International Journal of Future Generation Communication and Networking
Vol. 13, No. 2s, (2020), pp. 407–422

# MRI Images based Brain Tumour Detection System

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***Abstract***

*Brain tumor detection is a challenging task and it's very important to analyze the structure of the tumor correctly so an automatic method is used now a day for the detection of the tumor. This method saves time as well as it reduces the error which occurs in the method of manual detection. This proposed method is a new technique which not only detect tumor but also calculate percentage area occupied by tumor cells compared with total brain cells. Circular Hough transform is used for encircling the affected area and to estimate relative affected area. KNN& LLOYED are used for detecting and differentiating tumor affected tissues with not affected tissues. Perform wavelet transform on the converted Gray scale image and extracted 12 features like contrast, correlation, energy, homogeneity etc. DB5 wavelet transform is used for feature extraction.*

***Keywords:*** *KNN& Lloyd, wavelet transform, tumor, MRI image.*

## I. INTRODUCTION

The development of additional phones frequently shapes a mass of tissue called a development or tumor. 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. Precise identification of the kind of mind variation from the norm is exceedingly fundamental for treatment arranging which can limit the lethal outcomes. Manual discovery of mind tumor is a repetitive activity and takes a great deal of time and not precise, shifts starting with one specialist then onto the next. Exact outcomes can be acquired just through PC supported robotized frameworks. Other than being exact, these procedures must scope rapidly keeping in mind the end goal to apply them for continuous applications. Cerebrum tumor can be analyzed by utilizing attractive reverberation imaging (MRI), ultrasonic, CT pictures and X-beams. X-ray remains for Magnetic Resonance Imaging. A MRI scanner utilizes intense magnets to enrapture and energize hydrogen cores (single proton) in human tissue, which creates a flag that can be distinguished and it is encoded spatially, bringing about pictures 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. Brain tumor is the extensive antecedent of the bereavement with common people. It is obvious that the probability of endurance

ISSN: 2233-7857 IJFGCN

can be improved if the tumor is detected and classify properly at its early phase. The segmentation of brain tumors in magnetic resonance images (MRI) is a difficult one since the range of their promising shapes, locations, image intensities. In this paper, it is projected to encapsulate and evaluate the method of mechanical recognition of brain tumor through Magnetic Resonance Image (MRI) with Histogram Thresholding and Artificial Neural Network. The anticipated method can be effectively useful to distinguish the shape of the tumor and its geometrical measurement. Also in this paper, a tailored Artificial Neural Network (ANN) model that is based on learning vector quantization with image and data analysis and exploitation technique is anticipated to carry out a computerized brain tumor classification using MRI-scans. The appraisal of the adapted ANN classifier concert is deliberate in terms of the guidance performance, classification accuracies and computational time. MRI (Magnetic resonance Imaging) brain tumor metaphors detection is a difficult mission due to the inconsistency and Convolution of tumors. This paper present two techniques for the exposure purpose; first one is Histogram Thresholding and another one is Artificial Neural Network technique. The planned Neural Network technique consists of some stages, specifically, feature extraction, dimensionality diminution, recognition, segmentation and organization. In this paper, the purposed scheme is additional precise and effectual for the brain tumor detection and segmentation. Brain tumor detection and segmentation the MRI Images is very useful in recent years. Due to MRI Images we can detect the brain tumor. For detection of unusual growth of tissues and blocks of blood in nervous system can be seen in an MRI Images. The first step of detection of brain tumor is to check the symmetric and asymmetric Shape of brain which will define the abnormality. After this step the next step is segmentation which is based on two techniques
1)F Transform (Fuzzy Transform) 2) Morphological operation. These two techniques are used to design the image in MRI. Now by this help of design we can detect the boundaries of brain tumor and calculate the actual area of tumor. In this the f-transform is used to give the certain information like rebuilt of missing edges and extracting the silent edges. Accuracy and clarity in an MRI Images is dependent on each other

