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# A Comparative Study on Brain Tumor Segmentation

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**Abstract:** Human brain tumor segmentation systems can enhance the diagnostic capabilities of physicians and reduce the wastage of time for accurate diagnosis. Brain tumor segmentation is one of the most challenging and time consuming tasks in medical image processing. MRI (Magnetic Resonance Imaging) is a medical technique, mainly used by the radiologist for visualization of internal structure of the human body without any surgery. MRI provides plentiful information about the human soft tissue, which helps in the diagnosis of brain tumor. Accurate segmentation of MRI image is important for the diagnosis of brain tumor by computer aided clinical tool. After appropriate segmentation of brain MR images, tumor is classified into malignant and benign, which is a difficult task due to complexity and variation in tumor tissue characteristics like its shape, size, gray level intensities and location. Taking into account the aforesaid challenges, this research is focused towards highlighting the merits and demerits of earlier proposed classification techniques discussed in the contemporary literature. Besides summarizing the literature, segmentation analysis brings forth a comparative study on seven recent papers depending on the standard analytic measures.

**Keywords:** Brain MRI images, tumor detection and segmentation, Brain cancer, surgery planning.

## I. INTRODUCTION

Brain tumor segmentation is the basic requirements in preplanning and executing the surgical treatment to reach success in surgical operations on brain. The brain tumor operation which is performed in manual way in hospitals takes more time. Moreover the brain tumor diagnosis is very difficult as it heavily depends on the individual pathologists. The multi sequence images obtained simultaneously from MRI scanner and complementary information in the tumor area can help to analyze tumors by pathologists [5] [9] [10].

The brain tumor segmentation involves several challenges like its different sizes, shapes and appearances at different locations. The deforming nature of surrounding structures in the brain because of mass effect or edema, complicates the brain tumor segmentation. Therefore a semi-automatic-segmentation or automatic-brain-tumor-segmentation will enhance the quality of brain tumor segmentation. The artifacts and noise are other obstacles in brain tumor segmentation [11] [12]. This paper analyses and compares the recent developments on brain tumor segmentation based on different analytic metrics and research categorization to help the researchers.

The tumor detection process of labeling each pixel in an image that they share the same characteristics is spelled by the paper [13] which makes segmentation using Genetic algorithm. The author Rajesh C. Patil [14] describes a threshold based tumor detection method which creates a binary segmented image from grayscale image. Deepthi Murthy [15] has also published a paper in this concept. A. Lekshmi [16] accomplishes the tumor segmentation based on fuzzy C means method. The other papers which follow these techniques are [17] [18]. The watershed algorithm is also based on the same technique [19].

## II. BRAIN STRUCTURE AND TUMOR TYPES

The human brain is the central organ of the human nervous system. It is a soft, spongy mass of tissues. It is the most important organ in the body as it controls 5 senses and also provides ability to speak and move. The right side of the brain controls the left side of the body. The left side of the brain controls the right side of the body. There are three major parts of the brain which controls different activities:

i) **Cerebrum**: It is the largest part of the human brain. It controls reading, thinking, learning, speech, and emotions.
ii) **Cerebellum**: The cerebellum is located behind the top of the brain stems. It controls the ability to move, walk, talk and other physical activities.
iii) **Brain stem**: The brain stem is the posterior part of the brain. It connects the brain with the spinal cord. It controls hunger, thirst, breathing, body temperature, and blood pressure

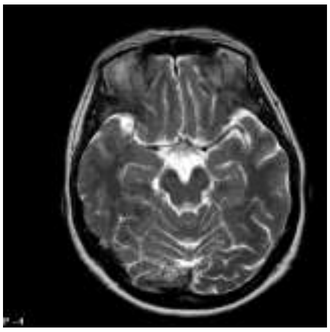

Figure1.**Structure of Brain Tumor**.

The brain and spinal cord are made up of several cells. The thinking cells and the brain activity cells are known as '*neurons*'. The other cells in the brain take care of the neurons and they are known as '*glial cells*'.

