Brain Tumor Detection Using KNN

Miss. Priyanka Aiwale,
E&TC Department, D.Y.P.S.O.E Pune, Maharashtra, India
E-mail - aiwalepriyanka9@gmail.com

Dr. Saniya Ansari
E&TC Department, D.Y.P.S.O.E Pune, Maharashtra, India
E-mail- ansari.saniya6@gmail.com

ABSTRACT

Abstract- Detection of Brain Tumor is actually a difficult task and the correct analysis of the Tumor structure is also difficult as a result an automatic method for the detection of Tumor is in usage nowadays. Undoubtedly, this saves the time as well as it gives more accurate results as in comparison to manual detection. The proposed method is a novel approach for detection Tumor along with the ability to calculate the area (%age) occupied by the Tumor in the overall brain cells. Firstly, Tumor regions from an MR image are segmented using an OSTU Algorithm. KNN& LLOYED are used for detecting as well as distinguishing Tumor affected tissues from the not affected tissues. 12 features are extracted like correlation, contrast, energy, homogeneity etc. by performing wavelet transform on the converted gray scale image. For feature extraction DB5 wavelet transform is used.

Keywords- *KNN& Lloyd, wavelet transform, tumour, MRI image*

1. INTRODUCTION

The development of additional phones frequently shapes a mass of tissue called a development or tumour. Cerebrum Tumor is one of the real reasons for death among individuals. The manifestations of a mind Tumor rely upon Tumor size, sort and area. Indications might be caused when a Tumor pushes on a nerve or damages a piece of a cerebrum. Additionally, they might be caused when a Tumor obstructs the liquid that moves through and around the or when the mind swells since develop of liquid. Cerebral pains, queasiness and heaving, Changes in discourse, vision or hearing, issue adjusting or strolling, changes in temperament, identity or capacity to focus, issues with memory, muscle snapping or tingling, deadness or shivering in the arms or legs. Accurate identification of the type of mind variation among the majority is extremely basic for treatment arranging which could restrict the deadly outcomes. [2]

Detection of mind Tumor manually is a recurring activity which consumes a lot of time and also the results are not accurate, shifts starting with one specialist then onto the next. PC supported robotized frameworks provides the appropriate outcomes. Not only being exactly same, these procedures must scope at a brick pace with a mind set that the final target for their implemation on continuous applications. MRI helps in analyzation of brain Tumor along with CT images as well as ultrasonic or X-Rays. MRI (Magnrtic Resonance Imaging) is an essential instrument utilize in a great many fields of recommendation which is outfitted for producing a explicit image of any part of the body of human. X-ray remains for MRI. A Magnetic Resonance Imaging scanner make use of magnets for the objective of enrapturing as well as for energizing hydrogen cores (single proton) in tissue of humans, that produces a flag that can be distinguished and it's encoded spatially, bringing about images of the body. The MRI machine produces radio recurrence

(RF) beat that particularly ties just to hydrogen. The framework sends the beat to that particular territory of the body that should be inspected. Because of the RF beat, protons here retain the vitality expected to influence them to turn in an alternate heading. This is implied by the reverberation of MRI. The RF beat influences the protons to turn at the larmour recurrence, in a particular bearing. This recurrence is discovered in light of the specific tissue being imaged and the quality of the principle attractive field. [5]

Grouping of the mind Tumor is likewise a vital undertaking for treatment arranging. There are two sorts of Tumor which are-benevolent (non-destructive) and threatening (carcinogenic) tumours. Ordinary strategies include intrusive systems, for example, biopsy, lumbar cut and flag tap technique, to identify and group cerebrum Tumor into benevolent and harmful which are exceptionally agonizing and tedious. Wavelet investigation is a practicable strategy suitable to unveil various sections of information which other flag as procedures for examination. Segmented the images at a great many levels, this method can eliminate much better reason of interest from itself as well as thusly inflates the behaviour of the image. What is more, for the process of compacting or de-noising a flag, equipment of it is done with no extensive debasement. It is actually of from almost all importance when there ought to develop an event of flimsy details, for instance, when there to be an event of therapeutic imaging [7]

2. RELATED WORK

In below section, various techniques are utilized in literature by various authors who summarized grounded on primary categories such as segmentation, feature extraction as well as classification method used.

Different methods Used in previous research work.