## II. LITERATURE SURVEY

**Jin Liu, Min Li, Jianxin Wang et al**, studies the MRI based brain tumor segmentation which is more and more attractive because of non-invasive imaging and good soft tissue contrast of Magnetic Resonance Imaging (MRI) images. They purposed to provide a comprehensive overview for MRI-based brain tumor segmentation methods. Then, the pre-processing operations and the state of the art methods of MRI-based brain tumor segmentation are introduced. [1]
**Pavel Dvorak and BjoernMenze et al,** Indeed, even under treatment, patients don't make due all things considered over 14 months after conclusion [3]. Current medicines incorporate surgery, chemotherapy, radiotherapy, or a blend of them. X-ray is particularly helpful to evaluate gliomas in clinical practice, since it is conceivable to procure MRI arrangements giving corresponding data. The exact division of glioma's and its intra-tumoral structures is vital for treatment arranging, as well as for follow-up assessments. Be that as it may, manual division is tedious and subjected to between and intra-rater blunders difficult to describe. In this manner, doctors more often than not utilize harsh measures for assessment. Hence, precise self-loader or programmed strategies are required [4]
**V.Karthikeyan, B. Menze and K.Sreedhar et al,** the tumor mass impact change the course 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] and natural picture division [5] challenges. Since a CNN works over patches utilizing pieces, it has the benefit of considering and being utilized with crude information. In the field of mind tumor division, late proposition additionally explore the utilization of CNNs [11].
**J.Selvakumar, A.Lakshami&T.Arivoli et al,** deals with analysis of image Intensification carried out various methodologies used in Mathematical Morphological [MM] theory on poor lighting images. They, Some Morphological Transformation have been processed through Block Analysis, Morphological Operation and Opening by Reconstruction on dark Images. Analysis of above mention methods illustrated through the processing of images with filtering techniques along with different dark background images. [7]

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**RaunaqRewari,** implement the enhancement of the digital images by using the global morphological technique to detect the background features of the images which is characterized by poor lighting. The contrast image enhancement carried out by the application of two operators based on the Weber's law. The first operator employs information from blocked analysis, while the second transformation utilizes the opening by reconstruction, which is employed to define the multi background.. Finally, the performances of the proposed operators are processing through the images with different backgrounds, the majority of them with poor lighting condition. [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 the computational load. The vast spatial and basic fluctuation in mind tumors is additionally an essential worry that we think about utilizing information growth. [9]

**Nikesh T. Gadare, Dr. S. A. Ladhake, et al**, used some Morphological Transformation which processed through Block Analysis, Morphological Operation and Opening by Reconstruction on dark Images. Basically, Image enhancement and Background detection is illustrated through Weber's Law Operator... In Mathematical Morphology it has transformation which allows filtering of the Image with new contour leads to Opening by reconstruction and closing by reconstruction as well. [13]

**Vaishnavi S. Mehekare, Dr.S.R., Ganorkar**, from all among cerebrum tumors, Glioma are the most widely recognized, forceful, prompting a short future in their most elevated evaluation. There are different proposes of automatic division strategy in light of Convolutional Neural Networks (CNN), investigating little kernel. The use of kernel permits outlining a more profound design, other than having a constructive outcome against over fitting, given the less number of weights in the system.. [15]

**Alexis Arnaud, Florence Forbes, Nicolas Coquery et al**, analyzed brain tumors, which perform two tasks, are intrinsically linked, spatial localization and physiological characterization of the lesioned tissues. There are different Non trivial interactions between relevant physiological parameters are captured which provide a larger variety of distributional shapes compared to the more standard Gaussian distributions. [20]

**NileshBhaskarraoBahadure, Arun Kumar Ray, and Har Pal Thethi et al,** The segmentation, detection, and extraction of infected tumor area from magnetic resonance (MR) images are a primary concern but a tedious and time taking task performed by radiologists or clinical experts, and their accuracy depends on their experience only. So, the use of computer aided technology becomes very necessary to overcome these limitations. In this study, to improve the performance and reduce the complexity involves in the medical image segmentation process, we have investigated Berkeley wavelet transformation (BWT) based brain tumor segmentation. Furthermore, to improve the accuracy and quality rate of the support vector machine (SVM) based classifier, relevant features are extracted from each segmented tissue. The experimental results of proposed technique have been evaluated and validated for performance and quality analysis on magnetic resonance brain images, based on accuracy, sensitivity, specificity, and dice similarity index coefficient. The experimental results achieved 96.51% accuracy, 94.2% specificity, and 97.72% sensitivity, demonstrating the effectiveness of the proposed technique for identifying normal and abnormal tissues from brain MR images. The experimental results also obtained an average of 0.82 dice similarity index coefficient, which indicates better overlap between the automated (machines) extracted tumor region with manually extracted tumor region by radiologists. The simulation results prove the significance in terms of quality parameters and accuracy in comparison to state of-the-art techniques [38].

