lead to over clustering.	98% and 96.1%
9.	Navarro et al	2013	Introduce anew method for feature select ion and dimensionality reduction by using off the shelf classifiers.	There are many issues involving different pathologies.	95%
10.	Saritha et al	2013	Approach is by integrating wavelet entropy based spider web plots and probabilistic neural network.	Whenever there is an increase in image database fresh training is required.	100%
11.	Sumitra and Saxena	2013	Yses a neural network technique for the classificant ion of MRI images.	Over discriminate accuracy is less.	73%
12.	Jayachandran and Dhanasekhara	2013	Based on hybrid algorithm for detection of brain tumour MRI using statistical and SVM classifier.	Principle component analysis, reduces the lower dimen	95.3%
13.	Nanthagopal and Sukanesh	2012	Dominant run length and co-occurrence texture feature are selected	Whenever there is change in the data set it requires a new training set and this method is applied only to CT images	96.4%

All Rights Reserved, @IJAREST-2016

			by SVM.		
14.	Deepa and Devi	2012	These methods exploit the capability of back propagation and radial basis function neural network function	Difficulty in selecting the optimal features to distinguish between classes.	98.6%
15.	Mustara and Suchalatha	2012	The texture feature is extracted by using GLCM.	Computational cost is high	97.6%
16.	Jafari and Shafaghi	2012	Hybrid approach for the detection of brain tumour tissue in MRI based on genetic algorithm and support vector machine.	Wavelet transform require large storage and its computational cost is high.	83.22%

III. **Literature Survey**

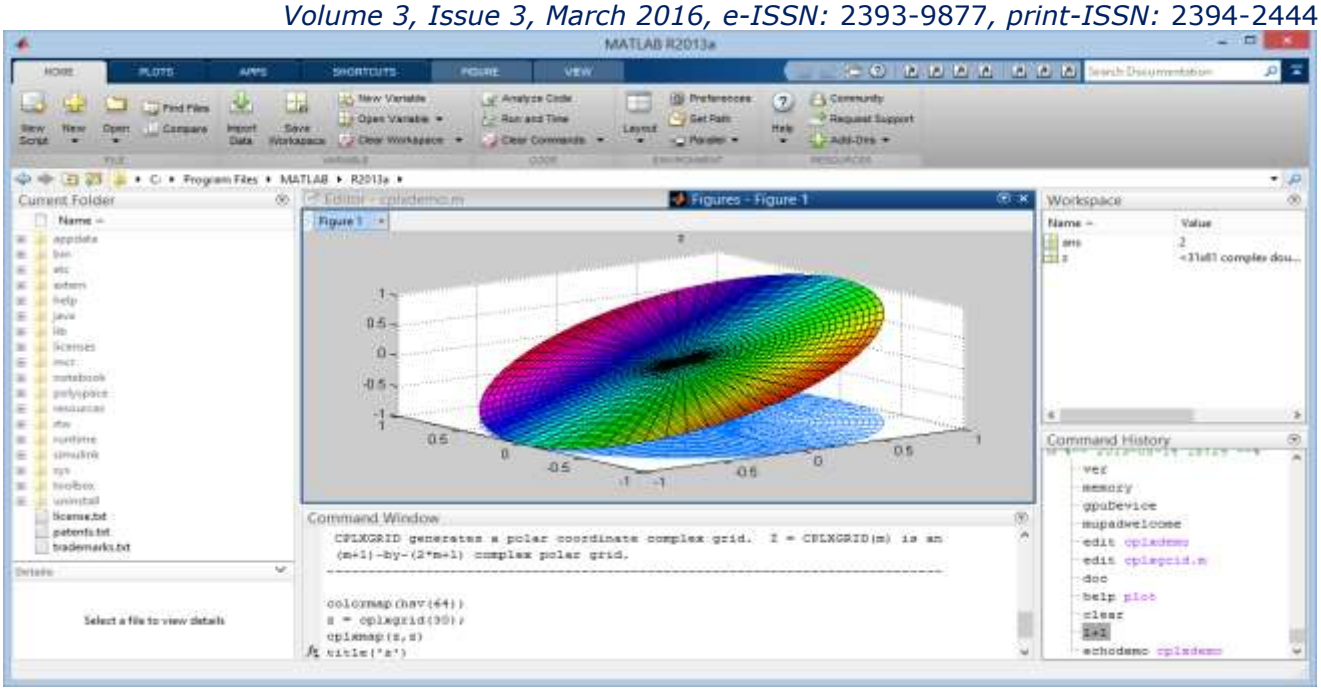
We researched a lot and after a lot of considerations we decided to implement the brain tumour detection from MRI images by different techniques like morphological operation, histogram, thresholding, etc. While doing the same we searched many websites on the internet and came up with the implementation methodology . The idea of this project was taken from the IEEE paper of Brain tumour detection using watershed algorithm. Research showed that lack of alertness and awareness is one of the major cause of the people dying due to tumour and hence we decided to use a efficient and combination of different techniques to work out exactly on the tumour.