A brain tumor is a collection or mass of abnormal growth of the tissues, growing in the brain. It can be malignant or benign. Benign cells are non cancerous and malignant cells are cancerous. Benign brain tumor grows slowly, has distinct boundaries, and rarely spreads. Malignant brain tumor grows quickly, has irregular boundaries, and spreads to nearby brain areas. Malignant tumors are of two types. They are primary and secondary brain tumors. The primary brain tumors are tumors that start in the brain. Secondary (Metastatic) brain tumor occurs when cancer cells spread to the brain from a primary cancer in to another part of the body. The symptoms of brain tumor depend on the tumor area, type, and location. Symptoms may be caused when a tumor presses on a nerve or damages certain area of the brain. The most common symptom of brain tumor is headache, because of the pressure that the tumor places on the brain. Seizures or convolutions can occur because the tumor may irritate the brain. The Figure.1 depicts the structure of brain tumor.

## III. Survey of Brain Tumor Segmentation

This paper makes a survey on brain tumor segmentation to get more knowledge on tumors and tumor-detection-methods for medical research persons. To build a comparative study, this paper uses the following seven methods.

- Brain tumor segmentation based on fuzzy Logic based genetic programming [1]
- Brain tumor segmentation based on fluid vector flow [2]
- Brain tumor segmentation based on tumor cut method [3]
- Brain tumor segmentation based on multi fractal texture estimation [4].
- Brain tumor segmentation based on local independent projection based classification [5].
- Brain tumor segmentation based on 3-dimensional intracranial structure deformation features [6]
- Brain tumor segmentation based on convolutional neural networks [7]

### A. *Brain Tumor Segmentation based on Fuzzy Logic based Genetic(BTS-FLG)*

The Magnetic Resonance Imaging (MRI) can be the input for this method to extract brain tumors. The MRI images undergo the preprocessing, Standardizing, non brain removal and enhancement. The fuzzy clustering algorithm is employed to segment the brain tumor. The fuzzy logic based genetic programming is used to make a refined classification. This work can be divided into three divisions,

i) Preprocessing

ii) Segmentation

iii) Classification

The preprocessing step does a normalization process on signal intensities of brain MRI. It also removes the non-brain regions after applying a contrast enhancement. The Segmentation process separates the image data into White Matter (WM), Gray matter (GM), Cerebrospinal Fluid (CSF) and brain tumors. At last the classification rules related with brain tumors are derived to diagnose the brain tumor. This method enables the n-class classification problem to be solved as a whole rather than as n-two class problems. The overall diagram of this method is described in Figure.2

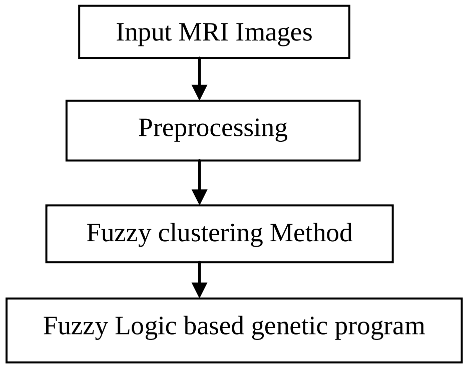


**Figure 2.Structure of brain tumor.**

This paper classifies the tumor into three varients. The name of them are meningioma, Glioma and medulla blastoma. This work is involved with four types of MRI scans, such as flair-ir FSE, T2-FSE, PD-FSE and T1-Contrast. The advantage of this method is that it supports classification also. The disadvantages of this method are that it cannot detect initial type tumors.

### B. *Brain Tumor Segmentation based on Fluid Vector Flow (BTS-FVF)*

The brain tumor segmentation is a process using fluid vector flow active contour model. This method provides solution for sufficient capture range and poor convergence for concavities. This method is applicable for synthetic images, Pediatric head MRI images and brain tumor MRI images. This method executes a parametric active contour model with FVF to simulate fluid flow towards object boundary and derives the contour evaluation by applying external force fields. The entire image can be captured by utilizing the concept FVF. The non-static external force fields extract the matters related with accurate concave shapes. This method is branched into the following subdivisions,

i) Binary boundary map generation
ii) Vector flow initialization
iii) FVF computation

The input image is I(x,y) taken as the input to the system and a closed parametric contour is generated as the output which denotes the extracted target object O(x,y) meaning that the brain tumor. The overall diagram of this method is ,

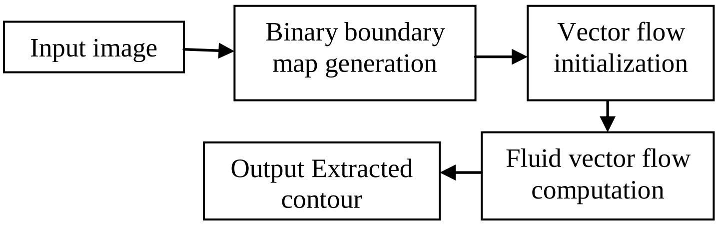


**Figure. 3 Flow chart of the BTS-FVF Method**

In this method the contour is initialized and after that the binary boundary map is formed. The vector flow is initialized and FVF is calculated in a dynamic fashion until the object contour is completely extracted. The advantage of this method is the less complexity. The disadvantage of this method is the need of user interaction meaning that semi- automation of brain tumor segmentation.