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| SR NO | REFEREANCE | AUTHOR NAME | PURPOSE | RESULT |
|---|---|---|---|---|
| 1 | studies the MRI based brain tumor segmentation | Jin Liu, Min Li, Jianxin Wang et Al | To provide comprehensive overview for MRI-based brain tumor segmentation methods | Got comprehensive overview for MRI-based brain tumor segmentation methods. |
| 2 | A Survey of MRI-Based Brain Tumor Segmentation Methods | Pavel Dvorak and BjoernMenze et al | Local structure Prediction with CNN for Multimodal modal brain tumor segmentation | Useful for easily obtaining local structure prediction of local label patches |
| 3 | Brain Tumor Detection Using Neural Network | V.Karthikeyan, B. Menze and K.Sreedhar et al | The tumor mass impact change the course of action of the encompassing typical tissues. | Being utilized with crude information |
| 4 | Implementing Tumor Detection and Area Calculation in Mri Image of Human Brain | J.Selvakumar, A.Lakshami& T.Arivoli et al | Carryout various methodologies used in Mathematical Morphological | Images with filtering techniques along with different dark background |
| | Using Image Processing Techniques | | theory on poor lighting images | images are obtained |
| 5 | Automatic Tumor Segmentation from MRI scans | RaunaqRewari | Implement the enhancement of the digital images by using the global morphological technique | Got enhanced image using block analysis and reconstrution |

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|---|---|---|---|---|
| 6 | A survey of MRI-based medical image analysis for brain tumor studies | Stefan Bauer, Roland Wiest et Al | The creators decided on 2D filters | Better filtering is obtained using 2D filters instead of 3D filters |
| 7 | Image Intensification Using Mathematical Morphology | Nikesh T. Gadare, Dr. S. A. Ladhake, et al | Used some Morphological Transformation on dark images | Image enhancement and Background detection is illustrated through Weber's Law Operator |
| 8 | A Survey on Brain Tumor Detection Using Neural Network | Vaishnavi S. Mehekare, Dr.S.R., Ganorkar | Automatic division strategy in light of Convolutional | More profound design using kernel permits outlining |
| | | | Neural Networks (CNN), investigating little kernel. | |
| 9 | Fully Automatic Lesion Localization and Characterization: Application to Brain Tumors Using Multiparametric Quantitative MRI Data | Alexis Arnaud, Florence Forbes, Nicolas Coquery et al | Analyzed brain tumors, which perform two tasks, are intrinsically linked, spatial localization and physiological characterization of the lesioned tissues | Non trivial interactions between relevant physiological parameters are captured |
| 10 | Image Analysis for MRI Based Brain Tumor Detection and Feature Extraction Using Biologically Inspired BWT and SVM | Nilesh Bhaskarrao Bahadure, Arun Kumar Ray, and Har Pal Thethi et al | The segmentation, detection, and extraction of infected tumor area from magnetic resonance (MR) images | Experimental results achieved 96.51% accuracy, 94.2% specificity, and 97.72% sensitivity |

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## III. PROBLEM DEFINATION

In previous techniques of segmentation and morphological operation accuracy of the algorithms is less. Making use of an automatic segmentation method based on K-Nearest Neighbour to overcome above drawbacks.

## IV. METHODOLOGY

Brain tumor is detected by using image processing techniques. Here we are using MATLAB software to detect tumor in MRI images. The block diagram of proposed system is shown in figure below.

