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AN EFFICIENT SUPERVISED LEARNING BASED TECHNIQUE FOR BRAIN TUMOUR DETECTION

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ABSTRACT

Digital image processing has lot of applications in field of recognizing and processing medical images. To analyze medical images in an accurate way is very important as patient life and treatment is associated with recognizing disease in an image. Brain tumour need a major attention as sometimes it is very difficult for a practitioner to exactly recognize and classify the tumour. In this paper our proposed system is based on supervise machine learning which classify the tumour in category of benign and malignant. The proposed work achieved an accuracy rate of near 99% which surpasses the accuracy rate of all existing methods. The machine learning enable the system to efficiently classify the category of tumour as learning improve the overall system performance and accuracy.

Keywords*: Benign, Tumour, MRI, Malignant, Segmentation.*

I. INTRODUCTION

Brain cancer is a fatal ailment which affects the brain cells and is growing rapidly among the aging population. There are several varieties of cancer and brain cancer is on the fifth in terms of incidence and mortality. Brain cancer is an aberrant growth of brain tissues which multiply in an outrageous manner and cannot be regulated by the mechanism that controls this abrupt growth of cells. Proper diagnosis of brain cancer is extremely vital to prevent the causalities occurring due to this. That's where medical imaging techniques come into play. Several imaging techniques are like Computed Tomography (CT), Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI). In CT scan, radioactive rays are passed inside the body and the images are collected based on the different ways these rays are reflected by the tissues. In PET, drugs are injected into the body which flows through the organs, cells and tissues and images are acquired based on that. Out of all, MRI is the safest method for cancer diagnosis as nonradioactive rays are passed and no drugs are injected into the body. It is best suited for the diagnosis of brain cancer because it provides a high resolution image without adversely affecting the tissues inside the brain.The vital concern is to accurately locate and detect the exact position in the brain where brain tumor exists. Despite of the fact that medical imaging techniques like MRI produce a high quality image and sensitive to the positioning of the tissues inside the brain, image processing techniques have to be applied to further enhance the quality of the image and make it feasible for a medical practitioner to clearly distinguish between the tumor cells and healthy cells. Basic steps involved in medical image processing are shown in fig.1.In the basic steps of medical image processing, image segmentation is the most crucial step. Image segmentation is the partitioning of the image collected using MRI into mutually exclusive distinct regions so that it is easier to locate the objects and identify the distinct boundaries in the images. . But it remains the challenging process due to the noises that creeps into the image while acquisition, poor contrasts and missing boundaries. Since image segmentation is the most crucial step in the clinical diagnosis of brain tumour, several techniques have been proposed in the literature to carry out the image segmentation accurately

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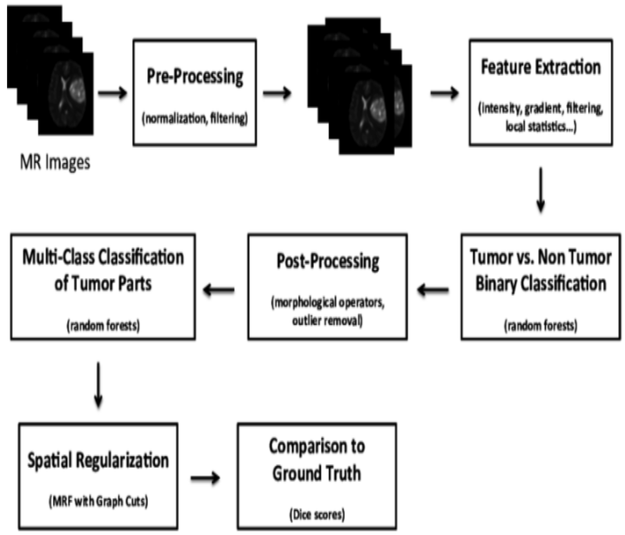


Fig.1. Steps of medical image processing

II. LITERATURE REVIEW

Chaplot et.al. et.al. [1] proposed a technique which involves wavelets as a contribution to support vector machines and neural network self-organizing maps to classify the MRI images of human brain. It classifies the MRI images as normal or abnormal based on certain characteristics. Experimental results indicate that self-organizing maps technique exhibit the classification rate of 94% and support vector machines show 98% classification rate. Dataset of 52 MRI images is used.

Bandhyopadhyay et.al [2] put forth a method of image segmentation that involves K-means clustering. The technique consists of three steps: first step is image segmentation of the acquired MRI images using K-means clustering, second step is local standard deviation guided grid based coarse grain localization and the final step is local standard deviation guided grid based fine grain localization. It involves the image that is acquired by MRI to be divided into two segments: First segment consists of normal cells comprising of cerebrospinal fluids, grey matter etc. and the second segment consists of tumor cells. The major constraint of this segmentation technique is that the images should be of adjacent imaging layers. But sometimes it leads to the loss of intensity. There are several other drawbacks like finer anatomic details were ignored.

Glavan et.al [3] developed a system which makes use of Convolution neural network (CNN) as pixel classifier for the image segmentation of X-ray images. The main aim of this study is to separate the bone tissue area from the rest of the image. For this, the image is classified into bone and non-bone as the system analyzes each pixel of image. The attempt was made to ensure the minimum training time of the network by dealing with only interest areas in the image. The proposed CNN based system exhibit better results than other techniques but still suffer from flaws due to the irregularities in the bone area and increased execution time.