IV. **Components**

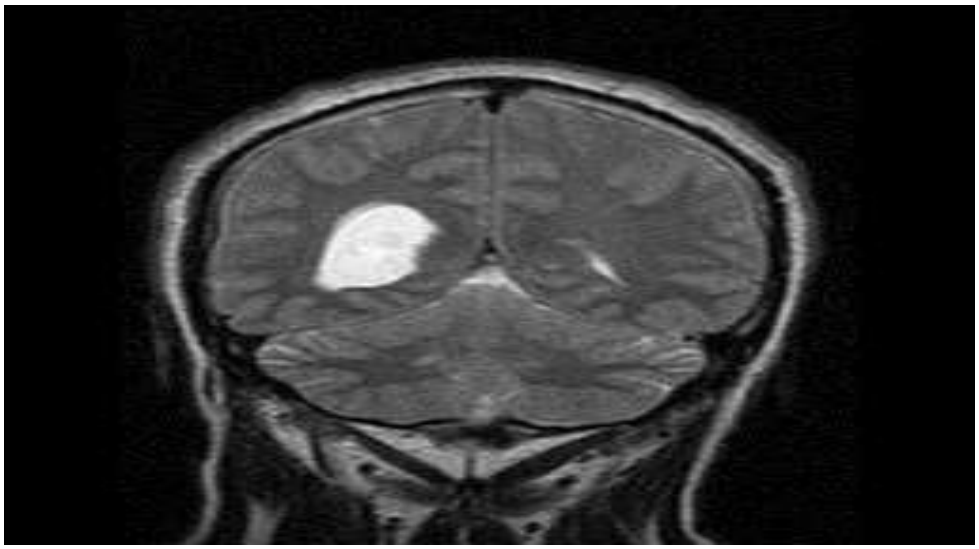
4.1 MATLAB Software

MATLAB(matrix laboratory) is a multi-paradigm numerical computing environment and fourth-generation programming language. A proprietary programming language developed by MathWorks. Matlab allows matrix manipulation, plotting of functions and data, implementation of algorithms, creation of user interfaces and interfacing with programs written in other languages, including C, C++, Java, Fortran and Python. Million's of engineer's and scientist's worldwide use MATLAB to design and analyze the system's and products transforming our world. MATLAB is in automobile active safety systems, interplanetary spacecraft, health monitoring devices, smart power grids, and LTE cellular networks. It is used for machine learning, signal processing, image processing, computer vision, communication's, computational finance, control design, robotics and much more.