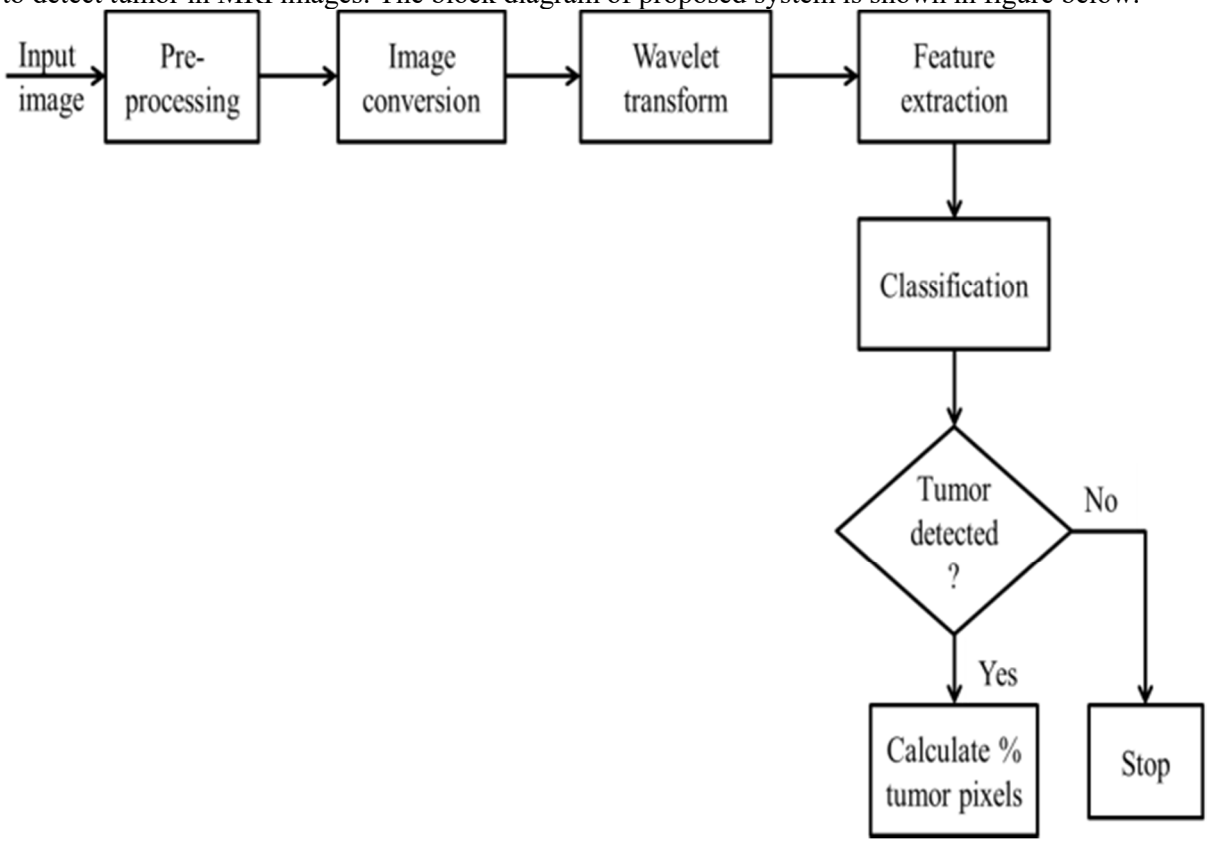


Figure 1: Block Diagram of proposed system

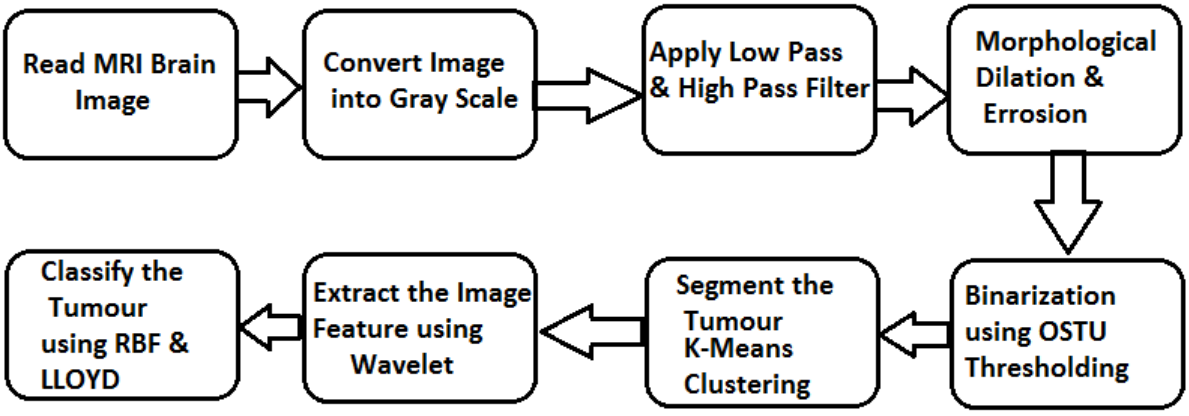


Figure 2: Block Diagram of Implementation Flow

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## V. ALGORITHM

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper.

