International Journal of Innovative Research in Computer Science and Engineering (IJIRCSE)
www.ioirp.com ISSN: 2394-6364, Volume – 1, Issue – 6. May 2015

DETECTION AND CLASSIFICATION OF MRI BRAIN IMAGES USING A HYBRIDTECHNIQUE

[1]M.Kanagalakshmi, [2]Mrs.A.S.Shanthi.M.E.,(Ph.D).,
[12]Department of Computer Science and Engineering, Tamilnadu College of Engineering, Coimbatore, India.
[1]kanagalakshmigmp@gmail.com, [2]babushanthi@gmail.com.

***Abstract*— The main objective of this paper is to provide a hybrid technique for the detection of the MRI brain images by using principal component analysis and fisher linear discriminate analysis. After that the deducted tumor part is classified using support vector machine and self organizing mapping techniques. By using this techniques the tumor part can be able to identified into Grade I, Grade II and Grade III, Grade IV types.**

Keywords*— Principle Component Analysis (PCA), Fisher Linear Discriminant Analysis (FLDA), Support Vector Machine (SVM), Self Organizing Map (SOM).

I. INTRODUCTION

Brain tumor is one of the most serious life threatening disease. The tumor can be defined as the mass of tissues formed by an unregulated growth of abnormal cells in the brain. Tumors are found to be two types. The malignant type is cancerous and the benign type is non-cancerous. The first one can lead to death whereas the second can be able to cure. Diagnosis of brain tumor is a very crucial task. MRI scan can be used produce image of any part of the body and it provides an efficient and fast way for diagnosis of the brain tumor. The images obtained using MRI scanning is used in machine intelligence for deletion of diseases like after that the MRI image undergoes series brain tumor of follow steps for analysis using image processing techniques. In this paper the efficient detection and classification of MRI brain images is done with a help of hybrid can also help to identified the type of tumor from Grade I,II,III and IV finally the obtained type of tumor is subjected to undergoes analysis step.

II. EXISTING SYSTEM

Brain tumor is one of the major causes for the increase in the Mortality rate among the people Brain tumor are the tenth most common cause of cancer death in human beings especially among women. For this, many authors have been provided possible solution for this disease. The MRI image undergoes the series of steps for analysis using image processing techniques. The first step is preprocessing of the images. The preprocessing helps to identify different scale of signal intensities in different images which involves the operation to analyze the data by the extraction of information. The preprocessing includes two major steps. The noise removal and image enhancement. The noise removal can be done using fitters like median filters, sober filter, Robert and pre with filters; Palladian filters etc after that the edges can be preserved. The degradations such as noise blur and distortions also removed.

A. .Image Enhancement:-

The image enhancement methods are used to improve the visual appearance of images from magnetic resonance image. If provides mole accurate results. The techniques used are histogram equalization by removing the noise and then enhances by adjusting the value of parameter, k mean and fuzzy c-mean algorithm increases the performance. The Haarwavelet transform helps to accelercite the signals of damaged primitive feature using wavelet co-efficient for single degree of freedom system (SDOF). The contrast enhanced MRI has the capacity to correlate the features in mammograms by enhancing the regions which mammograms by enhancing the regions which can also be used to classify the 3D distribution of micro classification structures.

B. Image Segmentation:-

The image segmentation can be defined as partitioning or the separation of the region into similar attributes or characteristics based on the intensity region and there hold value. The following are the methods used already in segmentation. Principal component Analysis and kernel support vector machine is used to reduced up to 65536 to 1024 feature vector. The Gray level concurrence metric method provides texture based feature selection using this we can be able to get accurate results for

the smaller dataset. The discrete wavelet transform, PCA,K-Nearest neighbor classification helps in measuring skew ness, kurtosis specificity. The linear discriminate analysis, PCA and SVM provides accuracy of 98.87% PCA with supervised learning techniques produce around 95 – 96% recognition rate for 4-5 error images.