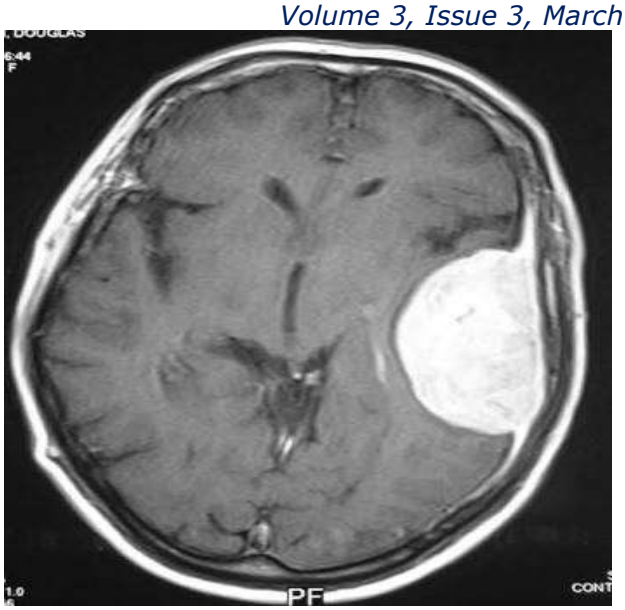
All Rights Reserved, @IJAREST-2016

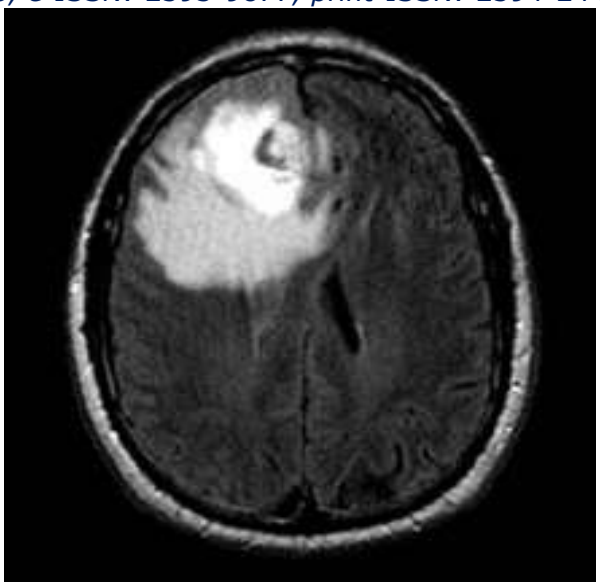


4.2 Tumour affected database image



All Rights Reserved, @IJAREST-2016





V. **Conclusion**

We proposed a fast and simple algorithm for hand gesture recognition for controlling robot. We have demonstrated the effectiveness of this computationally efficient algorithm on real images we have acquired. In our system of gesture controlled robots, we have only considered a limited number of gestures. Our algorithm can be extended in a number of ways to recognize a broader set of gestures. The gesture recognition portion of our algorithm is too simple, and would need to be improved if this technique would need to be used in challenging operating conditions. Reliable performance of hand gesture recognition techniques in a general setting require dealing with occlusions, temporal tracking for recognizing dynamic gestures, as well as 3D modelling of the hand, which are still mostly beyond the current state of the art.
Brain tumour detection which combines modified texture based region growing and watershed segmentation is proposed. Pre-processing is done to enhance the input MRI image. Simulated results have shown that the proposed method is an efficient brain tumour detection technique and it enhances the tumour detection done by the individual methods such as modified texture based region growing and watershed segmentation. Also, it is found that 2D cellular automata provide clear and exact edges compared to other classical edge detection methods.

REFERENCES

[1] Padmakant dhage,prof. M. R. Phegade, dr. S. K. Shah , a technique of watershed segmentation to separate the abnormal tissue from mri images.2015
[2] Charutha s., m. J. Jayashree, combination of two image segmentation methods such as modified texture based region growing and cellular automata edge detection.2014
[3] *r.manikandan, g.s.monolisa and k.saranya* a cluster based segmentation of magnetic resonance images,2013
[4] warsito p. Taruno, marlin r. Baidillah, rommy i.Sulaiman, detection using electrical capacitance volume tomography (ecvt)
[5] Kai xiao,a.lei liang, hai bing guan, about ella hassanien,"extraction and application of deformation based feature in medical images", else neuro-computing 2013
[6] padma nanda gopal &r.sukanesh," wavelet statistical feature based segmentation and classification of brain computed tomography images" let image process vol7 pp 25 -32 2013
[7] Hashem kalbkhani, mahrokh g shayesteh, behrooz zali-vargahan " robust algorithm for brain magnetic resonance image classification based on garch variances series", else biomedical signal processing and control 8(2013) 909-919
[8] Sindhumol s, anil kumar, kannan balakrishnan " spectral clusterring independent component a nalysis fort issue classification from brain mri" else, biomedical signal processing and control (2013)667-674
[9] Navarro, david hackney," feature and model select ion wit h discriminatory visualization for diagnostic classification of brain tumour. Else, computerized medical imaging and graphics 29(05) 21-34
[10] m.saritha, k.paul joseph, abbraham t mathew, classification of mri brain images using combined wavelet entropy based spider web plot and probalistic neural network" else, pattern recognition letters 34(2013)2151-215