### *C. Brain Tumor Segmentation using Tumor-Cut (BT-TC)*

Andac Hamamci et al. [3] report a brain tumor segmentation method for contrast enhanced MR images. The name of this method is tumor cut method. The basic concept of this method is cellular automata (CA) based seeded tumor segmentation. The contrast enhanced T1 weighted magnetic resonance images are the input of this method and the volume of interest and seed selection is standardized. The connection establishment on CA based segmentation is performed to solve the shortest path problem. The state or transition function of CA is modified to compute exact shortest path solutions. This method designs a parameter to adapt the heterogeneous tumor segmentation.

The level set method is employed by tumor probability map which is served by the CA to make the spatial smoothness. In this method the user should draw a line through the cancer object as initial seed.

This method works based on user's line drawing over the largest visible diameter of the tumor. The VOI is selected depending on the user's line and the seeds of foreground and background. Tumor possibility map is generated using the two strength maps. The level set surface is initialized as 0-5 and the map is used to evolve the surface which converges to the final segmentation map. The necrotic regions of tumor are segmented using CA based on necrotic seeds.

The simulation is conducted using two real tumor databases: one from hardware tumor repository and another from clinical database of tumors at radiation oncology department of ASM. The accuracy of this method is upto 90%. The merit of this method is the fast execution due to the parallel implementation of BTS-TC method. It also has less computational cost. The demerit of this method is that it is a semi- automatic method not a full automatic one. Another demerit of this method is that it has not dealt with any other tumor growth measurement scheme. This method can assist clinicians and researchers in radio surgery planning.

### *D. BrainTumor Segmentation based on Multi Fractal Texture Estimation (BTS-MFTE)*

The author Atiq Islam et al. [4] describes a tumor detection method for human brain tumors. The multi-fractal texture estimation concept is used in this paper. This method proposes a stochastic model for addressing tumor texture in brain tumor MRI images. The Multi-fractional Brownian Motion (MBM) is utilized to formulate the brain tumor texture. The Ada-boost algorithm is extended to reach the tumor segmentation by making alteration on assigning weights to component classifiers. This method conducts analysis using BRATS2012 dataset. This method fuses the fractal and Multi FD features for automatic tumor segmentation in brain MRI. The text on features are also used in this method. The overall flow diagram in depicted in Figure. 4.

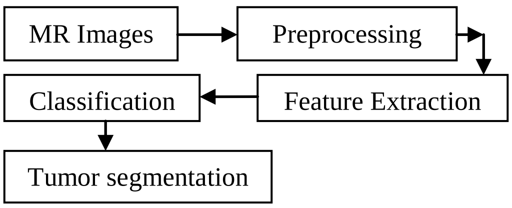


**Figure 4. Overall flow diagram for BTS-MFTE method**.

The standard preprocessing steps are performed to enhance the MR Images. The Fractal, Texton and Intensity features are extracted and they are applied on tumor segmentation. The Ada-Boost classifier is employed to absorb the features as input and make output as tumor-and- non-tumor regions. The preprocessing steps involve the actions such as realign and unwrap slices within a volume and co-register slices from different modalities. The fractal and Multi FD features are simplified its single features for each. The modified supervised Ada-Boast classifier is trained to differentiate tumor from the non-tumor tissues. In this work T1, T2 and FLAIR modalities are used. The advantages of this method are

i) easily attached with 3D feature based segmentation
ii) Patient independent model
iii) Automatic model

The demerit of this method is that it suffers when it faces large set data because Ada-Boost is a linear type classifier.

### *E. Brain Tumor based on Local Independent Projection (BTB-LIP)*

The author Meiyan Huang et al. [5] expresses a brain tumor segmentation methodology for early tumor diagnosis and radiotherapy planning. Magnetic system and segmentation are treated here as clarification issue. Each and every voxel are characterized as various classes based on Local Independent Projection base classification (LIPC) method. The calculation of LIPC method is picked up from Locality property that has local anchor embedding. The MICCAI 2012 and MICCAI 2013 database are used to conduct simulation. The BRAIS 2012 database also aids to make simulation in brain tumor. The flow chart of the BTS-LIP method is depicted in Figure. 5.