C. Image Classification:-

The classification method is used to separate the image to get the result of normal or abnormal regions. The classification techniques are as follows cellular Automata(CA) regimentation and ANN provides reliable segmentation only for small set of data. Multimodal fuzzy Image fusion helps to preserve the quality of the Image. PNN classification of the image encryption avoides explovation of the imag. Modified Probabilistic neural network model provides 100% accuracy whereas Back propagation network based classification produces 77.56% of accuracy. CBIR based on texture retrieval along with SVM classification suitable for detecting multiple sclerosis and tumors. Texture feature coding Method and SVM method provides 88% accuracy. Multi classification SVM helps to extracts the boundaries of 7 kinds of encephalic tissues successful and proved satisfactory generalization accuracy. Fuzzy logic is used to assign weights to different features values based on its discrimination. Capability. The sensitivity rate and specificity rate for the classifiers FP-NN is 95.9% and KNN obtain 96%. The sphere shaped support vector machine and immune algorithm is helpful in classifying data with high irregularities. Fuzzy logic is used to assign weights to different features values based on its discrimination capability.

D. Image Analysis:-

Finally the classified image undergoes analysis stage in order to get accurate results. The techniques used for analysis are 1) Region of interest which helps to convert text format into digital format 2) feature Maps which are masked by using non linear filtration.

III. PROPOSED SYSTEM

The proposed system was a hybrid technique for the detection and classification of the MRI Brain images. The following figure1.1 represents the block diagram.

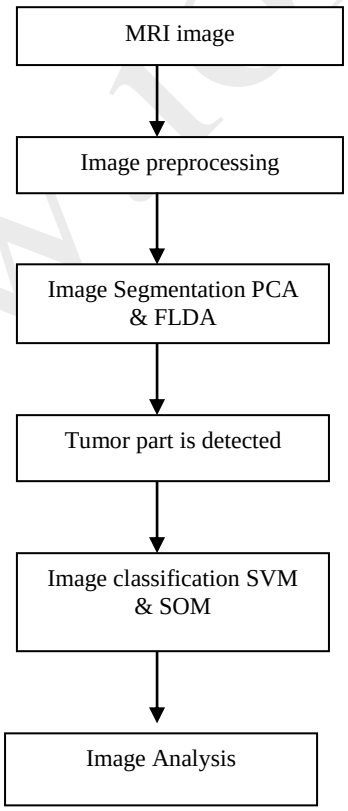

Fig1 Block Diagram

The MRI image is given as the input image. The first step is to perform the preprocessing of the MRI image the segmentation of the image is done using the Principal component analysis and Fisher Linear discriminate analysis. After segmentation the tumor part is detected. Now the detected region undergoes classification by support vector machine and self organizing map method in order to know that the detected part is of Grade I, Grade II ,Grade III or Grade IV. The implementation is done using Mat lab software.

IV. EXPERIMENTAL RESULTS

From the proposed methodology the MRI brain image is detected and classified. In the detection of tumor from the Brain MR Image the result of individual step are shown as figure (a) to(d) where (a)The original image (b)Weiner Filter(c) Enhanced Image (d) Image after segmentation to locate ROI. Fig.2 shows the result of classification in testing phase.

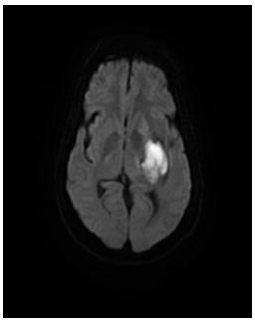

Fig (a)

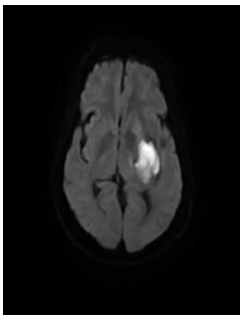

Fig (b)

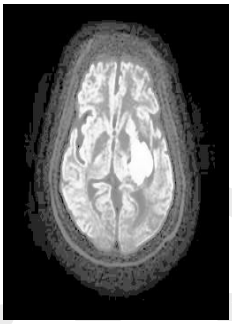

Fig (c)

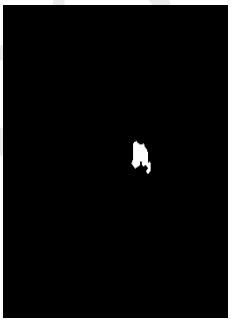

Fig (d)

The developed system efficiently classifies the input images of patients affected by Brain Cancer used during Recognition/Testing phase. The system shows the tumor affected region extracted from the outer skull of brain as an input image used for testing. The features extracted from this region are compared with stored features in Knowledge base. Since SVM classifier is a binary classifier it classifies the images into either normal or abnormal. The SVM is not accurate with a large dataset. The SOM classifies the abnormal images and displays the appropriate Grade type of the tumor. Grade I, Grade II and Grade III type tumors have shown 100% accuracy , which means that all the input images are correctly being predicted by the system.

