A Review on Study and Analysis of Automatic Brain Tumor Detection through Magnetic Resonance Imaging

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Abstract
Brain tumor is an abnormal growth in the brain caused by cells reproducing themselves in an uncontrolled manner. It is detected by examining the medical images such as MRI. To Analyze and compare the diverse methods of automatic detection of brain tumor through Magnetic Resonance Image (MRI) used in different stages of Computer Aided Detection System (CAD).Tumor detection and segmentation are two key problems in research undertaken on brain diagnosis. The main techniques for detection and segmentation are clustering based, knowledge-based, Model-based, level-set evolution, or combination of them. In particular, the Preprocessing, Enhancement and Segmentation are studied and compared. Classification procedure used to obtain final results is also discussed. In Preprocessing and Enhancement stage, medical image is converted into standard format and is manipulated for noise reduction by background removal, edge sharpening, filtering process and removal of film artifacts. Segmentation determines the process of dividing an image into disjoint homogenous regions of a medical image. Classification helps to compare the system generated result with the radiologist report are studied and compared. In this study, a novel method is proposed for image segmentation using soft computing

Keywords: MRI, Preprocessing & Enhancement, Segmentation, Feature Extraction, Feature Selection, Classification**.**

1. Introduction
The paper mainly focuses on the comparison of automatic brain tumor detection methods through MRI brain Images[[23][30]. Yearly, above 30,000 persons in Europe are diagnosed with brain tumor, a rate of 7-8 per 100,000 people. Brain tumors can not be prevented, because causes are detecting now.Detection of brain tumor requires high resolution brain MR Images.

1.1 Automatic System
Automated MRI (Magnetic Resonance Imaging) brain tumor segmentation is a strenuous task due to the divergence and intricacy of tumors [7]. Now Many segmentation techniques are available such as (a) Automatic Segmentation[[31][32] (b)Semi Automatic Segmentation[33] (c) Manual Segmentation.

In this paper describes automatic segmentation. It is very efficient compare than manual and automatic segmentation. In Automatic System Contains two phases. The First phase contains Preprocessing & Enhancement and segmentation. In the second phase contains Feature extraction, Feature selection and classification.

1.2 MRI

Out of the Medical Imaging test and studies conducted using MRI, PET and CT-Scan**,** MRI is the renowned technique as it is multidimensional in , nature of data provided from different sequential pulses [3].MR scanners are capable of producing 1500 images per second and can acquire high contrast images of Soft tissue anatomy [6]. Gilbert Vezina says 'Magnetic resonance imaging (MRI) is the most commonly utilized technique for lesion detection, definition of extent, detection of spread and in evaluation of either residual or recurrent disease[4]

2. Preprocessing & Enhancement

2.1 Preprocessing

The Preprocessing stage is used for reducing image noise, highlighting edges, or displaying digital images. it implies that the tissue of same type might have different scales of signal variations for different images.

2.1.1 Standardization

Shen developed preprocessing of MR Images using standardization and obtained 89.81% of accuracy.

2.1.2 Clustering Technique

The medical image segmentation primarily focuses on the extraction and characterization of anatomical structures with respect to some input features or expert knowledge

Marcel prastawa described Unsupervised Clustering Technique is use to preprocess the MR images with high resolution. It automatically identifies the presence of edema with few false positivies[15].

2.1.3 Wavelet Transform

Azadeh described Wavelet Transforms vanish the noise coefficients by thresholding the detail components[16].

2.1.4 Genetic programming (GP)

GP very large terminal sets could lead to huge sub-programs which
use a lot of memory and need a large amount of time to process. Pre-processing of the data can be used to
reduce the number of variables. The three stages used on the data in this study are Principal Component (PC)Analysis followed by varimax and (with the second data set) promax rotations[18].

2 Enhancement

The enhancement stage includes resolution enhancement; contrast enhancement. it is used to suppress noise and imaging of spectral parameters. After this stage the medical image is converted into standard image without noise, film artifacts and labels.

