Detection and Quantification of Brain Tumor from MRI of Brain: A Review

Ankit Ojha
Shri Shankaracharya Technical Campus (SSTC SSGI)
Dept. of Information Technology (M.Tech)
Junwani Bhilai Chhattisgarh, India
Email id- ankit.ojha75@gmail.com

Mr.K.V.Ravi kumar
Assistant Professor
Shri Shankaracharya Technical Campus (SSTC SSGI)
Dept. of Information Technology (M.Tech)
Junwani Bhilai, Chhattisgarh, India
Email id- kvrk1986l@gmail.com

Abstract

MRI Imaging plays a vital part in brain tumor for diagnosis, analysis and treatment planning. It is useful to doctor for determine the former steps of brain tumor. Brain tumor detections are using MRI images is a most challenging task, because of the complex structure of the brain. Brain tumor is a strange development of cell of brain. MRI images offer better contrast concern of different delicate tissues of human body. MRI Image gives preferred outcomes over CT, Ultrasound, and X-ray. In this review paper, our main goal is to present the review of various brain tumor segmentation methods using the MRI images. The various approaches for segmentation are studied with their advantages and disadvantages in this paper.

Keywords— *Brain Tumor (BT), MRI-Images, CT Scan, IP, X-Ray*

I. INTRODUCTION

Human body is comprised of a different types of cells. Brain is a highly specific and delicate organ of human body. Brain tumor is an exceptionally harmful disease for human being. The brain tumor is intracranial mass made up by abnormal growth of tissue in the brain or around the brain.

Brain tumor can be identified by amiable or dangerous type. The considerate being non-cancerous and threatening is cancerous. Malignant tumor is distinguish into two sorts; primary and secondary tumor, benign tumor is less destructive than malignant. The malignant tumor it spread quickly entering different tissues of the brain and therefore, worsening condition patients are loosed. Brain tumor detection is extremely challenging issue because of complex structure of brain.

Brain tumor diagnosis is very troublesome as a result of differing shape, size, area and appearance of tumor in brain. To detect Brain Tumor is hard in starting stage since it cannot locate the exact measurement of tumor. Be that as it may, once it gets identified the brain tumor it provides for begin the best possible treatment and it might be curable. And therefore, the treatment depends on tumor like; surgery, chemotherapy, and radiotherapy.

PC algorithm for the depiction of anatomical structures and different region of interest are a key segment in helping and automating particular radiological tasks. These algorithm, called image segmentation algorithm, plays a crucial part in various biomedical imaging applications, for example, investigation of anatomical structure, treatment planning, partial volume correction of functional imaging information, the measurement of tissue volumes, diagnosis, localization of pathology, and PC integrated surgery. Segmentation of brain tumor considers the separation of tumor tissues(tumor, edema and necrosis) from ordinary brain tissues: gray matter(GM),white matter(WM) and cerebrospinal fluid (CSF).Brain tissues segmentation particularly tumor and edema, is a intricate task as a result of artifacts in tumor, complex shape, heterogeneous intensity distribution and variability of the position of tumor. Since brain tumor division has extraordinary effect on monitoring, diagnosis, treatment planning for patients, and clinical trials.

Brain tumor is one of the main sources of death among individuals. It is evidence that the shot of survival can be expanded if the tumor is identified effectively at its initial stage. As a rule, the doctor gives the treatment for the strokes instead of the treatment for the tumor. In this manner, location of the tumor is fundamental for the treatment. The lifetime of the individual who influenced by the mind tumor will increment in the event that it is recognized early. MRI is a noninvasive and great delicate tissue differentiate imaging methodology, which gives important data about shape.

There are numerous division procedures which can be comprehensively utilized, for example, histogram based strategies, edge-based techniques, manufactured neural

system based division techniques, physical model based methodologies, region based techniques (area part, developing, and combining), and clustering strategies (Fuzzy - implies grouping, K-implies grouping, Mean Shift, and Expectation Maximization).Our primary focus is on the procedures which utilize image segmentation to identify brain tumor.

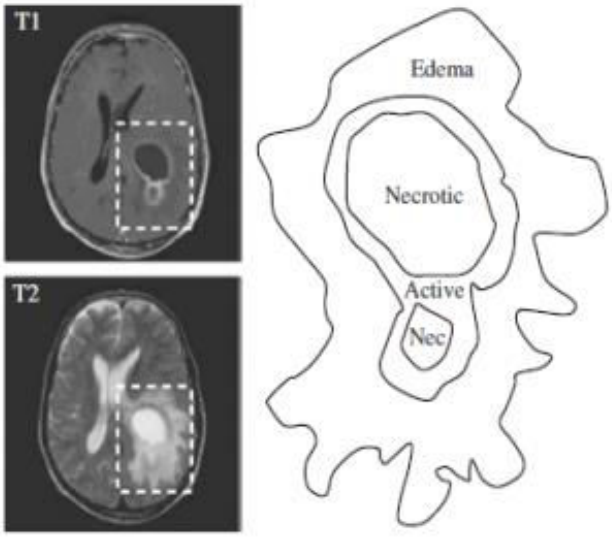

Fig. 1. Labeled example of a brain tumor describing the importance of the various modalities).

II. LITERATURE SURVEY

Tuhin Utsab Paul [1], Detection and segmentation of brain tumors in Magnetic Resonance Images (MRI) is an important but very time-consuming task that required to be completed manually by medical experts. Automation of this process is a challenging task due to the occurrence of the high degree of intensity and textural similarity between normal areas and tumor areas in Brain MRI images. In this paper we propose a fully automated two step segmentation process of brain MRI images. Firstly, the scull is stripped from the MRI images by generating a scull mask from the original MRI image.. Finally, the length and breadth of the tumor is assessed.