Table 1 System Accuracy Rate

Feature Reduction Technique	No. of Images	No. of Correct predictions by SVM and SOM	Accuracy
PCA	15	13	83.33%
FDA	15	15	100%

The overall accuracy of the system is found to 91.665%.The SOM's performance graphs shown below. The results concludes that FDA adds much to the accuracy of the image classifiers than PCA.The image classifiers SVM and SOM are used .The first classifier detects the presence of brain tumor if any. The second classifier SOM identifies and displays the grades of the tumors. SVM classifier accuracy is less for the large dataset.SOM an ANN technique is proves to be the 100% accurate classifier. More features can be added to make the system effective, accurate and robust.

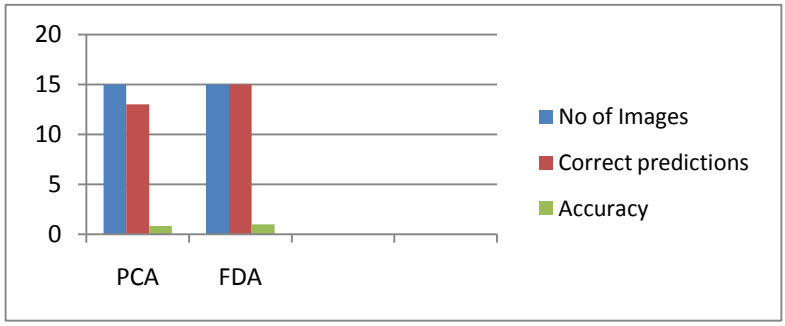

Fig 2 Performance Analysis chart of the system

V. CONCLUSION

In Modern sciences and technologies, images also gain much broader scopes due to the ever growing importance of scientific visualization. The techniques used here helps for focusing future develops in the field of medical image processing.

References

[1] Adyta P, Killdeer, Vienna Patel, and Meghan Bores (2012), "*Content Based Image Retrieval Approach to Tumor Detection in Human Brain Using Magnetic Resonance Image*", 1st International Conference on Recent Trends in Engineering & Technology, ISSN: 2277-9477.

[2] Ahmad, Mahmoodul-Hassan, Imran Shafi, and Abdelrahman Mubashir (2012),"*Classification of Tumors in Human Brain MRI using Wavelet and Support Vector Machine*",IOSR Journal of Computer Engineering (IOSRJCE), ISBN: 2278-8727Volume 8, Issue 2, PP 25-31.

[3] Ahmed Kharrat, KarimGasmi, MohamedBen Messaoud, NacéraBenamrane and Mohamed Abid (2010), "*A Hybrid Approach for Automatic Classification of Brain MRI Using Genetic Algorithm and Support Vector Machine*", Journal of Sciences ISSN 1583-0233, Issue 17,p.71-82.

[4] Atari Kothari (2012), "*Detection and classification of brain cancer using artificial neural network in MRI images*", World Journal of Science and Technology, 2(5):01-04 ISSN: 2231 – 2587.

[5] Bhopal Singh and Jai Singh (2011), "*Classification of Brain MRI in Wavelet Domain*", A journal of International Journal of Electronics and Computer Science Engineering,ISSN 2277-1956/V1N3-879.

[6] Ben George E, Karnan M (2012), "*MRI Brain Image Enhancement Using Filtering Techniques*", International Journal of Computer Science & Engineering Technology, Vol. 3 No. 9, 399-403.

[7] Ben George E, Karnan M (2012), "Feature Extraction and Classification of Brain Tumor Using Bacteria Foraging Optimization Algorithm and Back Propagation Neural Networks",European Journal of Scientific Research, 88 (3), 327-333.