2.2.1 V-Filter

Hideki Described Boundary Enhancement Algorithms for MRI using V-Filter is use to increase the signal-to-noise ratio to mean to variance ratio[19].

Sandham presents non brain removal method to enhance MRI brain images[20].

3. Segmentation

The segmentation is important part in automatic segmentation. This section is used to segment suspicious regions from background tissue. It requires selection of window size pixels and threshold parameters [13]. Image Segmentation is a very complicated system for automation[24][25].

Segmentation Algorithms for brain images can be divided into the following categories (a) Pixel Based (b) Region or Texture Based (c) Structural Based[27].

3.1Genetic Algorithm:

Jing-Hao says Genetic Algorithm is used to improve the accuracy of the label for the context segmentation. This label produces optimal solution [1].

3.2 Deformable Model

Hybrid deformable models are intended to automate the model initialization process and improve segmentation and registration process[9].

3.3Fuzzy Model:

Karen Chia describes Generalized KCL algorithms are used in ophthalmological MRI s and these are detect the lesion area.Fuzzy Algorithms normally suffer to initials, parameters and noise[11][26].

The fuzzy model is used to design the overall function of the GAs (Genetic Algorithm) and Region Growing Method [34].

Knowledge-guided methods from Artificial Intelligence (AI), Image recognition neural networks (IRNN) produce high interpersonal variability [2].

Shen described segmentation of MR Images using fuzzy clustering algorithm and obtained approximate result in particular location[8]

Papageorgiou described The novelty of the method is based on the use of the soft computing method of fuzzy cognitive maps (FCMs) to represent
and model experts' knowledge (experience, expertise, heuristic)[12].

3.4 Artificial Intelligence

Prastawa constructed Artificial Intelligence techniques,statistical pattern recognition ,Minimum Covariance determination(MCD) for segmentation and got good accuracy compare than previous process[28]**.**

4. Feature Extraction

4.1 Deformable Region Model

Albert presented a modified deformable region model for the extraction of brain tumor boundary in the 2D MR images. The time required for the extraction of brain tumor boundary in MR images is greatly reduced.

4.2 Wavelet

Azadeh says wavelet is the ability to perform local analysis,it is use to analyze a localized area of large sized pixel[5].

5. Classification

Different Machine Learning(ML) Classification techniques have been investigated such as neural networks(NN),Support vector machine(SVM),Markov Random Files(MRF s),Conditional Random Fields(CRFs)[21][29].

5.1 Support Vector Machine (SVM):

SVMs were comparutively evaluated with the Bayesian classifier and the Probabilistic Neural Network.

Glotsos says The SVM classifier Discriminated low from high-grade tumours with an accuracy of 90.8% and less from highly aggressive tumours with 85.6%[14].

5.2 Genetic Programming (GP)

Genetic Programming is an Artificial Intelligence Technique; it can be grouped with genetic algorithms and Neural Networks.

Patterson designed a new automatic classification of MR Images by Genetic Programming (GP) to obtain 97% high accuracy[22].

5.3Receiver Operating Characteristics (ROC)

Devos prefers Classification is evaluated by the area under the Receiver Operating Characteristics (ROC) curve (AUC) gives good accuracy of 0.98 for Gliomas & Meningiomas detection from background tissue[17].

5.4 Multilayer Perceptron Model

Hamid Soltanian Constructed multilayer perceptron neural networks to classify the features extracted from the spectra.classification accuracy results were 82% for Glioma,85% for oligodendro Glioma,83% for Astrocytoma[10]**.**

6. Conclusion

The "Intelligent System for Brain Tumor Detection Using Soft Computing" reduces the involvement of radiologists in detecting the brain tumor and helps the radiographer to provide a primary opinion with a considerable rate of accuracy. Ant Colony Optimization(ACO),Particle Swarm optimizations(PSO), and Genetic Algorithm, from this above technique to expect more accuracy from the research. The foremost aim of this research work is to provide more accuracy to the result and to decrease the time complexity. As MRI brain image is the input, patients can themselves self examine their brain in the scan centers before consulting to a radiologist, thus saving time.

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