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Detection of Brain Abnormalities from MRI Images Using MATLAB

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ABSTRACT: Medical image processing is the most challenging and emerging field now a days. Processing of MRI images is one of the part of this field. This paper describes the proposed strategy to detect & extraction of brain tumor from patient.MRI scan images of the brain. This method incorporates with some noise removal functions, segmentation and morphological operations which are the basic concepts of image processing. Detection and extraction of tumor from MRI scan images of the brain is done by using MATLAB software. Tumour is defined as the abnormal growth of the tissues. Brain tumour is an abnormal mass of tissue in which cells grow and multiply uncontrollably, seemingly unchecked by the mechanisms that control normal cells. Brain tumours can be primary or metastatic, and either malignant or benign. A metastatic brain tumour is a cancer that has spread from elsewhere in the body to the brain.A computer based method for defining tumor region in the MRI brain images is presented in this paper. The algorithm incorporates steps for pre-processing, feature extraction and classification using neural network techniques. The extraction of texture features in the detected tumor has been achieved by using Gabor filter. These features are used to train and classify the brain tumor employing Artificial Neural Network classifier. The system significantly improves the classification accuracy of brain tumor detection.

KEYWORDS:MRI, MATLAB, Tumor, Biological neural networks, Image segmentation, Feature extraction, Image edge detection

I. INTRODUCTION

Brain tumor segmentation is a recent research in field of biomedical application. Image segmentation is the process of partitioning an image into different clusters. The goal of image segmentation is a domain independent decomposition of an image into distinct regions such as color, intensity, brightness, textures etc. An important step in segmentation is to extract the region of area in which we are interested in. Clustering is a technique which classifies patterns in such a way that true positive pixels of same group who actually belongs to cancer than false positive pixels who does not belong to tumor belongs to different group. A brain tumor is any intracranial mass created by abnormal and uncontrolled cell division. Tumors can destroy brain cells or damage them indirectly by causing inflammation, compressing other parts of the brain, inducing cerebral edema or by exerting internal pressure as they grow. Brain tumors are classified into:

- Primary brain tumor
- Secondary brain tumor

Most Research in developed countries show that the number of people who develop brain tumors and die from them has increased perhaps as much as 300 over past three decades. The overall annual incidence of primary brain tumors in the U.S is 11 to 12 per 100,000 people for primary malignant brain tumors, that rate is 6 to 7 per 1,00,000. In the UK, over 4,200 people are diagnosed with a brain tumor every year (2007 estimates In India, totally 80,271 people are affected by various types of tumor (2007 estimates). Many approaches have been applied to find tumorous part from image. A neural network approach is given in 7 steps of training data (in 2010). T.LOGESWARI has defined a work on brain tumor detection using soft computing. In this paper, the proposed technique ACO hybrid with Fuzzy and Hybrid Self Organizing

Hybrid with Fuzzy describe segmentation consists of two steps . A cellular automata approach is used for radio surgery