Jin Liu, Min Li, Jianxin Wang et al, studies the MRI based brain Tumor segmentation which is more and more attractive because of good soft tissue contrast and non-invasive imaging of Magnetic Resonance Imaging images. They purposed to make an extensive introduction for MRI-based brain Tumor segmentation strategies. Then, the pre processing activities as well as the state-of-the-art methods of MRI based Tumor segmentation are actually introduced. [1]

Pavel Dvorak and Bjoern Menze et al, Indeed, even under treatment, patients don't make due all things considered over fourteen weeks after conclusion [3]. Present day medicines incorporate surgery, radiotherapy, chemotherapy or all of them. X-ray is very beneficial to make use of gliomas in various clinical practices, as it is conceivable to procure MRI arrangements giving corresponding information. An actual division of glioma's as well as its intra-tumoural structures is essential for treatment arranging, and also for the regular follow-up schedules. Be that as it may, manual division is laborious and subjected to between along with intra-rater blunders hard to summarize. In this manner, doctors more often than not utilize harsh measures for assessment. Hence, accurate self-loader or perhaps programmed techniques are needed. [4]

V. Karthikeyan, B. Menze and K. Sreedhar et al, the Tumor mass impact alter the couse of action of the encompassing typical tissues. Along these lines, the emphasis is on planning structures as opposed to creating handmade elements, which may require particular learning. CNNs have been utilized to win a few question acknowledgment [6], [12] as well as challenges of natural picture division [5]. Since a CNN operates over patches utilizing pieces, it has the benefit of considering as well as being used with crude information. In the arena of mind Tumor division, late proposition additionally examine the utilization of CNNs [11].

J. Selvakumar, A. Lakshami & T. Arivoli et al, analyzes the methodologies carried out by the image

Intensification used in Mathematical Morphological [MM] theory on the dark images. Some Morphological Transformation have been processed through Block Analysis, Morphological Operation and Opening by Reconstruction on the Images with poor lighting. Analysis of the methods which is mentioned above illustrated through the processing of images with various filtering techniques along with various background images of less intensity of light. [7]

Raunaq Rewari, with the utilization of pan morphological methods for the purpose of detection of various background features of the images with poor lighting has implemented the improvement in the digital images. The intial operator works with the information reterived from the block analysis while the next tranformation make use of the reconstruction opening employed to state various backgrounds. Lastly, through the images with different backgrounds, most of them light backgrounds, the performances of the proposed operators are processed. [8]

Stefan Bauer, Roland Wiest et al, are the creators decided on 2D filters despite the fact that 3D filters can exploit the 3D way of the pictures; however, it builds computational load. The vast spatial and basic fluctuation in mind tumours is additionally an essential worry that we think about utilizing information growth. [9]

K. Sreedhar and B. Panlal, taken automation of brain Tumor segmentation continues to be a challenging task because of significant variations in its structure. In this paper, an automated brain Tumor segmentation algorithm using deep convolutional neural network (DCNN) is presented. [12]

Nikesh T. Gadare, Dr. S. A. Ladhake, et al, implemented few of the transformations which were morphological in nature and these were processed through block analysis, morphological operations followed by reconstruction opening of images with less intensity of light. Through Weber's Law Operator, Background detection and Image enhancement are illustrated. In Mathematical Morphology it has transformation that enables filtering of the Image with new contour leads to closing by reconstruction and opening by reconstruction. [13]

Bjoern Menze and Pavel Dvorak worked on the medical images includes an excessive similarity in the intensities of close by pixels and a powerful correlation of various image modalities. All the images deal with correlation used by local image patches. As well as, there is a high correlation between close labels in the image; this feature is utilized in "local structure prediction" of the local label patches. For 3D segmentation tasks and for systematically evaluating different parameters that are appropriate for the dense annotation of anatomical" structures, local framework prediction approach is used by them. [14]

Vaishnavi S. Mehekare, Dr.S.R., Ganorkar, from all among cerebrum tumours, Glioma are the most widely recognized, forceful, prompting a brief long term in their most lofty evaluation. There are different proposes of automatic division strategy in light of Convolutional Neural Networks), investigating little kernel. The use of kernel permits outlining a far more deep design, apart from not having a destructive outcome against over fitting, provided the less number of weights in the system.. [15]

3. PROPOSED METHODOLOGY

Image processing techniques are being used to detect the bain tumour. For the purpose of detecting Tumor in the MRI images we are using MATLAB software here. The figure shown below is the block diagram of the proposed system.