[8] Ben George E, Karnan M (2012), "MR Brain Image Segmentation using Bacteria Foraging Optimization Algorithm", IJET-4.

[9] Daljit Singh, and Kamaljeet Kaur (2012), "*Classification of Abnormalities in Brain MRI Images Using GLCM, PCA and SVM*", International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-1, Issue-6.

[10] EL-Sayed A.EL-Dahshan, Abdel-BadeehM.Salem and Tamer.H.Youni (2009), "*A Hybrid Technique for automatic MRI brain images classification*", Volume LIV.

[11] Evangelia I. Zacharaki, Sumei Wang, Sanjeev Chawla, Dong SooYoo, Ronald Wolf, Elias R. Mel hem and Christos Davatzikos, "*MRI based Classification of tumor type and grade using SVM-RFE, Section of Biomedical Image Analysis*", Department of Radiology, University of Pennsylvania.

[12] Erdem Varol, Bilwa jGaonkar, Guray Erus, Robert Schultz and Christos Davatzikos, "Feature Ranking based nested Support Vector machine Ensemble for Medical Image Classification Section of Biomedical Image Analysis", Department of Radiology, University of Pennsylvania.

[13] Fany Jesintha Darathi R., K.S.Archana, 2013,"*Image Segmentation and Classification of MRI Brain Tumors Based on Cellular Automata and Neural Network*", International Journal Of Computational Engineering Research (ijceronline.com).

[14] GladisPushpaRathi V.P and Dr.Palani (2012), "A Novel approach for Feature Extraction and selection on MRI images for brain tumor classification", S Computer Science & Information

[15] Technology (CS & IT).

[16] Guruvasaki.R and Josephine Pushpa Arasi.A (2013), "*MRI Brain Image Retrieval Using Multi Support Vector Machine Classifier*", International Journal of Advanced Information Science And Technology (IJAIST) ISSN: 2319:2682 Vol.10, No.10.

[17] HaoZhang, Alexander C. Berg, Michael Maire and Jitendra Malik, "*SVM –KNN: Discriminative Nearest Neighbour Classification for Visual Category Recognition*", Computer Science Division, EECS Department, Univ. of California, Berkeley.

[18] Lei Guo, YouxiWu, Xuena Liu and Xuena Liu,"*Research on the Segmentation of MRI Image Based on Multi-Classification Support Vector Machine*" in the http://www.paper.edu.cn.

[19] Jaya J, Thanushkodi K, Karnan M (2009), "*Tracking algorithm for de-noising of MR brain I mages*", International Journal of Computer Science and Network Security 9 (11).

[20] Joseph Peter .V, Karnan M, (2013), "*Medical Image Analysis Using Unsupervised and Supervised Classification Techniques*, "International Journal of Innovative Technology and Exploring Engineering, Volume 3, Issue 5, Pp 40-45.

[21] Jiang uo Zhang, Kai-Kuang Ma and Meng Hwa Er," Tumor Segmentation from MRI Imaging by Learning via One-Class SVM".

[22] Kailash D. Kharat, Pradyumna P. Kulkarni and M.B.Nagori, 2012, "*Brain Tumor Classification Neural Network Based Methods*", International Journal of Computer Science and Informatics ISSN (PRINT): 2231 –5292, Vol-1, Iss-4.

[23] Kothavari. K et al,2013," A Hybrid approach for PNN-Based MRI Brain Tumor Classification and Patient Detail Authentication Using Separable Reversible Hiding", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, ISSN (Print) :2278 – 8875.

[24] Lalit P. Bhaiya and Virendra Kumar Verma, 2012," *Classification of MRI Brain Images Using Neural Network*", International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com.

[25] LeiGuo, YouxiWu, Xuena Liu and Xuena Liu,"*Research on the Segmentation of MRI Image Based on Multi-Classification Support Vector Machine*", in the website http://www.paper.edu.cn

[26] Logeswari T, Karnan M (2010), "An Improved Implementation of Brain Tumor Detection Using Segmentation Based on Hierarchical Self Organizing Map", International Journal of Computer Theory and Engineering, 2 (4), 1793-8201.

