Brain Tumor Detection Using Otsu Method and Feature Extraction with DWT and GLCM

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***Abstract*: Tumor in brain is a lifestyles threatening disorder and its early detection may be very vital to protect life. The tumor area may be detected by segmentation of brain Computed Tomography(CT), in the case of suspected brain tumor, the vicinity and length of tumor may be determined with the help of radiologic reviews. The report of this assessment is very essential for futher analysis. CT uses a combination of X-rays and a computer to create pictures of body organs, bones, and other tissues. It shows more detail than a regular X-ray. CT scan image is a diagnostic technique used to detect the tumor in brain and classify that tumor is Benign or Malignant. Difficult to detect tumor because of such variations so that the techniques used in this project are Image Preprocessing, Segmentation, Feature extraction and classification.**

***IndexTerms:* CT Image, Segmentation, DWT, GLCM, SVM**

I. INTRODUCTION

Tumor in brain is a collection of unusual cells that grows out of manage of the ordinary forces within the brain or around the brain. Diagnosis of brain tumors is dependent on the detection of strange brain structure, i.e. tumor with the genuine region and orientation. Brain tumor are of two types beginning or Benign tumor and malignant tumors. Beginning tumors are generally need not to be treated. Malignant tumor is essentially termed as brain cancer. Now a day's CT (Computed Tomography) image is an crucial tool for detection of brain tumor for the doctor. Here We used in this project is CT image, The cross-sectional images generated during a CT scan can be reformatted in multiple planes Computed tomography (CT) is a diagnostic imaging test used to create detailed images of internal organs, bones, soft tissue and blood vessels., and can even generate three-dimensional images which can be viewed on a computer monitor, printed on film or transferred to electronic media. CT scanning is often the best method for detecting many different cancers since the images allow your doctor to confirm the presence of a tumor and determine its size and location.

II. LITERATURE SURVEY

Swati Ghare, Nikita Gaikwad[1] , in this paper they proposed the possibility of brain tumor using image segmentation and they proposed an approach for the form and range of tumor in brain with simple set of rule implementation using Magnetic Resonannce Imaging(MRI). Here Fuzzy C means was used for segmentation to get the exact shape of the malignant tumor.

Dina Aboul Dahab, Samy S. A. Ghoniemy[2], they proposed for the brain tumor classification they used modified Probabilistic Neural Network model based on Learning Vector Quantization with the help of Magnetic Resonance Imaging. Many image segmentation techniques are applied on the MRI for brain tumor detection. For this brain tumor classification there are four steps , the first step ROI segmentation was done where boundary of tumor identified and the second step includes feature extraction from ROI, third step was feature selection and the fourth step was the classification brain tumor.

V.P.Gladis, Pushpa Rathi and Dr.S.Palani[3] , in this paper they proposed the method for classification of brain tumor MRI images into normal and abnormal one. This approach contains number of features and classifies the tumor into matter and area. Support Vector Machine classifier is used here for the comparison of linear and nonlinear techniques. For the classification of data and dimensionality reduction Principle Component Analysis and Linear Discriminant Analysis are used here in this paper.

Rohini, Paul Joseph, C. Senthil Singh[4], proposed that the K-means clustering algorithm used for the segmentation of brain MRI image. To avoid Misclustered regions that can be formed after segmentation of brain MRI image for detecting the tumor Morphological filtering was used. Morphological operation called Erosion used for the thinning of the objects and another morphological operator Dilation used for thickening of the objects in image.

Khalil Tarhini, Soha Saleh[5] proposed to create a segmentation software to extract an injured location within the brain with minimal user contribution. A Matlab set of rules changed into advanced with a graphical consumer interface (GUI) to effortlessly perceive a lesion, highlight a voxel in it and choose to extract it and show it as a three dimensional image. The algorithm used a series of morphological image processing steps followed by way of location growing segmentation. The outcomes of the advanced application verified a extraction of lesion from MRI information of patient with ischemic stroke.