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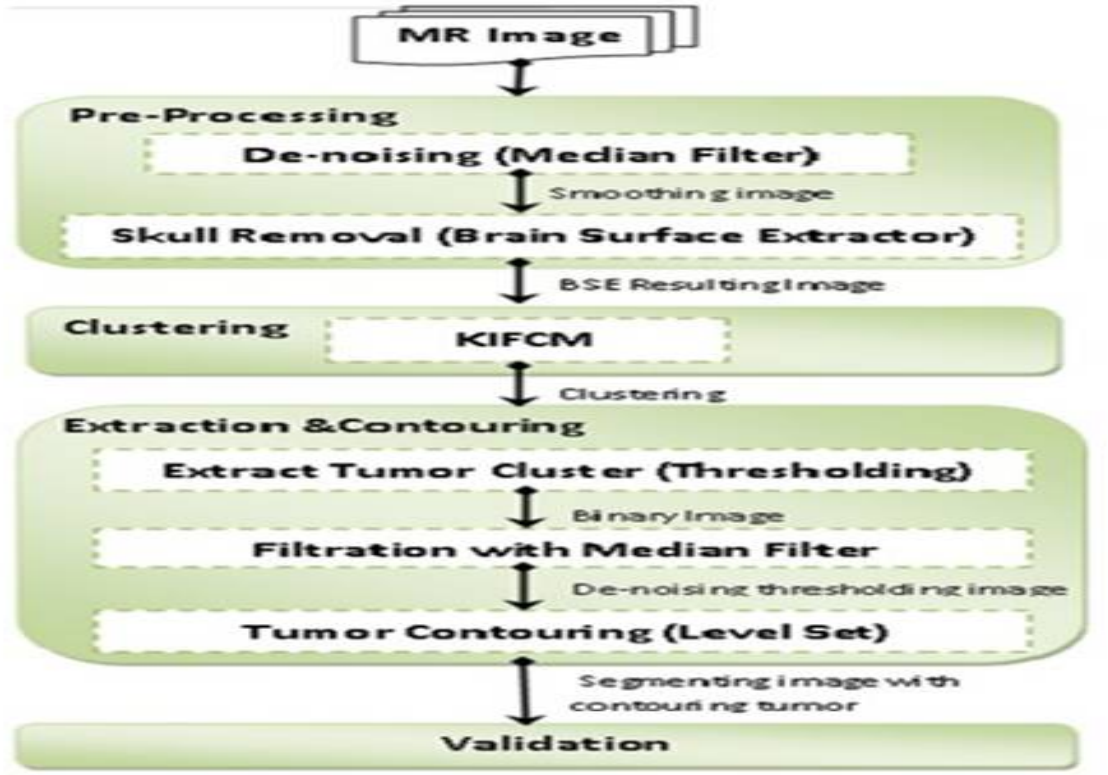
applications which gave results with far more accuracy than previous results (in 2012). A CAD approach is also applied to detect tumor which works upon global threshold segmentation is done on the sharpened image to segment the brain tumor. An automated diagnosis system for brain tumor detection should consist of multiple phases including noise removal, brain image segmentation and brain tumor extraction. This paper presents a fuzzy clustering approach combined with genetic algorithm for brain tumor detection. Our systems extracts tumor by using three phases, pre-processing, and genetic algorithm combined with fuzzy clustering means and post processing. This paper is arranged in four parts. Section II explains the proposed method and step by step procedure for automated brain tumor detection and segmentation. Intensity inhomogeneity often exists in magnetic resonance imaging (MRI) images due to the imperfection of imaging devices. Intensity inhomogeneity can be generally modeled as a smooth and spatially varying field, multiplied by the constant true signal of the same tissue in the measured image. The spatially varying field is also named as the bias field.



II. DIGITAL IMAGE PROCESSING

An image may be defined as a two-dimensional function f (x, y), where x and y are spatial (plane) coordinates, and the amplitude of f at any pair of coordinates is called the intensity of the image at that point.The term gray level is used often to refer to the intensity of monochrome images. Color images are formed by a combination of individual images. For example, in the RGB color system a color image consists of three individual monochrome images, referred to as the red (R), green (G), and blue (B) primary (or component) images. For this reason, many of the techniques developed for monochrome images can be ex- tended to color images by processing the three component images individually. Color image processing an image may be continuous with respect to the x- and y-coordinates, and also in amplitude. Converting such an image to digital form requires that the coordinates, as well as the amplitude, be digitized. Digitizing the coordinate values is called sampling; digitizing the amplitude values is called quantization. Thus, when x, y, and the amplitude values of f are all finite, discrete quantities, we call the image a digital image.

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Tool	Description
Pixel Information	Displays information about the pixel under the mouse pointer
Pixel Region	Superimposes pixel values on a zoomed-in pixel view.
Distance	Measures the distance between two pixels.
Image Information	Displays information about images and image files.
Adjust Contrast	Adjusts the contrast of the displayed image.
Crop Image	Defines a crop region and crops the image.
Display Range	Shows the display range of the image data.
Overview	Shows the currently visible image.

III. IMAGE TYPES

The toolbox supports four types of images:

- Gray-scale images
- Binary images
- Indexed images
- RGB images

Gray-Scale Images

A gray-scale image is a data matrix whose values represent shades of gray. When the elements of a gray-scale image are of class uint8 or uint16, they have integer values in the range [0, 255] or [0, 65535], respectively. If the image is of class double or single, the values are floating-point numbers. Values of double and single gray-scale images normally are scaled in the range [0, 1], although other ranges can be used.

Binary Images

Binary images have a very specific meaning in MATLAB. A binary image is a logical array of 0s and 1s. Thus, an array of 0s and 1s whose values are of data class, say, uint8, is not considered a binary image in MATLAB. A numeric array is converted to binary using function logical. Thus, if A is a numeric array consisting of 0s and 1s, we create a logical array B using the statement.