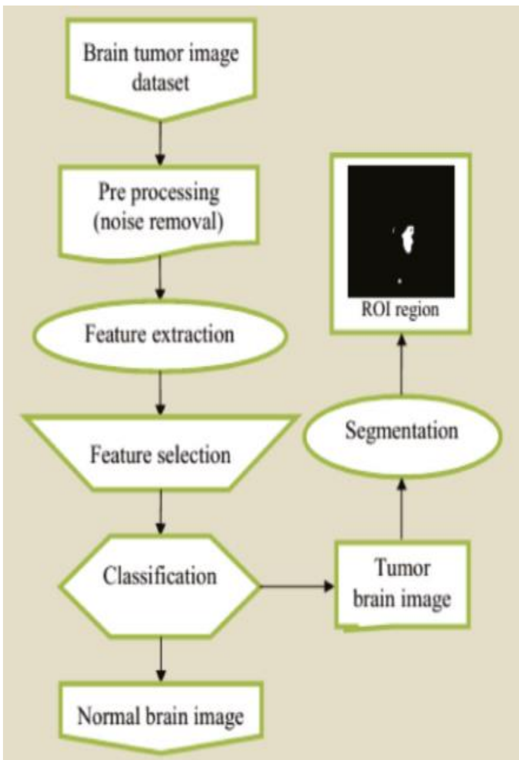
Yerpude et. al. [4] proposed an algorithm which makes use of K-Mediods clustering for the color image segmentation. The main concept of this algorithm is to identify the cluster of the objects by locating the mediods for each cluster. Instead of taking the mean values of the objects in the cluster, it takes the representative objects as points of reference. The major drawback of this technique is that it did not focus on finding the optimal number of segments which could have provided more accurate results.

Christe et.al [5] came forth with a technique that involves the amalgamation of two techniques: K-means and Fuzzy C-means. Various parameters were considered like number of clusters, distance, fuzziness and stopping the criterion. In order to obtain the objective function, firstly the memberships are initialized randomly and they are recalculated in several iterations. It can deal with the gray scale intensities which are being overlapped but it failed to define the boundaries between the tissues. Even the proposed technique does not perform well with the noise corrupted images.

Funmilola et.al. [6] developed a new method called Fuzzy K-C Means which possess more properties of Fuzzy C-means than Fuzzy K-Means. It works on the same gray scale images as that of Fuzzy C-means and also as the same number of iterations except that the attempt is made to reduce the number of iterations with the help of distance checker. The proposed algorithm firstly reads the acquired image, fixes the number of iterations and then minimizes the number of iterations using a distance checker, calculates the distance, obtains the size of the image , concatenates the dimension etc. major drawback of this technique is that except for some images, its results are similar to the Fuzzy C-means

III. PROPOSED WORK AND RESULTS

This paper aims to classify the tumour on basis of characteristic. The is shown in figure below process



- Pre-Processing Noise Removal- This step is done to remove all the noise from image, which degrade the image quality.
- Feature Extraction and Selection- The machine supervised learning is applied for feature extraction.

Based on learning the images are classified.

The proposed system achieves the overall accuracy of more than 99%. The dataset of 100 input images is used for testing. The major change in existing work is addition of supervised learning. Various images are shown, the classification is done on basis of feature selection.

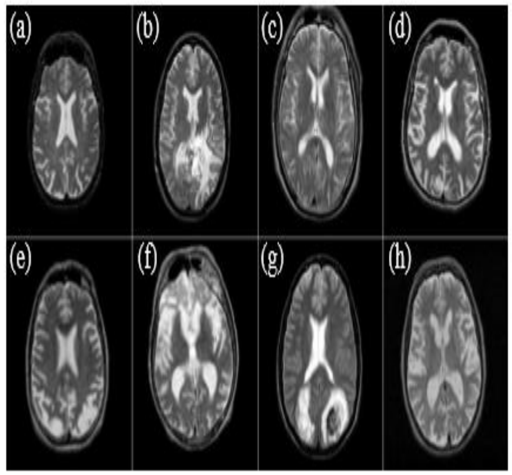


Figure 2 Brain MRI Images

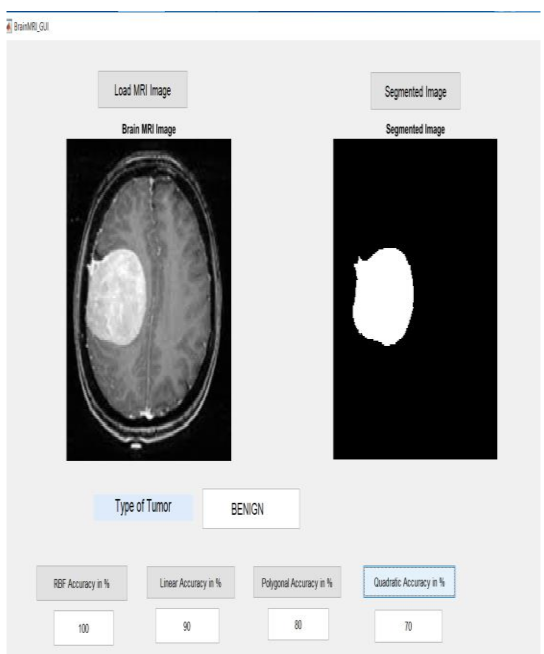


Figure 3 Proposed Work GUI

IV. CONLUSION

Tumour may be located in various regions of brain and is very difficult to recognize the exact size and shape of tumour cell due to distortion of edges. Our proposed algorithm segments the image in a clean manner and various operations for image noise removal and enhancement is applied for edges prevention to locate the tumour cell boundaries exactly. The tumour is classified in two categories benign and malignant where benign signifies the initial stages of tumour and malignant signifies last stages of tumour. The proposed system is tested on a image data set of 100 images which randomly containing tumour images which can be classified as benign and malignant. Learning based classification results in accurate classification of tumour. The proposed algorithm achieve an accuracy rate of more than 99% which is very high and it helps a practitioner to exactly classify the tumour.

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