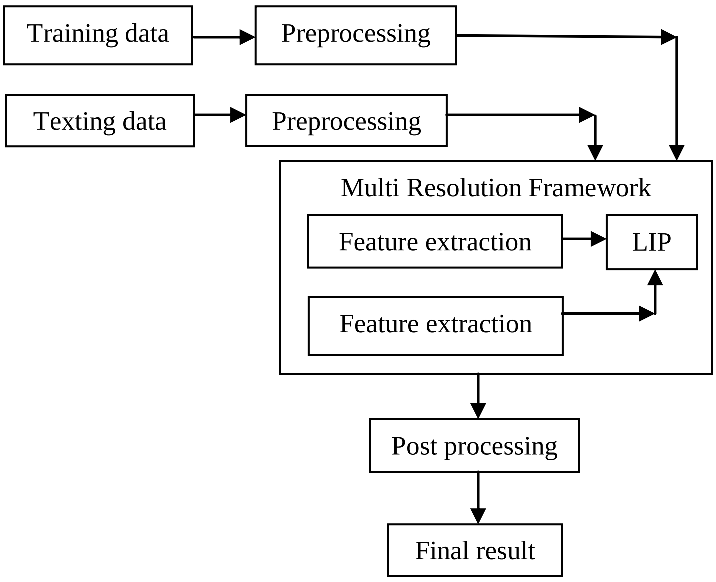


**Figure 5. Flow chart of the BTS-LIP method.**

The BTS-LIP method includes four major divisions such as preprocessing, feature extraction, tumor segmentation and post processing. The preprocessing steps includes N3 algorithm to remove the bias field artifacts. The intensity values at the 1% and 99% qualities are extracted for brain region which involves tumors, edema and brain tissues. Thus the three stage preprocessing is performed in this work. This feature extraction is performed by selecting intensity values in a patch (w) around a voxel and rearranged as a feature vector. The LIPC method segments the brain tumor image. The post processing scheme works based on the concept that each classified edema region must have a voxel near the classified tumor regions within some small distance. The connected component algorithm and mathematical morphology methods helped to refine the classified edema regions by extracting the edema regions which are connected atleast one of the tumor regions.

The proposed method's advantage is that it makes a natural smoothness on segmented images. The other advantages are:

i) Automatic tumor segmentation
ii) Executes on multi resolution framework
iii) Less computational cost

The demerit of this method is that it needs four modalities to segment brain tumor.

### *F. Brain Tumor Segmentation based on Intracranial Structure Deformation Features (BTS-ISDF)*

A brain tumor segmentation method is described by the author Shang-Ling Jui et al. in the paper [6]. This method improves feature extraction component based on 3-Dimentional Intracranial Structure Deformation features. The Lateral Ventricular (LAV) deformation is measured using 3 dimensional non-rigid registration and deformation modeling. The ever increasing amount of brain MR Image data has granted new opportunities for pathologists to analyze and processing of image data.

This method uses dynamically created template LaVs by considering the specialist of brain hemisphere symmetry. This method aligns and models LaV deformation via 3-D view. The Artificial Neural Network (ANN) and Support Vector Machine (SVM) is handled to segment the brain tumor segmentation. The flow diagram of this method is depicted in the Figure. 6.

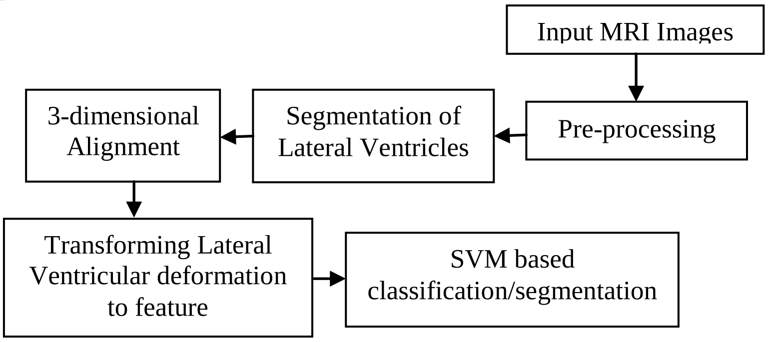


**Figure 6. Flow diagram of BTS-ISDF method.**

The feature extraction process includes three major divisions such as Segmentation of lateral ventricles, 3-Dimensional alignment and Feature transformation. The cerebrospinal fluid (CSF) tissue separation is done by Fuzzy C means (FCM) method. The specific group of CSF pixels is identified based on the intensity property from MRI images. The segmentation can be formed by using a mask in the brain followed by a filter for removing small isolated CSF pixels. The deformation modeling is applied through the alignment from control points generation and control points registration. The merit of this method is that it can be adapted with any classifier to segment brain tumors.