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 tumor
13. Find the percentage of tumor
14. Stop

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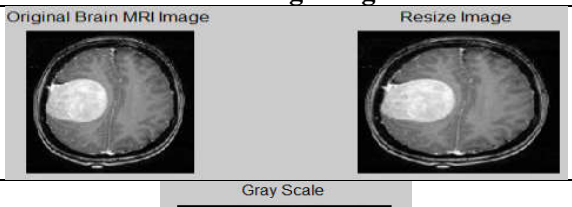
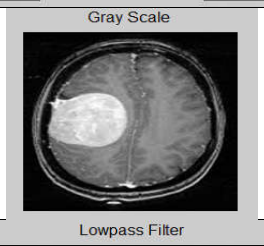
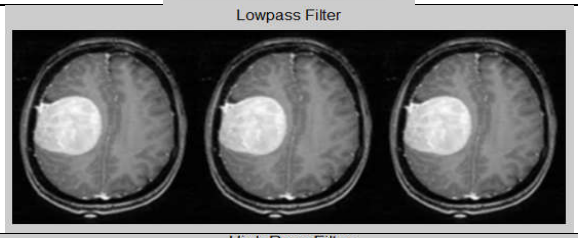
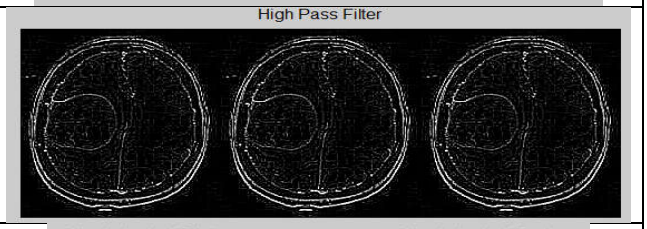
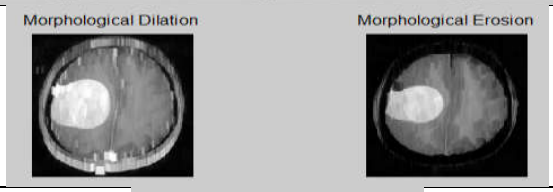
## I. RESULTS

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.

Table 5.5. Result Image5

| Image Processing Technique | Resulting Image |
|---|---|
| **Original Image & Resize Image** |   |
| **Gray Scale** |   |
| **Low Pass Filtered Image** |   |
| **High Pass Filtered Image** |   |
| **Morphological Processing** |   |
| **OSTU Thresholding** |   |
| **LLOYD Clustering** |   |

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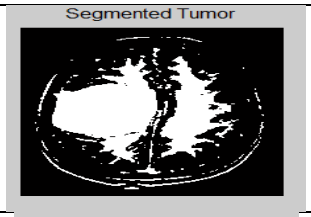
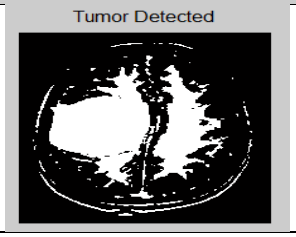
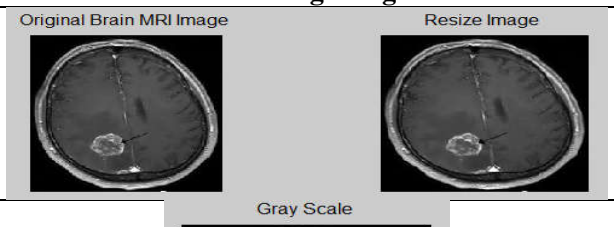
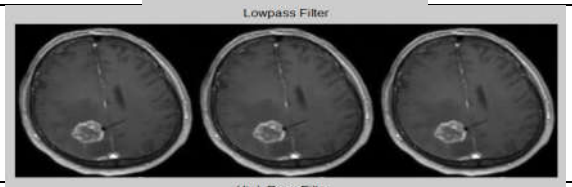
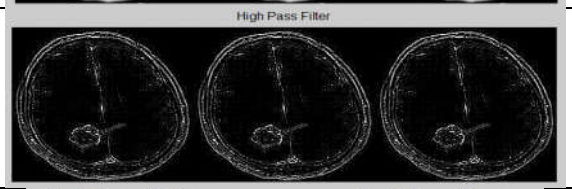
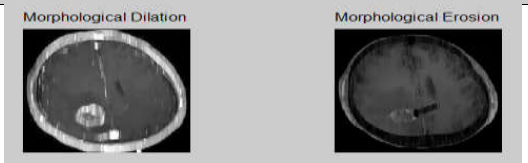
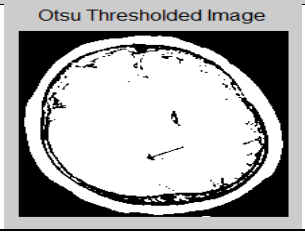
| | |
|---|---|
| **Segmented Tumor** |   |
| **Resulting Image** |   |