All Rights Reserved, @IJAREST-2016

[11] sumitra, saxena "brain tumour classification using back propagation neural network", i.j.image, graphics and signal processing,2013,2,45-50
[12] jayachandrana & r.dhanasekaran ,"brain tumour detection and classification of mri using texture feature and fuzzy svstem classifiers", research journal of applied sciences, engineering and tech 6(12):2264-2269,2013
[13] padmananthagopal & r.sukanesh rajamony" classification of benign and malignant brain tumour ct images using wavelet texture parameters and neural network classifiers" publication:j0urnal of visualization society, vit 16:19-28doi 10.1007/s12650-012- 0153-y
[14] Deepa and devi," feature and model selection wit h discriminatory visualization for diagnostic classification of brain tumour," in journal of computer science & engineering ijscet vol no42229-3345,2013
[15] Mustara & suchalatha," brain cancer classification using glcm based feature extraction in artificial neural network", else computerized medical imaging and graphics 29(2005) 21-34.
[16] Mehdi jafari & reza shafaghi," a hybrid approach for automatic tumour detection of brain MRI using genetic algorithm" global journal of science, engineering and technology(issn:2332-2441) ,2012
[17] sv.p.gladis pushpa rathi and s.palani, "linear discriminant analysis for brain tumour classification using feature select ion", int journel of communication and engineering, vol- 05-no 5.issue march 2012
[18] V. Salai selvam and s. Shenbaga devi, detection using scalp egg with modified wavelet-ica and multi layer feed forward neural network,2011
[19] M.h fazel zarandi, m.zarinbal, m.izadi "systematic image processing for diagnosis brain tumour :a type ii expert system approach", else applied soft computing 11(2011) 285-294
[20] Yudong zhang, zhengchao dong, lenan wu "a hybrid method for mri brain image classification", else expert system with application 38 (2011) 10049-100
[21] Ahmed kharrat, karim gasmi, mohamed bennacera," a hybrid approach for automatic classification of brain using genetic algorithm and svm ", leonardo journal of sciences issue17 july- december 2010
[22] Amir ehsan lashari "a neural network based method for brain abnormality detect ion in MRI images using gabour wavelet ", int journal of computer application(0975-8887)volume 4 july 2010
[23] Shewta jain, "brain classification using glcm based feature extraction in artificial network", int journal of computer science & engineering technology (ijcset), issn:2229-3345,vol.4.no.07jul 2013.
[24] Ei-sayed ahmed ei dahshan, tamer hosny, abdel-badeesh "hybrid intelligent technique for MRI brain image classification" else digital signal processing 20(2010) 433-441
[25] pantelis georgiadis, dioisis cavouras, menelaos malamas, "improving brain tumour characterization on MRI by probabilistic neural network and non linear transform of texture feature", else :computer methods and program in biomedicine 2008
[26] h.selvaraj, s.thamaraiselvi, d.selvathi, l .gewali, "brain mri slices classification using least square support vector machine" icmed, vol 1.no1.issue,p age 21
[27] geng-cheng lin, wen –june wang, chuin –mu wang, sheng-yih sun, "automated classification of multi-spectral mri images using linear discriminant analysis", else computerized medical imaging and graphics 34(2010) 251-268.
[28] Phooi yee lau, detection and visualization of brain tumours on t2-weighted mri images using multiparameter feature blocks 2005
[29] C. Ramalakshmi, a.jaya chandran,"automatic brain tumour detection in mri images using neural network based classification", int journal of science research and management (ijsrm)volume issue 2iipages 109-113ii2013
[30] Jianguo liu, jayaram kudupa, dewey odhner, david hackney, "a system for brain tumour volume estimation via MRI image and fuzzy connectedness", else computerized medical imaging and graphics 29(2005) 21-34.

All Rights Reserved, @IJAREST-2016