Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 2, Issue. 11, November 2013, pg.117 – 122

REVIEW ARTICLE

Review of Image Processing Techniques for Automatic Detection of Tumor in Human Brain

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Abstract- The review paper describes the various image processing techniques for automatic detection of tumor in human brain. Tumor in human brain cause problem in speech learning, loss in memories, hearing problem, problems in talking and understanding etc. It is a life threatening disease which has been a challenging phenomenon for both medical and engineering technologists. In this paper image processing techniques for automatic detection of brain tumor are discussed and these techniques include the image acquisition, preprocessing and enhancement, image segmentation, classification and volume calculation steps.

Keywords- Image Preprocessing and Enhancement; Segmentation; Classification; Volume calculation

I. INTRODUCTION

Medical image processing and analysis is one of the blessings of technique and science to detect degenerated tissue. In recent years, medical imaging aims to make diagnosis possible in a way as noninvasive as possible. There are various types of medical imaging technologies based on noninvasive approach like MRI,CT scan . In automated medical diagnostic systems, MRI (magnetic resonance imaging) gives better results than computed tomography (CT) as MRI provides greater contrast between different soft tissues of human body. Hence MRI is much more effective in brain and cancer imaging.[1]

Many disorders of brain exist these days out of which degenerated tissue(tumor) is spreading at an alarming rate. Even more than 400000 persons per year in the world (based on the World Health Organization (WHO) estimates) are suffering from this disorder.

The brain is a highly specialized and sensitive organ. It serves as the control center for functions of the body and allows us to cope with our environment. The higher functions of body like vision, hearing, speech, fine controls of movements, posture balance etc are controlled by brain.

A brain tumor is any intracranial mass created by abnormal and uncontrolled cell division. Tumors can destroy brain cells and tumors can also spread outside the brain and are more harmful and should be treated..[2] Any disorder in brain may cause diminished speech and memory difficulty, problem in talking, understanding. Early and accurate detection of degenerated tissue is very difficult task due to very complex structure of brain.

For this reason, fully automatic based histogram thresholding segmentation techniques are applied on MRI images of brain.[3] After that, classification techniques are applied on segmented images to classify tissue into two types, normal and abnormal(tumor).Then abnormal tissue's image is further investigated for extracting useful information from segmented image with the presence of some noises. Then volume calculation is carried out to identify its size.

II. LITERATURE REVIEW

Several studies are reported in literature for automatic detection of tumor in human brain. The work is as follows:

In year 2010, Ehab F. Badran, Esraa Galal Mahmoud and Nadder Hamdy performed a work, "An Algorithm for Detecting Brain Tumors in MRI Images"[4] **.**In this paper for defining the tumor region and classification of tissues, a computer based method has been applied on MRI images of brain. For automatic detection of brain tumor, a method is used that include various steps of image processing like image preprocessing, image segmentation, feature extraction and classification using neural network.

In year 2010,T.Logeswari and M.KARNAN performed a work, "An Enhanced Implementation of Brain Tumor Detection Using Segmentation Based on Soft Computing"[5].In this paper image segmentation method is described in details. The process of segmentation applied by author consist of two phase. In first phase MRI image of brain is collected. After that using preprocessing technique image is converted into standard form. And in second phase for image segmentation Hierarchical Self Organizing Map(HSOM) method is applied on image.

In year 2011, Dr. Samir Kumar Bandyopadhyay proposed " Detection of Brain Tumor-A Proposed Method"[6] . In this review paper author has also described the types of brain tumor, its anatomy and its symptoms. And various classification techniques are discussed. For detection of tumor in brain, author has used Computer Aided Diagnosis technique ,and for classification of tumor various methods like Artifical Neural Networks, Support Vector Machines etc. are discussed.

In year 2011,K.S.Angel Viji and Dr.J.Jayakumari proposed," Automatic Detection of Brain Tumor based on Magnetic Resonance Image using CAD System with watershed segmentation"[7]. In this paper, author has applied watershed segmentation on 3D image of MRI data.3D SLICER software is used by author to convert 2D MRI image into 3D Image. After Segmentation investigations is done for the improvement of 2D and 3D visualization of tumor.