IV. CLUSTERING

Clustering is the process of grouping similar object from the large dataset. It helps to arranging data into its logical group based on an attribute or a set of attributes. Clustering is the subject of active research in several fields such as statistics, pattern recognition, and machine learning. This survey focuses on different methods on clustering. The technique adds to clustering the complications of very large datasets with very many attributes of different types.This imposes unique computational requirements on relevant clustering algorithms. A variety of algorithms have recently emerged that meet these requirements and were successfully applied to real-life data mining problems. This paper is going to explore a variety of clustering methods and brief their working styles. The different techniques discussed here are just a snap shot of clustering algorithms. The Partitional clustering algorithms are have been used to develop clustering methods like K-Means, Clara, Clarans and implemented using Matlab environment.

Clustering is a technique to group together a set of items having similar characteristics. Clustering and classification are both fundamental tasks in Data Mining. Classification is used mostly as a supervised learning method, clustering for unsupervised learning (some clustering models are for both). The goal of clustering is descriptive, that of classification is predictive (Veyssieres and Plant, 1998). Since the goal of clustering is to discover a new set of categories, the new groups are of interest in themselves, and their assessment is intrinsic. In classification tasks, however, an important part of the assessment is extrinsic, since the groups must reflect some reference set of classes. “Understanding our world requires conceptualizing the similarities and differences between the entities that compose it” (Tyron and Bailey,

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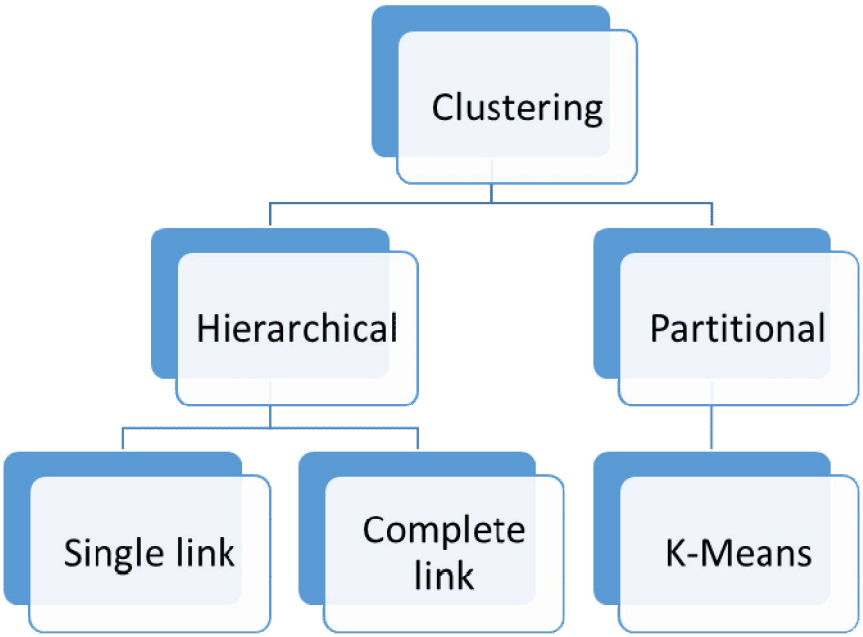
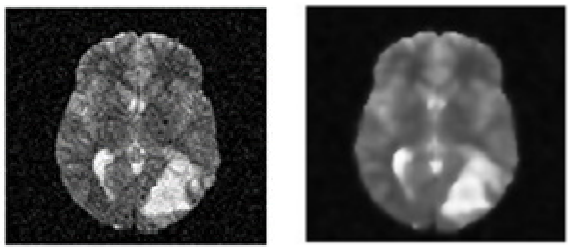
1970). Clustering can be considered the most important unsupervised learning problem, so, as every other problem of this kind, it deals with finding a structure in collection of unlabeled data.

A loose definition of clustering could be "the process of organizing objects into groups whose members are similar in some way". A cluster is therefore a collection of objects which are "similar" between them and are "dissimilar" to the objects belonging to other clusters.



V. RESULTS

After the successful analysis the results obtained are as follows:



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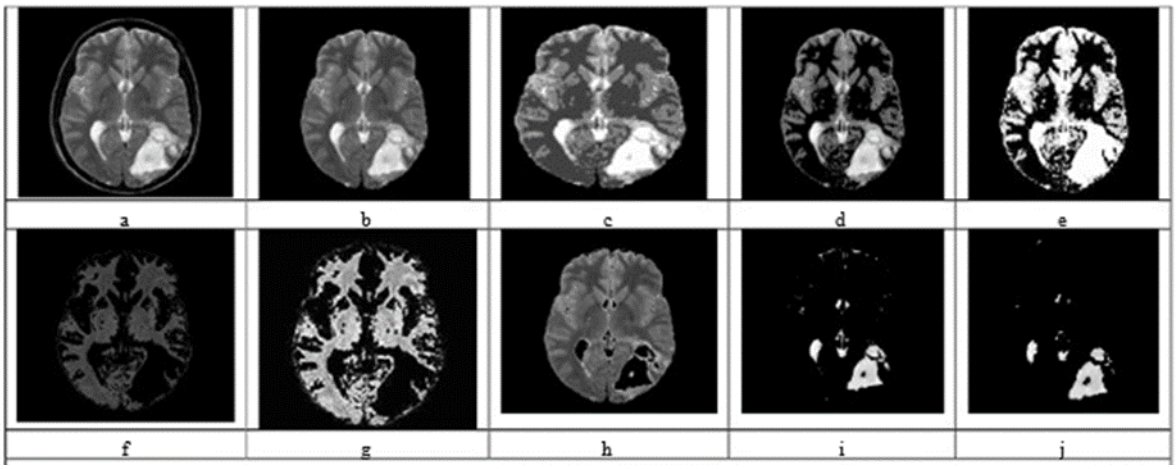
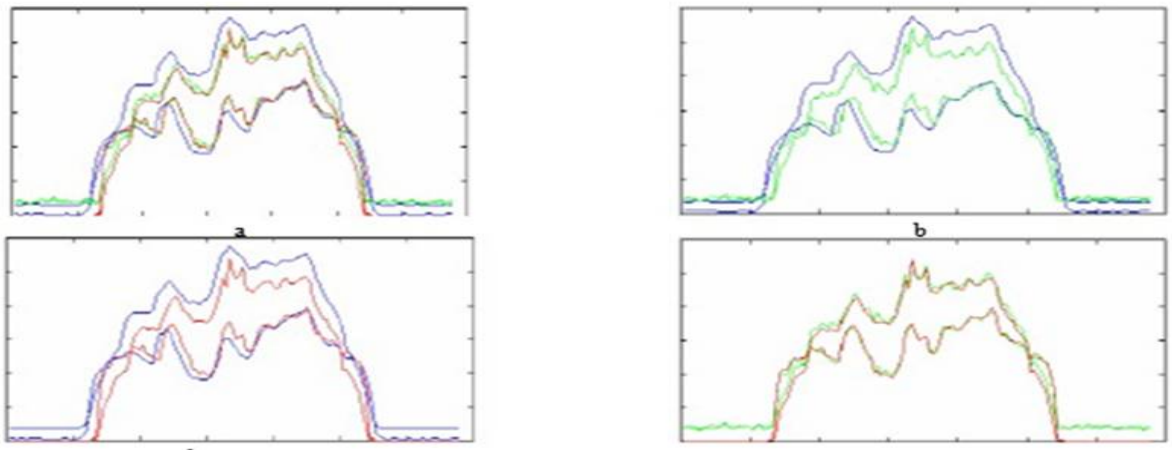


a = Original image
b = Skill removed
c = Segmented image
d = Extracting WM
e = WM after Intensity Correction
f = Extracting GM
g = GM after Intensity Correction
h = Removing Tumor
I = Tumor Volume
J = Erosion

It can be deduced from the results that un-supervised segmentation methods are better than the supervised segmentation methods. Because for using supervised segmentation method a lot of pre-processing is needed. More importantly, the supervised segmentation method requires considerable amount of training and testing data which comparatively complicates the process. Whereas, this study can be applied to the minimal amount of data with reliable results. However, it may be noted that, the use of K-Means clustering method is fairly simple when compared with frequently used fuzzy clustering methods. Efficiency and providing simple output are fundamental features of K-Means clustering method. To check the accuracy of the proposed method, mean and standard deviations of clean image, noisy image containing white guassian noise and enhanced image is drawn in Figure.



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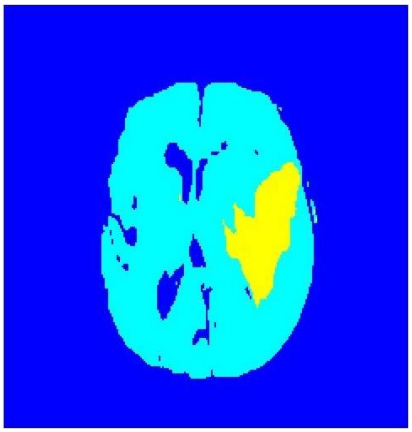

VI. CONCLUSION

In this paper, brain tumor detection is done in 6 steps on MR images. The proposed study of tumor detection is successful with the help of fuzzy c means clustering applied many times on genetic algorithm parameters. It is divided into preprocessing and post processing stages. This technique is applied on various sizes and intensities of tumor either it is primary or secondary type of abnormal image.

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