**Table 1. Result Image1**

| Image Processing Technique | Resulting Image |
|---|---|
| **Original Image & Resize Image** |   |
| **Gray Scale** |   |
| **Low Pass Filtered Image** |   |
| **High Pass Filtered Image** |   |
| **Morphological Processing** |   |
| **OSTU Thresholding** |   |

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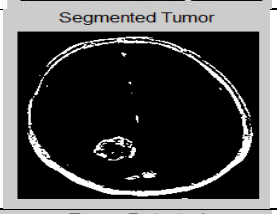
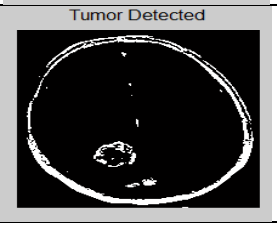
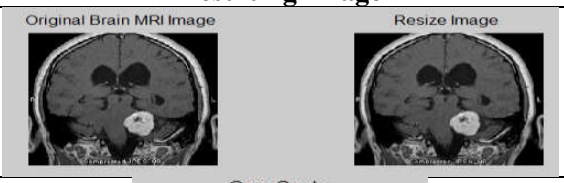
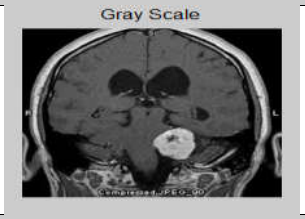
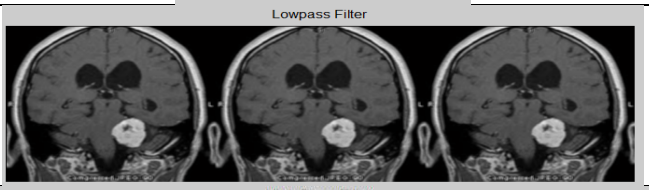
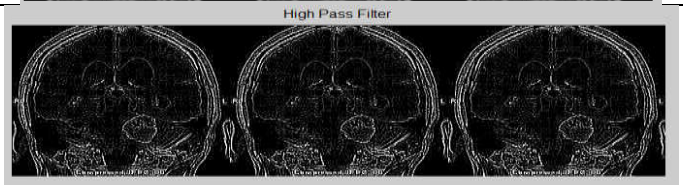
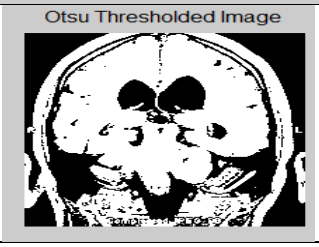
|---|---|
| **LLOYD Clustering** |   |
| **Segmented Tumor** |   |
| **Resulting Image** |   |
| **Image Processing Technique** | **Resulting Image** |
| **Original Image & Resize Image** |   |
| **Gray Scale** |   |
| **Low Pass Filtered Image** |   |
| **High Pass Filtered Image** |   |
| **Morphological Processing** |   |
| **OSTU Thresholding** |   |