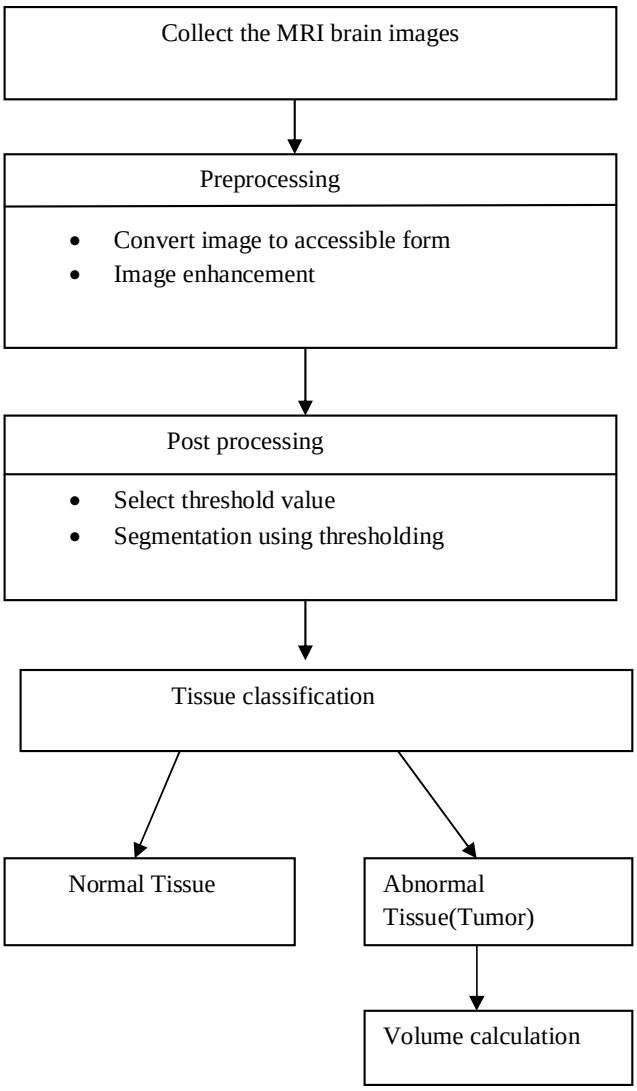
In year 2013, K.Elavarasi, A.K.Jayanthy performed a work," Soft sensor based brain tumor detection using CT-MRI"[2]. In this paper author has applied various image processing techniques and various morphological operations on CT and MRI images of brain and output of both image set are then compared.

In year 2013,Rosy Kumari proposed,"SVM Classification an Approach on Detecting Abnormality in Brain MRI images"[8]. In this paper author has described classification technique to classify the brain tumor .The proposed method applied by author consist of two stages-to extract the feature and its Classification. In this SVM classifier types and their performance are discussed.

In year 2013, A.Sivaramakrishnan1, Dr.M.Karnan performed a work,"A Novel Based Approach for Extraction of Brain Tumor in MRI Images Using Soft Computing Techniques"[9].In this paper, for detection of brain tumor, author used Fuzzy C-means clustering and histogram techniques and for its classification into normal and abnormal type, K-nearest neighbor method is used.

III. METHODOLOGY

The sequence of operations for detection of tumor area in MRI images of brain contain various steps like preprocessing, postprocessing, classification and volume calculation and these are shown in following figure:



a. Image preprocessing and enhancement

Before detecting the tumor in the image , preprocessing is done for increasing the reliability of optical inspection. Initially the MRI images of brain are acquired and they are pre-processed in order to extract the necessary information. During the process of image formation, the quality of images may degrade due to variety of causes such as out of focus, presence of noise, distortion of optical systems, the relative motion between the camera and the scene etc. Various preprocessing techniques are carried out ,each frame of image is converted from RGB to greyscale mode.[2] [10]

The aim of image enhancement is to improve the interpretability of information in images , or to provide better input for other automated image processing technique. In enhancement stage, film artifcates such as labels and marks on the MRI image and the high frequency components are removed. After applying enhancement techniques the MRI image is converted into standard image without noise, film artifacts and labels. Various image enhancement techniques like median filter, Gaussian filter, normalization methods are employable .[2] [10]

b. Image Segmentation

The Segmentation of an image entails the division or separation of the image into regions of similar attribute. The main objective of image segmentation is to extract various features of image which can be merged or split in order to build object of interest on which analysis and interpretation can be performed. It includes clustering, thresholding etc. Global Thresholding method is simple and effective technique that is most recurrently used for segmentation. Threshold segmentation is technique of converting gray scale image into binary image.[4] [9]

c. Feature Extraction

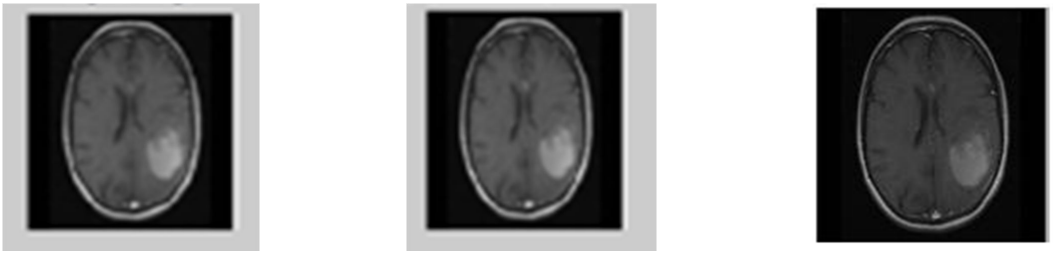
Feature Extraction is a methodology of extracting meaningful features (region of interest) from input image. In the study, we extract degenerated tissue (maximal area) from the segmented image with the presence of minimal superfluous elements and it represents reduction of dimensionality. It is challenging task to extract useful information for volume calculation.