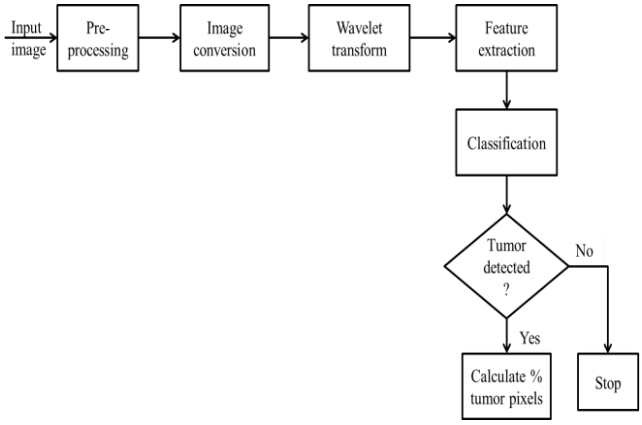


Figure 1: Block Diagram of proposed system

The detail description of system proposed is as follows:

- **Pre-processing:** It generally entails removal of background noise having frequency low, normalizing the intensity of the individual particles' images, masking of some portions of the images and removing reflections. Image pre-processing is the method to improve data images prior to computational processing.
- **Image conversion:** In greyscale image or RGB image is that image the value of each pixel is only a single sample which carries information related to the intensity of light or in other words which reprensents only the amount of light. This sort of images is composed of various shades of gray colour. The range of the contrats from black colour at the weakest intensity to the white colour at the strongest. Keeping this in mind, the conversion of the image in black and white is done. As we understand Tumor is actually big enough to not deemed as tiny bound, therefore we are going to detach little pixel bound.
- **Wavelets transform:** The Daubechies wavelets, based on each wavelet type of this class, there is a scaling function (called the father wavelet) which generates an orthogonal multi resolution analysis. the scaling filter associated with the Daubechies wavelet specified by wname. Where f is a real-valued vector.
- **Feature extraction:** For the purpose of extracting features from input image different operations are needed to perform like entropy, contrast, correlation, energy, root mean square, standard deviation etc.
- **Classification:** KNN & LLOYED for the purpose of classifying the tissue into normal or cancerous. If the tissue is normal or not-infectious, no Tumor detected displays on MATLAB output window. If in case the tissue is infectious or in simple words we can say that if Tumor is detected then the following steps are taken.

Step 1: For smoothing the Tumor MRI Image low pass and high pass filter are applied.

Step 2: For encircling the areas which are affected OSTU Thresholding is used. Draw a circle of maximum possible size covering maximum affected area and next then other circle of small size are drawn.

Step 3: One circle having exact center as that of maximum radius circle from above step with 60% large radius is chosen so that it can cover complete affected areas called region of interest.

Step 4: For calculating the area of Tumor cells thresholding is performed. Thresholding can be approximated as follow:

$$\% \, Area = \frac{no.of\ tumour\ pixels}{no.of\ total\ brain\ pixels} X\ 100$$

Step 5: Segment the tumour

Step 6: Classify the tumour

Step 7: Display the resulting Image

4. FLOW CHART

Below figure shows the flow diagram.