[27] Logeswari E, Karnan M (2010), "*An improved implementation of brain tumor detection using segmentation based on soft computing*" , Journal of Cancer Research and Experimental Oncology 2 (1), 006-014.

[28] Mehdi Jafari and Shohreh Kasaei, 2011,"*Automatic Brain Tissue Detection in Mri Images Using Seeded Region Growing Segmentation and Neural Network Classification*", Australian Journal of Basic and Applied Sciences, 5(8): 1066-1079, ISSN 1991-8178.

[29] Mussarat Yasmin, Muhammad Sharif and Sajjad Mohsin, 2013"*Neural Networks in Medical Imaging Applications: A Survey*" World Applied Sciences Journal 22, ISSN 1818-4952.

[30] Neeraja R Menon, Karnan M, R.Sivakumar R(2013), " *Brain Tumor Segmentation In MRI Image Using Unsupervised Artificial Bee Colony And FCM Clustering*", International Journal of Computer Science and Management Research, Volume 2 Issue 5, 2450-2454.

[31] Seetha M et al., 2008,"*Artificial Neural Networks and other methods of image classification*", Journal of Theoretical and Applied Information Technology.

[32] Pankaj Sapra, Rupinderpal Singh, and Shivani Khurana (2013), "*Brain Tumor Detection Using Neural Network*", International Journal of Science and Modern Engineering (IJISME) ISSN: 2319-6386, Volume-1, Issue-9.

[33] Rajeswari.S and TheivaJeyaselvi.K, "*Support Vector Machine Classification for MRI Images*", International Journal of Electronics and Computer Science Engineering, ISSN 2277-1956/V1N3-1534-1539.

[34] Sahasrabudhe, and Megha Borse (2013), "*Classification of brain Encephalic tissues from MRI Images using Sphere Shaped Support Vector Machine (SSSVM)*", International Journal of Scientific & Engineering Research, Volume 4, Issue 7, ISSN 2229-5518.

[35] R. Xu, X. Zhao, X. Li, C. Kwan, and C.-I Chang, "*Target Detection with Improved Image Texture Feature Coding Method and Support Vector Machine*", World Academy of Science, Engineering and Technology Vol:15 2008-03-23.

[36] Raja Lakshmi. N and Lakshmi Prabha.V," 2013,"Automated Classification of Brain MRI Using Colour converted k-means Clustering Segmentation and Application of Different Kernel Functions with Multi-Class SVM",.

[37] Ramalakshmi Can JayaChandran .A (2013), "*Automatic Brain Tumor Detection in MR Images using Neural Network Based Classification*", International Journal of scientific research and Management (IJSRM) Volume1,Issue 2,|Pages 109-113 ,ISSN (e): 2321-3418.

[38] Sindhumol S, Kannan Balakrishnan and Anil Kumar (2013), "*Brain Tissue Classification from Multispectral MRI by Wavelet based Principal Component Analysis*",I.J. Image, Graphics and Signal Processing.

[39] Selvaraj .H, ThamaraiSelvi .S, Selvathi,and Gewali .L(2007), "*Brain MRI Slices Classification Using Least Squares Support Vector Machine*", IC-MED Vol. 1, No. 1, Issue 1, Page 21 of 33.

[40] Sindhumol S, Anilkumar and Kannan Balakrishnan (2013), "Abnormality Detection from Multispectral Brain MRI using Multiresolution Independent Component Analysis", IJSPIPPR VOL-6.

[41] Shweta Jain and Shubha Mishra (2013), "*ANN Approach Based On Back Propagation Network and Probabilistic Neural Network to Classify Brain Cancer*", International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-3 Issue- 3.

[42] Sudeb Das,Manish Chowdhury, and Malay K. Kundu (2013), " Brain MR Image Classification using Multiscale Geometric Analysis of Ripplet by, Progress In Electromagnetics Research", Vol. 137.

[43] ShwetaJain, "*Brain Cancer Classification Using GLCM Based Feature Extraction in Artificial Neural Network*", International Journal of Computer Science & Engineering Technology (IJCSET).