d. Tissue classification

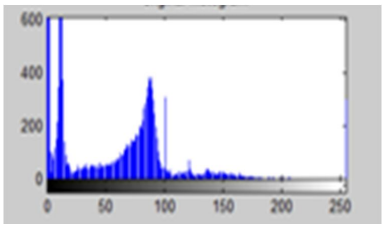
Tissues classification technique ,classify the tissues into two classes namely Normal and Abnormal (tumor) tissue. Classification is performed by starting with the more discriminative features and gradually adding less discriminative features, until classification performance no longer improved. Various classification techniques like SVM, Artificial neural network, k-Nearest Neighbor (k-NN) etc. are used for this purpose.[1]

IV. RESULTS

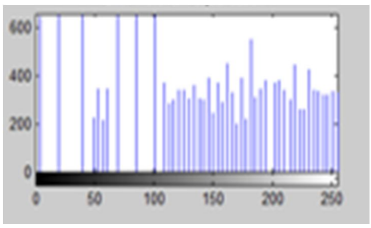
As a part of survey of various image processing techniques, the author has implemented some of the techniques like image preprocessing,, histogram equalisation etc. on MRI image of human brain and result are shown as follows:



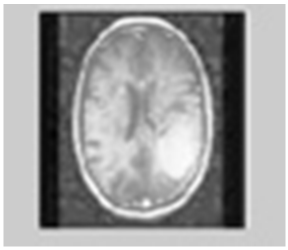
a) Original image b) Grayscale of original image c) Enhanced contrast image



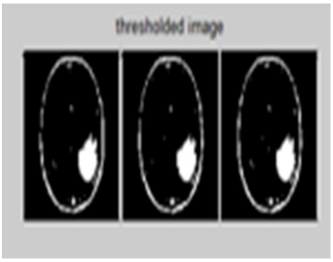
d) original histogram



e) histogram after equalization



f) image after histogram equalization



g) image after thresholding

V. CONCLUSION

As a part of review of various techniques are used for automatic detection of tumor in human brain. The author of this paper concluded that for detection of tumor in brain firstly a MRI image is acquired. After image acquisition, preprocessing is done by applying thresholding, increasing contrast and histogram equalization on image. After that image is segmented using various techniques like k-mean clustering, fuzzy c-mean clustering, thresholding segmentation etc. Then classification is done for deciding whether tissue is normal or abnormal (tumor).In last volume of tumor is calculated to identify its size.

REFERENCES

[1] Dipali M. Joshi, Dr.N. K. Rana, V. M. Misra," *Classification of Brain Cancer Using Artificial Neural Network*" 2010 2nd International Conference on Electronic Computer Technology (ICECT 2010)

[2]] K.Elavarasi, A.K.Jayanthy." *Soft sensor based brain tumor detection using CT-MRI*" International Journal of Science, Engineering and Technology Research (IJSETR) Volume 2, Issue 10, October 2013

[3] Dr.N. NandhaGopal," *Automatic Detection Of Brain Tumor Through Magnetic Resonance Image*" International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 4, April 2013

[4] Ehab F. Badran, Esraa Galal Mahmoud, and Nadder Hamdy," *An Algorithm for Detecting Brain Tumors in MRI Images*" IEEE Conference Publication Annual IEEE,Publication year 2010

[5] T.Logeswari and M.KARNAN," *An Enhanced Implementation of Brain Tumor Detection Using Segmentation Based on Soft Computing*" 2010 International Conference on Signal Acquisition and Processing

[6] Dr. Samir Kumar Bandyopadhyay," *Detection of Brain Tumor-A Proposed Method*" Volume 2, No. 1, January 2011 Journal of Global Research in Computer Science.

[7] K.S.Angel Viji and Dr.J.Jayakumari," *Automatic Detection of Brain Tumor based on Magnetic Resonance Image using CAD System with watershed segmentation"* Proceedings of 2011 International Conference on Signal Processing , Communication, Computing and Networking Technologies(ICSCCN 2011)

[8] Rosy Kumari," *SVM Classification an Approach on Detecting Abnormality in Brain MRI Images*" International Journal of Engineering Research and Applications (IJERA) Vol. 3, Issue 4, Jul-Aug 2013, pp.1686-1690

[9] .Sivaramakrishnan1, Dr.M.Karnan,"*A Novel Based Approach for Extraction of Brain Tumor in MRI Images Using Soft Computing Techniques"* International Journal of Advanced Research in Computer and Communication Engineering Vol. 2, Issue 4, Publication year april 2013

[10] K.Selvanayaki*, Dr. M. Karnan." *CAD System for Automatic Detection of Brain Tumor through Magnetic Resonance Image-A Review"* K.Selvanayaki et. al. / International journal of Engineering Science and Technology Vol. 2(10), Publication year 2010, 5890-5901