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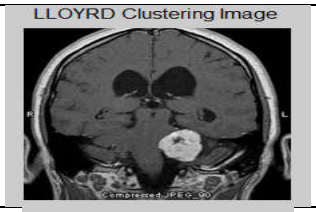
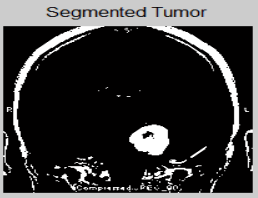
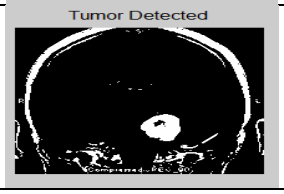
|---|---|
| **LLOYD Clustering** |   |
| **Segmented Tumor** |   |
| **Resulting Image** |   |
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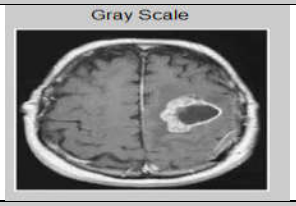
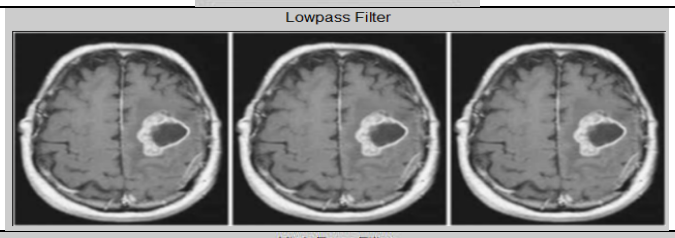
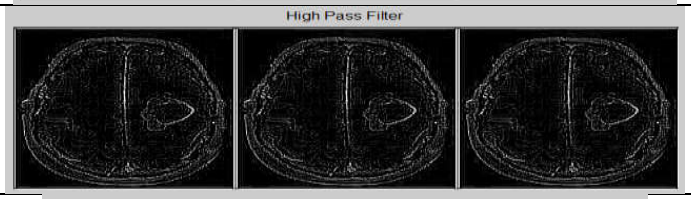
| **Gray Scale** |   |
| **Low Pass Filtered Image** |   |
| **High Pass Filtered Image** |   |
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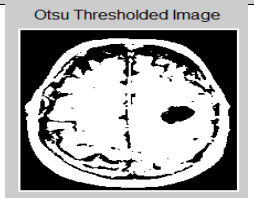
| **OSTU Thresholding** |   |

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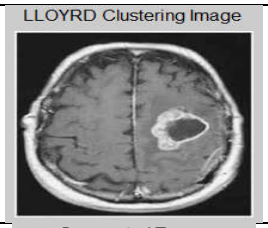
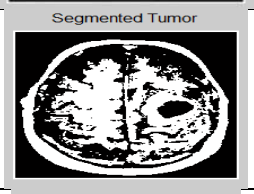
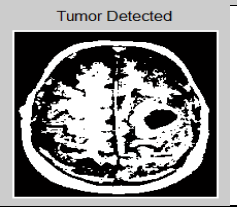
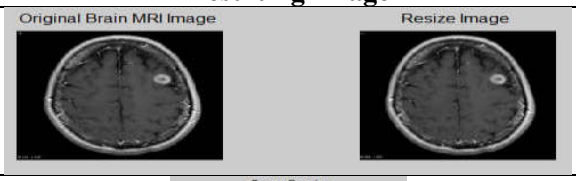
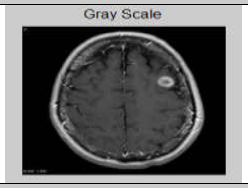
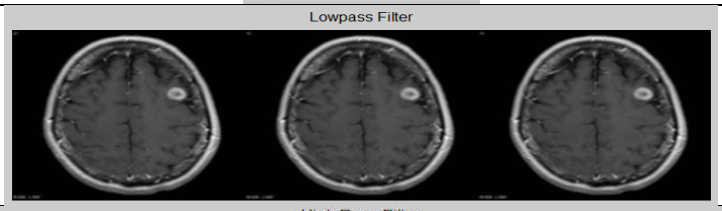
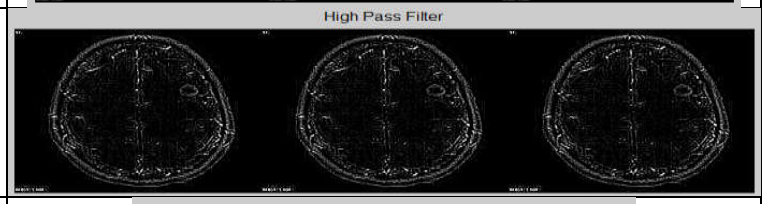
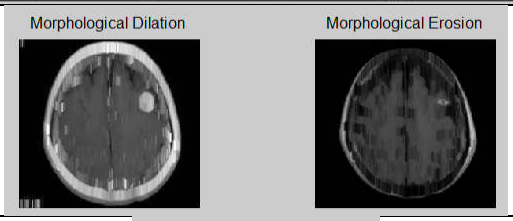
|---|---|
| **LLOYD Clustering** |   |
| **Segmented Tumor** |   |
| **Resulting Image** |   |
| **Image Processing Technique** | **Resulting Image** |
| **Original Image & Resize Image** |   |
| **Gray Scale** |   |
| **Low Pass Filtered Image** |   |
| **High Pass Filtered Image** |   |
| **Morphological Processing** |   |
| **OSTU Thresholding** |   |