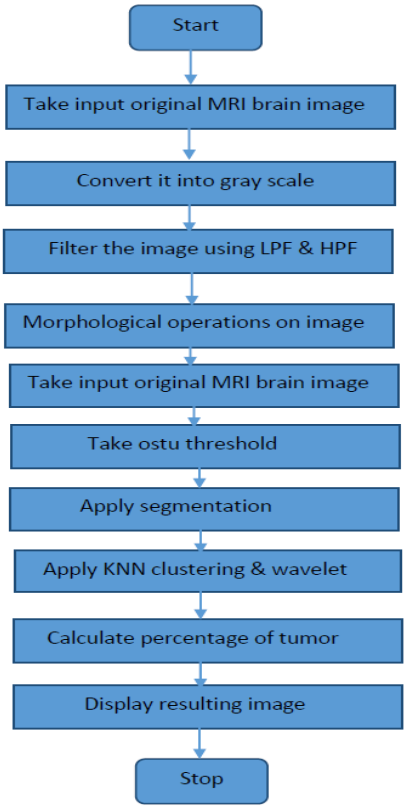


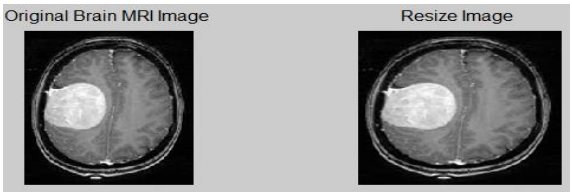
Figure3. Flow chart

5. ALGORITHM

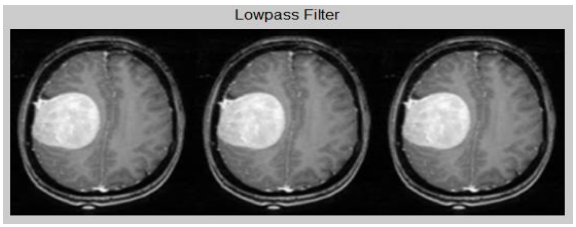
1. Start
2. Take input original MRI brain image
3. Convert it into gray scale
4. Filter the image using LPF & HPF
5. Morphological operations on image
6. Take OSTU Segmentation
7. LLOYD clustering to segment Tumor
8. Use KNN to find Equlidian distance
9. Hybrid feature extraction using 2 stage Discrete Wavelet Transform
10. Calculate contrast, colleration, Energy, Mean, RMS, Standard Deviation, Smoothness
11. Tran image using PNN & RBF
12. Classify the tumour
13. Find the percentage of Tumor
14. Stop

6. RESULT

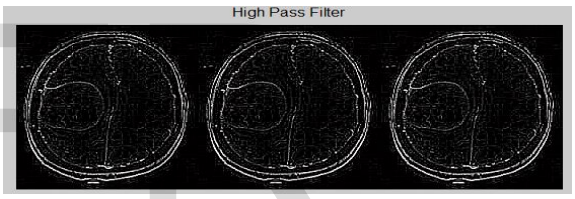
Below Figures, shows the output result of all steps used with KNN and LLOYD clustering. These figure shows that all outperforming the existing methods of classification on available dataset images.



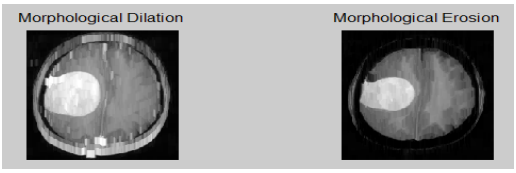
Original Image & Resize Image



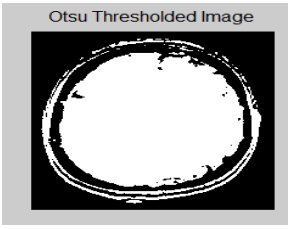
Low Pass Filtered Image



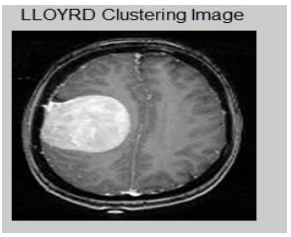
High Pass Filtered Image



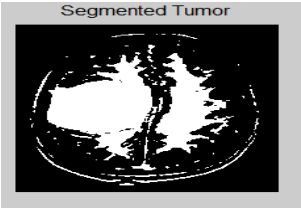
Morphological Processing



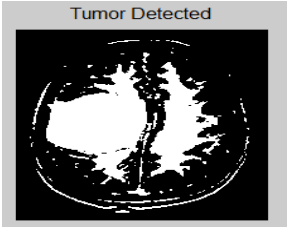
OSTU Thresholding



LLOYD Clustering



Segmented Tumour



Resulting Image

Fig 2. Image Processing Technique and the resulting Images of Tumour

Image Feature Parameter	Value
Contrast	4.6787
Correlation	0.5147
Energy	0.4659
Homogeneity	0.8131
Mean	0.3217
Standard Deviation	1.4570
Entropy	3.0240
RMS	0.3217
Variance	1.4588
Smoothness	0.9992
Kurtosis	21.9046
Skewness	4.1910

Table 1. Image Parameters of Feature Extraction

Brain Classifier	Percentage
Malignant	80%
Bennie	45%

Table 2. Percentage of the Brain Tumour

7. CONCLUSION

Features of Tumor cells are extracted efficiently from the MRI image which is further processed by classifier system. In this research work KNN & Lloyd are used to calculate the area occupied by brain tumour. Low pass and High Pass filter along with morphological operation like dilation and erosion effectively remove noise. In future Scope MRI brain Tumor will be classify using CNN & Deep Learning algorithm to obtain good result of MRI image, it can be possible by using Neural Network.

8. REFERENCES

[1] Saniya Ansari, Dr U. S Sutar "an efficient method of segmentation for handwriting Devnagri word recognization" international journal of scientific & engineering research (IJSER) volume 6 issue 5 May 2015 ISSN 2229-5518 pp230-235

[2] Saniya Ansari, Dr U. S Sutar "an efficient method of segmentation for handwriting devnagri word recognization" international journal of computer applications ISSN (0975-8887) volume -126 September 2015 edition

[3] S. Bauer et al., "A review of x-ray based therapeutic picture examination for mind Tumor thinks about," Physics in solution and science, vol. 58, no. 13, pp. 97– 129, 2013.