Jin Wang, Can Feng[6] proposed a completely automated technique for brain tumor segmentation from multispectral human mind MRIs. To classify the brain tumor and normal brain tissue inside the whole picture the sparse representation category turned into applied. At closing, the Markov random field regularization added spatial constraints to the SRC. The brain tumor segmentation outcomes of their set of rules for a actual affected person and simulated 3D information. By using comparing the outcomes it became discovered that Jaccard ratings of SRC are higher than the ones of MLR classifier and efficiency was increased from 82 to 93%.

Shubhangi Handore and Dhanashri Kokare[7] proposed a system that Image processing plays an important role in medical field. Various numbers of methods are available for tumour detection in image processing as Edge detection, segmentation (using Watershed transform). Here, after observing results watershed segmentation gives the exact results i.e. extracted tumour area.

III. METHODOLOGY

Proposed Work carried out the processing of CT Brain images for the detection and classification of tumor like Benign or Malignant by using the SVM classifier. The Image Processing techniques like segmentation, feature extraction using DWT and GLCM and classification by the SVM used for the detection of tumor in Brain. Figure 1 shows the block diagram for the proposed Methodology.

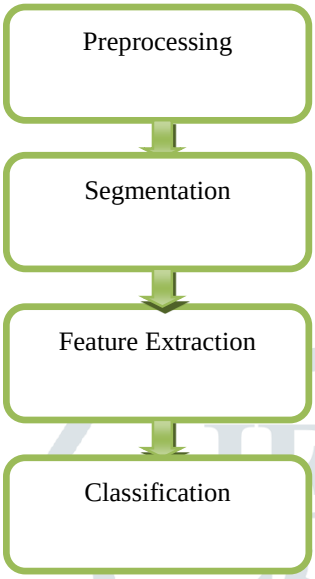

Figure1. Block Diagram for Proposed Methodology

A. PREPROCESSING

In the Preprocessing step of proposed methodology firstly it takes CT image as Input , then Noise removal process is done on that image, Median filter is used for the noise removal process. Median filter is a nonlinear operation often used in image processing to reduce noise. RGB to gray coversion is done after noise removal, RGB is color image and using this image we can get any image. Grayscale intensity is stored as an 8-bit integer giving 256 possible different shades of gray from black to white. Then Grayscale image is converted to binary, binary image is a digital image that has only two possible values for each pixel, the two colors used for a binary image are black and white. After this step image enhancement is done and this is process of adjusting digital images so that results are more suitable for further processing. Morhological structuring element Strel is used. A `strel` object represents a flat morphological structuring element which is an essential part of morphological dilation and erosion operations. Figure2 represents the Block diagram for the Preprocessing.

B. SEGMENTATION

For medical image segmentation there are many algorithms utilized by the researchers. Among many segmentation algorithms, otsu algorithm is used in this paper for the segmentation of CT brain images. Otsu calculates a global threshold by accepting the existence of two classes, foreground and background pixels, and choose the threshold that minimizes the interclass variance of the threshold black and white pixels. Converting a gray scale image to binarize is a common image processing task. In this paper, image processing methods are presented for automatically finding the optimum global threshold value.

C. FEATURE EXTRACTION

- In this paper DWT is used for the feature extraction. DWT's are particularly effective in analysing waveforms which have spikes or pulses buried in noise. The noise may be more effectively removed than with FT filtering and the shape of the pulses preserved. Conservation of energy similar to a Parseval theorem would also be nice. The Discrete Wavelet Transform(DWT) generates matrix Wkn which is now widely used for image compressioninstead of the FT since it is able to localise preserve photographic detail such that many of the coefficients may be ignored and yet the reconstruction remains effective.
- GLCM technique is used for the feature extraction, gray level cooccurance matrix as it involve the information about position of pixels having similar gray level values. In the feature extraction required information is extracted from the input data and distract unnecessary data. By applying GLCM calculation of 13 features they are
- Mean
- Standard Deviation
- Variance
- Homogeneity
- Entropy
- RMS
- Smoothness
- Kurtosis