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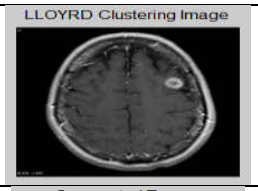
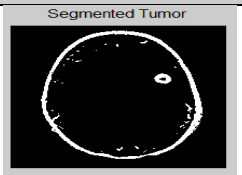
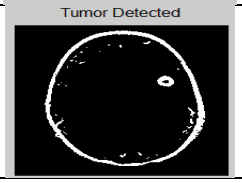
| | | |
|---|---|---|
| **LLOYD Clustering** | |   |
| **Segmented Tumor** | |   |
| **Resulting Image** | |   |

*A.* Image Parameters of Feature Extraction:

| 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 |

*B.* Image Parameters of Feature Extraction:

| Brain Classifier | Percentage |
|---|---|
| Malignant | 80% |
| Bennie | 45% |

*C.* Comparison Imag

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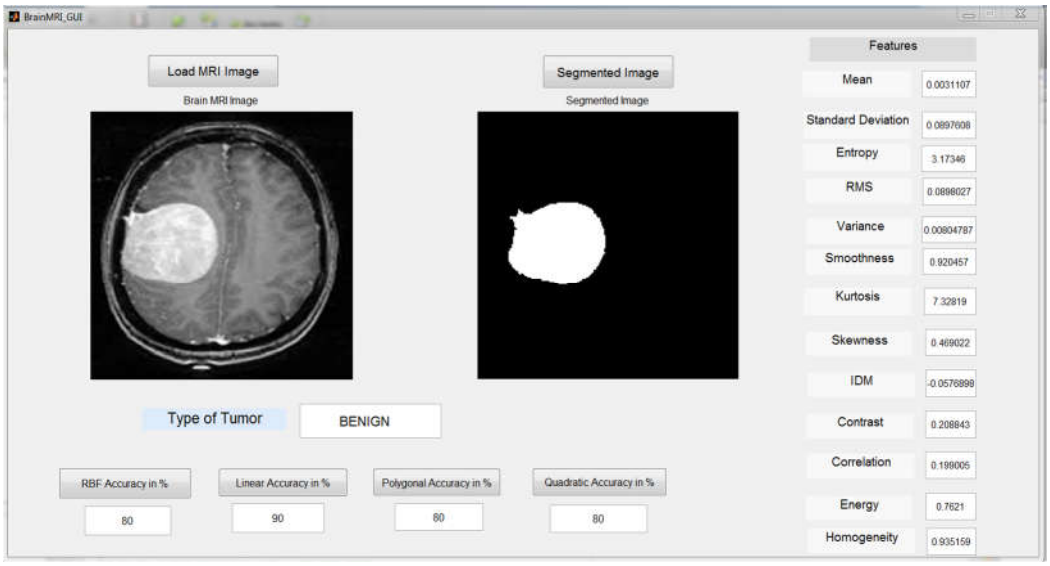


## II. CONCLUSION

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 tumor. Low pass and High Pass filter along with morphological operation like dilation and erosion effectively remove noise.

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