[4] S'ergio Pereira, Adriano Pinto, Victor Alves and Carlos A. Silva, “Brain Tumor Segmentation utilizing Convolutional Neural Networks in MRI Images",2016.

[5] Pavel Dvorak and Bjoern Menze,"Structured Prediction with Convolutional Neural Networks for Multimodal Brain Tumor Segmentation, MICCAI-BRATS 2015.

[6] Sheela. V. K and Dr. S. Suresh Babu,"Processing Technique for Brain Tumor Detection and Segmentation," International Research Journal of Engineering and Technology Volume: 02, June-2014

[7] Jaypatel and Kaushal Doshi, "An investigation of Segmentation Method for recognition of Tumor in Brain", Advance in Electronic and Electric Engineering, 2014.

[8] B. Menze et al., "The multimodal mind Tumor picture division benchmark (whelps)," IEEE Transactions on Medical Imaging, vol. 34, no. 10, pp. 1993–2024, 2015.

[9] J. Selvakumar, A. Lakshami & T. Arivoli,"Brain Tumor Segmentation and Its Area Calculation utilizing K-mean Clustering and Fuzzy C-Mean Algorithm", IEEE-International Conference On Advances In Engineering, March30,2012.

[10] Raunaq Rewari, "Programmed Tumor Segmentation Using Convolutional Neural Network."

[11] Stefan Bauer, Roland Wiest and Lutz-P Nolte, "A Survey Of MRI-based restorative picture examination for Brain Tumor Studies".

[12] Vaishnavi Dr. P. Eswaran "Enhanced Color Image Enhancement Scheme utilizing Mathematical Morphology ", Volume 3, Issue 4, April 2013 IJARCSSE.

[13] V. Karthikeyan1, V. J. Vijayalakshmi, P. Jeyakumar, “A Novel Approach For The Enrichment Of Digital Images Using Morphological Operators”, 2013.

[14] K.Sreedhar and B.Panlal, Enhancement of images using morphological transformation, 2012.

[15] Nikesh T. Gadare, Dr. S. A. Ladhake, Prof. P. D. Gawande, “Mathematical Morphology based Image Enhancement and Background Detection” 2014.

[16] Pavel Dvoˇr´ak1,2 and Bjoern Menze3 Structured Prediction with Convolutional Neural Networks for Multimodal Brain Tumor Segmentation, 2015.

[17] Vaishnavi S. Mehekare, Dr.S.R.Ganorkar, “A Survey on Brain Tumor Detection Using Neural Network 2017.Samjith Raj C.P. and Shreeja R, Automatic brain Tumor tissue detection in T-1 weighted MRI 2017.

[18] Manisha, Radhakrishnan.B and Dr. L.Padma Suresh, “Tumor Region Extraction using Edge Detection Method in Brain MRI Images” 2017

[19] V. Zeljkovic1, C. Druzgalski2, Y. Zhang1, Z. Zhu1, Z. Xu1, D. Zhang1, P. Mayorga3, “Automatic Brain Tumor Detection and Segmentation in MR Images” 2014.

[20] Anatoly Sorokin, Evgeny Zhvansky, Konstantin Bocharov, and Vsevolod Shurkhay, Alexander Potapov, “Multi-label classification of brain Tumor mass spectrometry data” 2017.

[21] Alexis Arnaud, Florence Forbes, Nicolas Coquery, Nora Collomb, Benjamin Lemasson, and Emmanuel L. Barbier, ”Fully Automatic Lesion Localization and Characterization: Application to Brain Tumours using Multi parametric Quantitative MRI Data”2018.

[22] Swathi P S, “Brain Tumor Detection and Classification Using Histogram Thresholding and ANN”2015

[23] Ms. Priya Patil, Ms. Seema Pawar, Ms. Sunayna Patil, Prof. Arjun Nichal, “A Review Paper on Brain Tumor Segmentation and Detection”2017.

[24] Moitra D and Mandal R” Review of Brain Tumor Detection using Pattern Recognition Techniques”2017

[25] Neha Rani” Brain Tumor Detection and Classification with Feed Forward Back-Prop Neural Network”2016.

[26] M. Avula, and Lakkhkula, et al., ``Bone Cancer from MRI Scan Imagery using Mean pixel intensity”, The International Conference of Electronic Computer Technology, pp, 112-116, 2014.