Sudipta Roy [2], in this work a fully automatic algorithm to detect brain tumors by using symmetry analysis is proposed. Here we detect the tumor, segment the tumor and calculate the area of the tumor. The quantitative analysis of MRI brain tumor allows obtaining useful key indicators of disease progression. The complex problem of segmenting tumor in MRI can be successfully addressed by considering modular and multi-step approaches mimicking the human visual inspection process. The tumor detection is often an essential preliminary phase to solve the segmentation problem successfully. The experiments showed good results also in complex situations. Segmentation of images embraces a significant position in the region of image processing.

Eman Abdel-Maksoud [3], this paper presents an efficient image segmentation approach using K-means clustering technique integrated with Fuzzy C-means algorithm. It is followed by thresholding and level set segmentation stages to provide an accurate brain tumor detection. The proposed technique can get benefits of the K-means clustering for image segmentation in the aspects of minimal computation time. In addition, it can get advantages of the Fuzzy C-means in the aspects of accuracy. The performance of the proposed image segmentation approach was evaluated by comparing it with some state of the art segmentation algorithms in case of accuracy, processing time, and performance.

Asra Aslam [4], Image segmentation is used to separate objects from the background, and thus it has proved to be a powerful tool in bio-medical imaging. In this paper, an Improved Edge Detection algorithm for brain-tumor segmentation is presented. It is based on Sobel edge detection. It combines the Sobel method with image dependent thresholding method, and finds different regions using closed contour algorithm. Finally tumors are extracted from the image using intensity information within the closed contours. The algorithm is implemented in C and its performance is measured objectively as well as subjectively. Simulation results show that the proposed algorithm gives superior performance over conventional segmentation methods.

Dai Junfeng [5], this paper studies several kinds of image segmentation algorithm, and region-growing algorithm and fast level set matching algorithm FM are programmed by VC and verified, there into, the speed of segmentation of region-growing algorithm is fast. It is primarily affected by the identity of gray level of object region, for the inconsistent object region, excessive segmentation and missing segmentation will happen. The fast matching method can easily handle the geometric objects which topological structure is complex or changing, but the evolving curve also easily leak from the boundary, if there are holes in an object which has been segmented, it will not quite separate the interior outline of the object, so, aiming at the characteristics of medical image, an improved fast matching algorithm is presented in this paper.

***TABLE I**. Shows comparison between various existing approaches and its limitation*

Ref. No.	Method Used	Data Source	Approach	Strength	Limitation
1	Symmetry analysis	MRI of brain	Propose a fully automated segmentation process of brain MRI images.	The proposed can identify the status of increase in the disease by employing quantitative analysis.	MRI segmentation is one of the essential tasks in medical area but is boring and time consuming. Visual study of MRI is generally more interesting and fast.
2	Normalized cut method	MRI of brain	Propose a fully automatic algorithm to detect brain tumors by using symmetry analysis	mean shift, normalized cut, component analysis	The brain tumor in the processed data is detected through component analysis.
3	Fuzzy C Mean Segmentation	MRI of brain	Presents an efficient image segmentation approach using K-means clustering technique integrated with Fuzzy C-means algorithm.	Unsupervised. It converges the tumor boundaries.	Long computational time, sensitivity to noise
4	Threshold based segmentation	MRI of brain	An improved version of Sobel edge detection for brain tumor segmentation of MR image is proposed.	Simpler, fast computations and lower complexity	Limited applicability to enhance tumor area. It does not take into account spatial domain, thus there is uncertainty that regions are connected.
5	Region based segmentation	MRI of brain	Proposed the fast matching method which can easily handle the geometric objects which topological structure is complex or changing, but the evolving curve also easily leak from the boundary.	It is best since it correctly segments regions that have similar properties and produces connected region.	It is quite expensive in terms of computation of both time and memory. Partial Volume effect.

III. CONCLUSION

As diagnosing tumor is a most complicated and sensitive task; therefore, accuracy as well as reliability are always assigned to be most important. MRI images are best suitable for detection the brain tumor. In this study Digital Image Processing Techniques are important for brain tumor detection by MRI images. In this paper, we have review the diverse aspects of medical imaging particularly for the use of analysis of brain tumor using MRI.

We have introduced the survey of various brain image segmentation strategies exhibited up until now, as well their advantages and disadvantages are examined as similar examination. For the future work, we suggest to present more accurate, efficient and faster technique for early detection and classification of brain tumors.

REFERENCES

[1] Tuhin Utsab Paul and Samir Kumar Bandhyopadhyay, "Segmentation of Brain Tumor from Brain MRI Images Reintroducing K – Means with advanced Dual Localization Method", International Journal of Engineering Research and Applications (IJERA), Vol. 2, Issue 3, May-Jun 2012, pp. 226-231.

[2] S. Roy and S. K. Bandyopadhyay, "Detection and Quantification of Brain Tumor from MRI of Brain and it's Symmetric Analysis", International Journal of Informat, Volume 2 No. 6, June 2012.

[3] Eman Abdel –Maksoud, Mohammed Elmogy, Rashid AlAwadi, ―Brain Tumor Segmentation based on a hybrid clustering Technique‖,Egyptian Informatics Journal 16 Science direct ,pp 71-81,2015.

[4] Asra Aslam,Ekram Khan,M.M.Sufyan Beg, ―Improved Edge detection algorithm for Brain Tumor Segmentation‖,Second International Symposium on Computer vision and the internet, procedia computer -science 58 pp-430-437,2015.

[6] Dai Junfeng,Y A N Yunyang,‖The Fast Medical Segmentation of Target Region Based on Improved FM Algorithm‖, International Workshop on Information and Electronics Engineering, Procedia Engineering 29.SciVerse Science Direct pp-48-52, 2012.