The accuracy provided by this method 94%.The demerit of this method is that it has no robust against noise environment.

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### *G. Brain Tumor Segmentation based on Convolutional Neural Network (BTS-CNN)*

The author Sergio Peteira et al. [7] report a brain tumor segmentation approach based on Convolutional Neural Network (CNN). This method is associated with 3x3 size small kernels which are the gifts to design a deeper architecture. The over-fitting problem of CNN is avoided using fewer numbers of weights in the network. Intensity normalization is used in this method as a processing work to enhance the performance of CNN. The BRAT2013 database is used to conduct simulation and the BTS-CNN method reaches the first position on success. The BRATS 2015 database challenge is also faced by the BTS-CNN method and attains second position on success of brain tumor segmentation. This method is the best suited to preplanning of GLIMOS brain tumor which has highest mortality rate. The intensity normalization method solves the heterogeneity caused by multi-site multi-scanner acquisitions of MRI. This method considered both spatial and structural variability in brain tumors to get segmentation. This method is designed with 3 stages such as preprocessing, classification and post-processing. The preprocessing step corrects the intensity so that same tissues reach same intensity through intensity normalization. After normalizing the MRI images, the mean intensity value and standard deviation across all training patches are extracted.

The application of convolutional layers consists of convolving signal-or-image with kernels to generate feature maps. The weights of the kernels are fixed at run-time using back-propagation to enhance the characteristics of the input. The neighborhood information is processing using kernels which is the key source of context information. The CNN is consisted by the following key modules.

- Initialization
- Activation function
- Pooling
- Regularization
- Data augmentation

## IV. ANALYSIS AND DISCUSSION

The reviewed results are analyzed and tabulated in tables and depicted via graphs

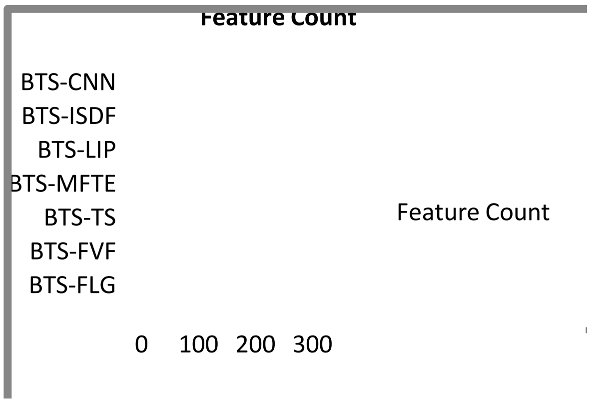


**Figure 7.Analysis chart for feature count for 7 methods**

The feature count property is expressed by the table 3 and Fig. 7. The BTS-CNN method occupies more features than other methods.

**Table 1: Analysis on preprocessing, feature and Segmentation method**

| Methods | Publication | Year | Pre-processing | Features | Segmentation method |
|---|---|---|---|---|---|
| **BTS-FLG[1]** | IEEE EMBS | 2003 | Morphological operation and Histogram specification | Intensity based patches | Fuzzy C-Means |
| **BTS-FVF[2]** | IEEE Transaction on Bio medical Engineering | 2009 | Gaussian smoothing filter | Patch based patches | Fluid flow |
| **BTS-TC [3]** | IEEE Transaction on medical Imaging | 2012 | User line based VOI selection | Intensity based patches | Level set |
| **BTS-MFTE [4]** | IEEE Transaction on Biomedical Engineer | 2013 | 4 stage method | Fractal multi FD and texton | Modified Ada-Boost |
| **BTS-LIP [5]** | IEEE Transaction on Biomedical Engineer | 2014 | N3 algorithm, brain region extraction, linear-scaling of voxel intensity | Patch based intensity | LIPC |
| **BTS-ISDF [6]** | IEEE intelligent systems | 2016 | Not reported | Intracranial structure | SVM |
| **BTS-CNN [7]** | IEEE transaction on medical imaging | 2016 | Intensity normalization | Pixels based intensity | CNN |