- Skewness
- Correlation
- Energy
- IDM
- Contrast

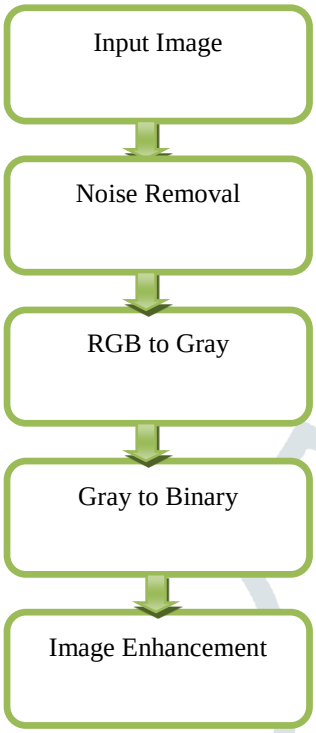

Figure2. Block Diagram for Preprocessing

D. CLASSIFICATION

The classifier used in this paper is Support Vector Machine and this is one of the finest classifier suggested by the many researchers and this used for the brain tumor detection of CT images. Features are extracted using discrete wavelet transform and glcm and that obtained features are given as input to the SVM to classify. The output of SVM classifier was obtained as Benign or Malignant.

IV. OBJECTIVE

- Using Image Processing tumor in brain is detected.
- To increase accuracy of the system.
- To extract valuable and currect information from the images with least error possible.

V. ADVANTAGES

- In the image segmentation of the proposed methodology morphological filtering is used to get more accuracy.
- In medical management CT is more effective.

