

# Brain Tumor Segmentation and Classification: A Review

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## ABSTRACT

A Brain Cancer is very serious disease causing deaths of many individuals. The detection and classification system must be available so that it can be diagnosed at early stages. Cancer classification has been one of the most challenging tasks in clinical diagnosis. At present cancer classification is done mainly by looking through the cells' morphological differences, which do not always give a clear distinction of cancer subtypes. Unfortunately, this may have a significant impact on the final outcome of whether a patient could be cured effectively or not. In this paper we have made a survey on different algorithms and techniques proposed by different authors for brain tumor extraction.

**Keywords:** Brain Tumor Detection, Artificial Neural Network, Magnetic Resonance Image.

## I. INTRODUCTION

The human body is made up of many organs and brain is the most critical and vital organ of them all. One of the common reasons for dysfunction of brain is brain tumour. A tumour is nothing but excess cells growing in an uncontrolled manner. Brain tumour cells grow in a way that they eventually take up all the nutrients meant for the healthy cells and tissues which results in brain failure. Currently, doctors locate the position and the area of brain tumour by looking at the MR Images of the brain of the patient manually. This results in inaccurate detection of the tumour and is also considered to be very time consuming. A tumour is a mass of tissue that grows out of control of the normal forces that regulates growth (Pal and Pal,1993). Brain tumour s are abnormal and uncontrolled proliferations of cells. An inferior or metastatic brain tumour takes place when cancer cells extend to the brain from a primary cancer in a different component of the body.

1.1 There are two common types of tumour:

1. Benign tumour
2. Malignant tumour

Analogy to the Brain

The exact workings of the human brain are still a mystery. Yet, some aspects of this amazing processor are known. In particular, the most basic element of the

human brain is a specific type of cell which, unlike the rest of the body, doesn't appear to regenerate. Because this type of cell is the only part of the body that isn't slowly replaced, it is assumed that these cells are what provide us with our abilities to remember, think, and apply previous experiences to our every action.

1.2 An artificial neural network (ANN): generally called neural network (NN), is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural networks. A neural network contains of an interconnected group of artificial neurons (processing element), working in unison to solve specific problems. ANNs, like people, learn by example.

When tumor spread in any part of brain then it is known as brain tumor. Now when brain tumor can identified number of symptoms including seizures, mood changing, difficulty in walking and hearing, vision, and muscular movement etc. brain tumor is classified into Gliomas, medulloblastoma, epeldymomas, CNS lymphoma and oligodendrogloma. In primary stage the tumor can be removed but in secondary stage ,the tumor disease spread, due to this after removal of tumor the seldom remains and grow back again so this is the biggest problem in the secondary stage of tumor . Why this problem occurs? It occurs due to inaccurately location of area of tumor. The next step is detection

techniques. In this the any segmentation and detection are to measure detection techniques the imaging of brain tumor can be done by-

1. MRI scanning that is magnetic resonant image
2. CT scanning i.e. computer tomography
3. Ultra sound etc.

There are several method to detect an brain tumor by that the tumor method we can diagnose and detect more easily .some edges are nuclear network algorithm watershed and edge detection, fuzzy c mean algorithm, asymmetry of brain is used to detect an abnormality . The problem of edge detection is the one of the most attractive problem for the image processing due to this it's various applications. Candy-edge detection is the one of the most useful feature in image segmentation. In this candy-edge detection is used for extraction of edges. F-transform is an intelligent method to handle uncertain information. This is useful for detection of tumor boundaries. It is very easy method for detection is a promising and efficient method for future and edge extraction progress.

### Literature Survey

The literature shows the various methods for the detection of brain tumour. This method used an approach to detect brain tumour using four different methods namely Otsu, K-means, Fuzzy-c-Means and thresholding. The main objective of this paper is to develop a fully automated brain tumour detection system that can detect and extract tumour from MR Image of brain. This paper also gives the comparison between the algorithms presented [1].

This project deals with such a system which uses computer based procedures to detect tumour blocks and classify the type of tumour using Artificial Neural Network Algorithm for MRI images of different patients. Different image processing techniques such as histogram equalization, image segmentation, image enhancement, morphological operations and feature extraction are used for detection of the brain tumour in the MRI images of the cancer affected patients[2]

This work has introduced one automatic brain tumour detection method to increase the accuracy and yield and decrease the diagnosis time. Here, it is tried to give clear description from brain tissues using Multi-Layer Perception Network, energy, entropy, contrast and some other statistic features such as mean, median, variance

and correlation. It is used from a feature selection method to reduce the feature space too. This method uses from neural network to do this classification.[3]

In this paper, a survey has been made on the applications of intelligent computing techniques for diagnostic sciences in biomedical image classification. This study gathers representative works that exhibit how AI is applied to the solution of very different problems related to different diagnostic science analysis. It also detects the methods of artificial intelligence that are used frequently together to solve the special problems of medicine. SVM neural network issued in almost all imaging modalities of medical image classification. Similarly fuzzy C means and improvements to it are important tool in segmentation of brain images. Various diagnostic studies like mammogram analysis, MRI brain analysis, bone and retinal analysis etc., using neural network approach result in use of back propagation network, probabilistic neural network, and extreme learning machine recurrently. Hybrid approach of GA and PSO are also commonly used for feature extraction and feature selection [4]

In this paper noise free image is given as a input to the k-means and tumour is extracted from the MRI image. And then segmentation using Fuzzy C means for accurate tumour shape extraction of malignant tumour and thresholding of output in feature extraction. Finally approximate reasoning for calculating tumour shape and position calculation. The experimental results are compared with other algorithms.[5]

This paper presents an automated recognition system for MR imaging using ANNs. It was observed that when Elman network was used during the recognition process, the duration time and the accuracy level were high, compared with other ANNs systems.[6]

This paper reviewed the techniques of the MRI image enhancement in terms of tumour pixels detected. They studied several digital image processing methods and discussed its requirements and properties in brain tumour detection .This paper gives enhanced information about brain tumour detection and segmentation. The marked area is segmented and the assessment of this tool from the radiologist, whom the project is concerned with, is positive and this tool helps them in diagnosis, the treatment procedure and state of the tumour monitoring.[7]

This paper presents a automated recognition system for the MRI image using the neuro fuzzy logic. Features are extracted from raw images which are then fed to ANFIS (Artificial neural fuzzy inference system).ANFIS being neuro-fuzzy system harness power of both hence it proves to be a sophisticated framework for multi object classification. A comprehensive feature set and fuzzy rules are selected to classify an abnormal image to the corresponding tumour type.[8]

The system developed in this study classifies and identifies pathological tissues in a noninvasive and automated fashion. The designed brain tumour detection and classification system uses conceptually simple classification method using the neural network. Textures features are used in the training of the ANN. Co-occurrence matrices at different directions are calculated and GLCM features and Gabor features are extracted from the matrices.[9]

## II. CONCLUSION

MRI images are best suitable for brain tumor detection. In this study Digital Image Processing Techniques are important for brain tumor detection by MRI images. The preprocessing techniques include different methods like Filtering, Contrast enhancement, Edge detection is used for image smoothing. The preprocessed images are used for post processing operations like; threshold, histogram, segmentation and morphological, which is used to enhance the images.

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