**Table 2: Analysis on block size used, merits and demerits**

| Methods | Block Size | Merits | DeMerits |
|---|---|---|---|
| **BTS-FLG[1]** | 2x2 | Support classification | Cannot detect initial type tumor |
| **BTS-FVF[2]** | 2x2 | Less complexity | Semi automation |
| **BTS-TC [3]** | Not reported | *Fast execution<br>*Robustness with various tumor types | Semi automatic method |
| **BTS-MFTE [4]** | 8x8 | *Less computational cost<br>*Easily adopt with 3D texture based segmentation. | Suffers with large set training data. |
| **BTS-LIP [5]** | Not reported | * Patient independent type.<br>*automatic model.<br>* Automatic tumor segmentation executes on multi-resolution framework. | Need of 4 modalities |
| **BTS-ISDF [6]** | Dynamic | *less computational cost<br>*Adapted to any classifier<br>*Automatic segmentation | Not robust to noisy environment |
| **BTS-CNN [7]** | 3x3 | *Reliable method<br>*Small 3x3 kernels<br>*Avoid over-fitting in CNN | Hard threshold is required in post processing |

**Table 3: Analysis on Feature count, database used and Accuracy**

| Methods | Feature used | Database used | Accuracy |
|---|---|---|---|
| **BTS-FLG[1]** | 256 | Internet images | 88% |
| **BTS-FVF[2]** | 256 | Web images | 87% |
| **BTS-TC [3]** | 121 | Hardware tumor database ASM | 90% |
| **BTS-MFTE [4]** | 50 | BRAST 2012 | 81% |
| **BTS-LIP [5]** | 108 | MICCAI 2012 and MICCAI 2013, BRATS 2012 | 90% |
| **BTS-ISDF [6]** | 81 | Own database with 11 cases BRATS 2013 and | 94% |
| **BTS-CNN [7]** | 192 | BRATS 2015 | 88% |

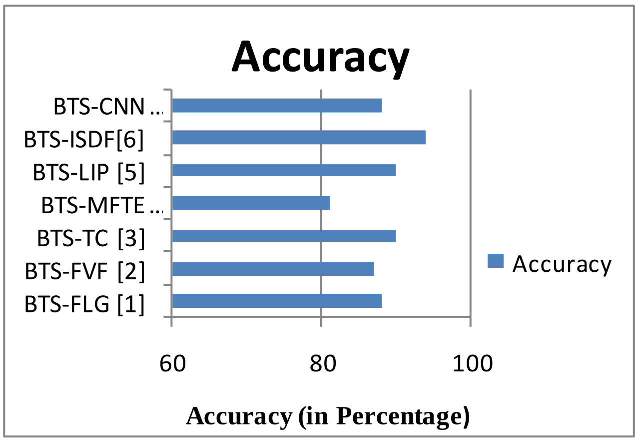


**Figure 8.Accuracy analysis chart for seven methods.**

This BTS-ISDF method provides higher accuracy in brain tumor segmentation than other methods. The BTS-TC method is the second-best method in case of accuracy and the BTS-MFTE is the least performance method. These accuracy based results are expressed by Table 3 and Fig.8.

## V. CONCLUSION

Image segmentation is applied in many modern biomedical applications. Tumor detection and diagnosis are sensitive and challengeable, hence accuracy and reliability play a key role. This study is based on the information from the recent five publishers on tumor segmentation. This paper reaches a partial survey of various tumor segmentation methods applied in MRI. In the earlier section the various methods which are currently used in medical field were extensively analysed. A brief explanation of each method along with tumor area detection and segmentation is givens. This analysis also compares various performance metrics of that methods. Each and every method is having their own merits and demerits and from that the young researchers can get knowledge on what method is suitable for detecting a particular type of tumor. This paper can be helpful to engineering theory and medical field. By concluding that there is no universal system that can detect the tumor accurately regardless of its location, shape and intensity. So in future to reduce the tumor detecting time and increase the accuracy better segmentation schemes should be developed to help doctors in analyzing MR Images.

## REFERENCES

[1] S.Shen,W.A Sandham and M.H. Granat M.F. Dempsey, J. Patterson,"A New Approach to Braain Tumor Diagnosis using Fuzzy Logic Based Genetic Programming", International conference of the IEEE, 2003.