VI. RESULT FLOW

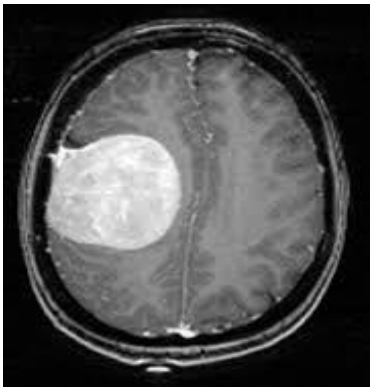

Figure3. Brain CT Image

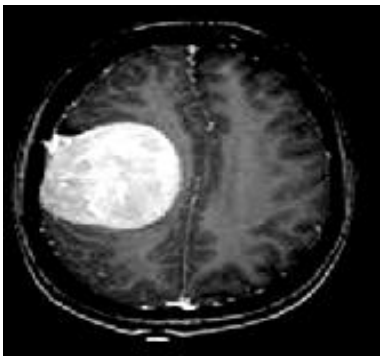

Figure4. Enhanced Image

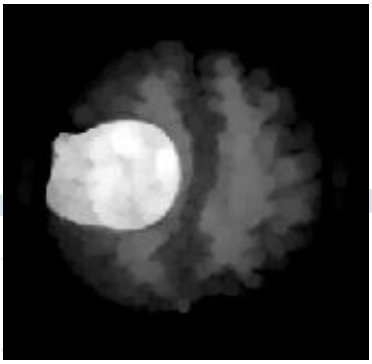

Figure5. Morphological Image

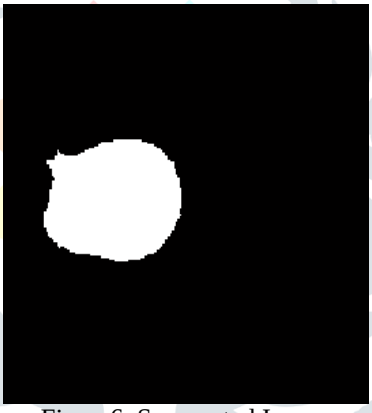

Figure6. Segmented Image

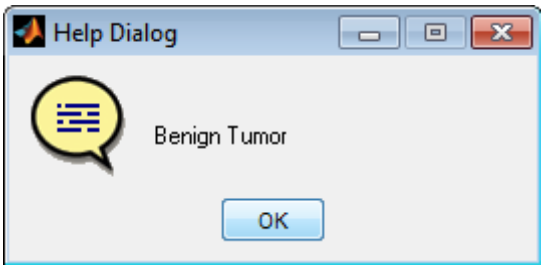

Figure7. Tumor Type Detected

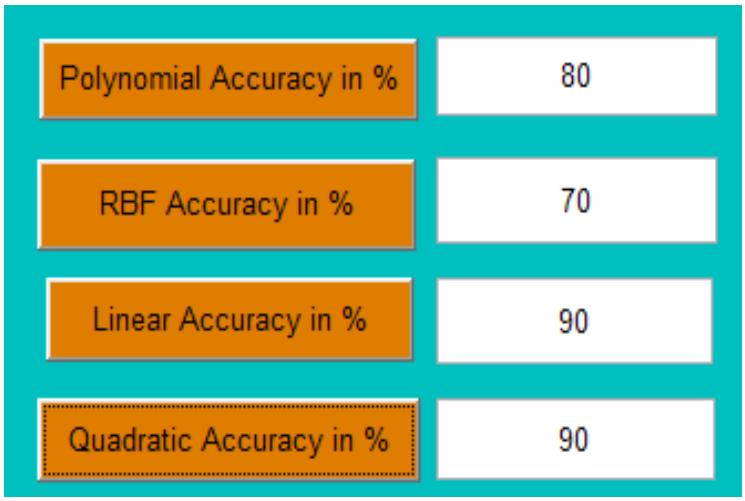

Figure8. Accuracy detected for the Tumor Image

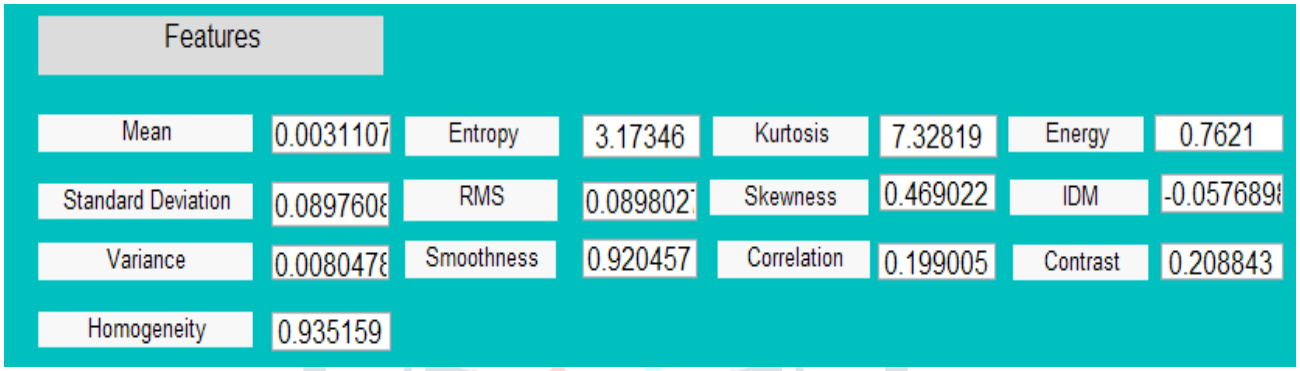

Figure9. GLCM 13 features with values

VII. CONCLUSION

This paper describes the tumor detection in brain using otsu thresholding algorithm, feature extracted by using DWT and GLCM and classification by the SVM classifier.In this paper Digital Image Processing Techniques are important for the Brain tumor detection by the Computed Tomography(CT) images. The work done in this paper for the tumor detection in brain will help the doctor to save the beloved time and it will help the pathologist to examine the tumor automatically in less time.

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