[2] Tao Wang, Irene Cheng, Member IEEE and Anup Basu, Senior member, IEEE," Fluid Vector Flow and Applications in Brain Tumor Segmentation", IEEE Transactions on Biomedical Engineering, Vol. 56, No.3, 2009.

[3] Andac Hamamci, Nadir kucuk, kutlay Karamon, Kayihan Engin and GozdeUnal, "Tumor- cut: Segmentation of brain tumors on contrast enhanced MR Images for radio-surgery applications", IEEE transactions on medical imaging, vol. 31, no. 3, pp. 790-804, 2012.

[4] Atiq Islam, Syed M.S Reza and M. Iftekharuddin, "Multi fractal texture estimation for detection and segmentation of brain tumors", IEEE transactions on biomedical engineering, vol. 60, issue 11, pp. 3204-3215, 2013.

[5] Meiyan Huang, Wei Yang, Yao Wu, Jun Jiang, Wufan Chen and Qianjin Feng, " Brain tumor segmentation based on local independent projection based classification", IEEE transaction on biomedical engineering, vol. 61, issue 10, pp. 2633-2645, 2014.

[6] Shang Ling Jui, Shichen Zhang, Weilum Xiong, Fangxia oqiyu, Mingjian, Dongmei Wang, Aboul Ella Hassanien and Xiao, "Brain MR Image tumor segmentation with 3-Dimensional intracranial structure deformation features", IEEE intelligent systems, vol. 31, issue 2, pp. 66-76, 2016.

[7] Sergio Pereira, Adriano pinto, Victor Alves and Carlos A. Silva, "Brain tumor segmentation using convolutional neural networks in MRI images", IEEE transaction on medical imaging, vol. 35, no. 5, pp. 1240-1251, 2016.

[8] Harsimranjot Kaur and Reecha Sharma, "A survey on techniques for brain tumor segmentation from Mri", IOSR journal of electronics and communication engineering (IOSR-JECE), vol. 11, issue 5, pp. 1-5, 2016.

[9] R.J Deshmukh and R.S Khule, "A survey on automated techniques for brain tumor detection", journal of engineering research and application, vol. 4, issue 5, version 4, pp. 78-80, 2014.

[10] Praveen Kumar and Manojkumar, " Tumor Detection in Brain MRI using improved segmentation Algorithm", IEEE 4th ICCCNT, 2013.

[11] S.V. Aswathy, G. Glan Deva Dhas and S.S. Kumar, "A Survey on Detection of brain tumor from MRI brain images", IEEE international Conference on control, Instrumentation, Communication and computational technologies (ICCICCT), 2014.

[12] LuxitKapoor and Sanjeev Thakur, "A survey on brain tumor detection using image processing techniques", IEEE international conference on cloud computing, data science and engineering confluence, pp. 582-585, 2017.

[13] S.Khare, N.Gupta and V. Srivastava, "Optimization technique, curve fitting and machine learning used to detect brain tumor in MRI", Proceeding of IEEE International conference on computer communication and systems, ICCCS14, 2014.

[14] Rajesh C.Patel and A.S.Bhalchandra, "Brain tumor extraction from MR Images using Matlab", International Journal of electronics communication and soft computing science and engineering, vol. 2 no. 1, 2012.

[15] T.S.D Murthy and G.Sadashivappa, "Brain tumor segmentation using thresholding, morphological operations and extraction of features of tumor", International Conference on advances in electronics computer and communications, 2014.

[16] J.SlevaKumar, A.Lekshmi and T.Arivoli, "Brain tumor segmentation and its area calculation in brain MR Images using K means clustering and fuzzy C means algorithm", IEEE international conference on advances in engineering science and management (ICAESM), 2012.

[17] M.N.Wu, C.C Lin and C.C. Chang, "Brain tumor detection using color based K means clustering segmentation", Third International conference on intelligent information hiding and multimedia signal processing (IIH-MSP), 2007.

[18] N.N Gopal and M.Karnal, Diagnose brain tumor through MRI using image processing clustering algorithms such as fussy C means along with intelligent optimization techniques", IEEE International conference on computational intelligence and computing research, 2010.

[19] E.F Badran, E.G Mahmoud and N.Hamdy, "An algorithm for detecting brain tumors in MR Images", International Conference on computer engineering and systems, 2010.

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