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Improved Initial Centroids for Automated Detection Segmentation of Intracranial Neoplasm Using Enhancement K-Means Clustering Algorithm.

Sridevi M* and Joany RM.

Department of Electronics & Communication Engineering, Sathyabama University, Rajiv Gandhi Salai, Jeppiaar Nagar, Chennai, Tamil Nadu, India.

ABSTRACT

Cancerous or non-cancerous cells are mass of abnormal growth in the brain. In India, fewer than one million people affected due to brain tumor per year. Affected individual should undergo medical diagnosis as per doctor's advice. Tumors can start in the brain, or cancer elsewhere in the body can spread to brain. Magnetic Resonance Image is used to detect the brain tumor efficiently where it doesn't examine deeper in to the brain. The image from brain contains noises and also blurred vision. To enhance the image and find the exact location of brain tumor processing techniques are required. In this paper, more efficient method is used to find intracranial neoplasm called Enhancement K-means clustering. This proposed system enhances the accuracy of brain tumor detection compared to other techniques. Enhancement K-means clustering technique is very effective due to less consumption of time to find the tumor in brain or cerebro spinal fluid.

Keywords: Neoplasm, enhancement K-means clustering, segmentation, dilation, erosion, regional maxima, morphological opening

**Corresponding author*

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INTRODUCTION

A brain tumor or intracranial neoplasm occurs when antidromic cells formed within the brain tissues. Swelling or obstruction of the passage of CSF from the brain may cause early signs of increased intracranial pressure.

There are two main types of tumors: a. Malignant or cancerous tumors: Cancerous tumors classified in to primary tumors that start within the brain and Secondary tumors that have spread from somewhere else, known as brain metastasis tumors. b. Benign tumors: This tumor is non-cancerous and it is developed within the brain cells and do not spread due to self-limited growth. Symptoms may include headaches, seizures, problems with vision, vomiting and mental changes. Also cause difficulty in walking, speaking and with sensation.

Most of the brain tissues are separated from the blood by blood-brain barrier (BBB) [1]. Thus the disruption of the BBB, which can be detected by MRI and CT, is regarded as the main diagnostic indicator for malignant gliomas, meningiomas and brain metastases.

Diagnosis is usually by medical examination along with Computed Tomography (CT) or Magnetic Resonance Image (MRI). MRI also has drawbacks that it doesn't goes through deeper part of the brain. Many methodologies have been implemented to detect and segment the tumor in the brain. Here, this proposed system Enhancement K-means clustering based framework to detect and segment intracranial neoplasm boundaries from various MRI images combined with other image processing techniques in order to enhance neoplasm region extraction and visualization process. Also this system overcomes the drawbacks of original K-means clustering [2], whereas enhancement K-means clustering uses the global optimum for initial centroids with less time consumption [3, 4, 5].

METHODOLOGY

The purported techniques are classified in to various steps and each are portrayed in detail. Following techniques are given below as in fig.1.

Step 1: Read the input image obtained from MRI. The image is used here is in JPG format.

Step 2: Resize the input image to enhance the pixel values. Resize the image in to a suitable pixel size for uniformity.

Step 3: Convert the resized image in to grayscale image. Each pixel is a shade of gray, normally from 0 (black) to 255 (white). While converting the true color image RGB to grayscale intensity image, luminance of the image is retained and hence, hue and saturation information is eliminated. For the conversion of true color image in to grayscale image, average method [6] is used by averaging the three colors.

Grayscale image= (R+G+B/3)

Step 4: The resized image is processed using median filter which removes noise and also enhance the quality of image. Median filter is a non-linear digital filtering technique. It is one kind of smoothing technique [7]. Such noise reduction is a typical pre-processing stage to improve the results of later processing. It preserves edges of an image while removing noise for a given, fixed window size. Median filter is widely used in digital image processing because it reduces salt and pepper noise (impulsive noise) [8] and speckle noise well than Gaussian blur or smoothing.

Step 5: Enhancement K-means clustering algorithm-Traditional K-means clustering depends on the local optima which has random values of initial centroids. These local optima lead to more iterative steps and also increase time consumption. The proposed system overcomes these drawbacks by the steps involved in iterations for global optima. It speeded up the clustering process by converging in to global optimum. The steps involved in the algorithm are represented in below points:

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Requirement:

D=data set; d=set of attributes of one data points; K=number of cluster.

Algorithm:

1. Check the data points of a data set D contain any negative value attributes. If there is no negative value follow step 2, otherwise follow step 4.
2. In the given data set D, find out the minimum values of data points.
3. The negative values are subtracted from the minimum values of data points.
4. Calculate the distance from origin.
5. Distance values are sorted further sort the data points according to the deliberated distances.
6. The sorted data points are grouped in to K-equal sets.
7. In each set, take middle value as initial centroids.
8. For each data points d,
   a) Compute its distance from centroid of nearest cluster.
   b) If this distance is less than or equal to present closest value then data points are belongs to the same cluster.
9. For every centroids, converge the distance until the criteria is met.

Step 6: The goal of segmentation is to simplify or change the representation of an image in to more meaningful and easier to analyze. The result of segmentation is a cluster of slices that together wrap the complete image. Each of the pixels in the region is similar with respect to some computed property, such as color, intensity, or texture. The algorithm used here segments the white matter (WM), grey matter (GM) and Cerebro Spinal Fluid (CSF).

Step 7: The significance of morphological operation [9] is to remove noise in background and removal of holes in foreground/background. The morphological images are constructed by utilizing the nature of the neighbor pixels like shape, intensity, size, etc. In this algorithm, disk shaped structuring element is used to preserve the circular nature of the brain. Morphological operations carried out in the proposed work are morphological dilation, erosion, opening, closing, reconstructed dilation and complicated dilation. The intensity values are sorted out and grouped according to their cluster intensity values. Regional maxima operator is mainly used for edge detection [10].

Step 8: Boundary detection technique [11] is used to provide boundary in the region of detected tumor part which makes easier to view and analyses the stage of the tumor. Bounding box property is used to view the tumor cells clearly by bounding the location of tumor and also easily distinguished by the viewer, here in this algorithm yellow color is given for bounding box.

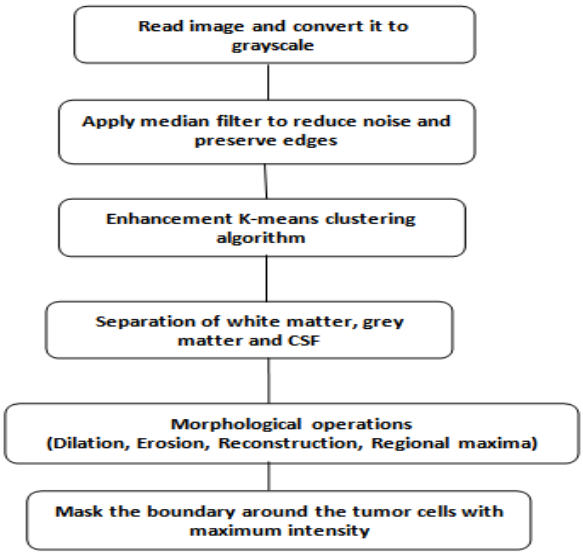

Fig 1: outline of proposed model

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EXPERIMENTAL RESULTS

The experimental results of tumor or neoplasm location and detection are shown in fig.7, Boundary region around the image which is in rectangle box characterize the exact location of tumor.

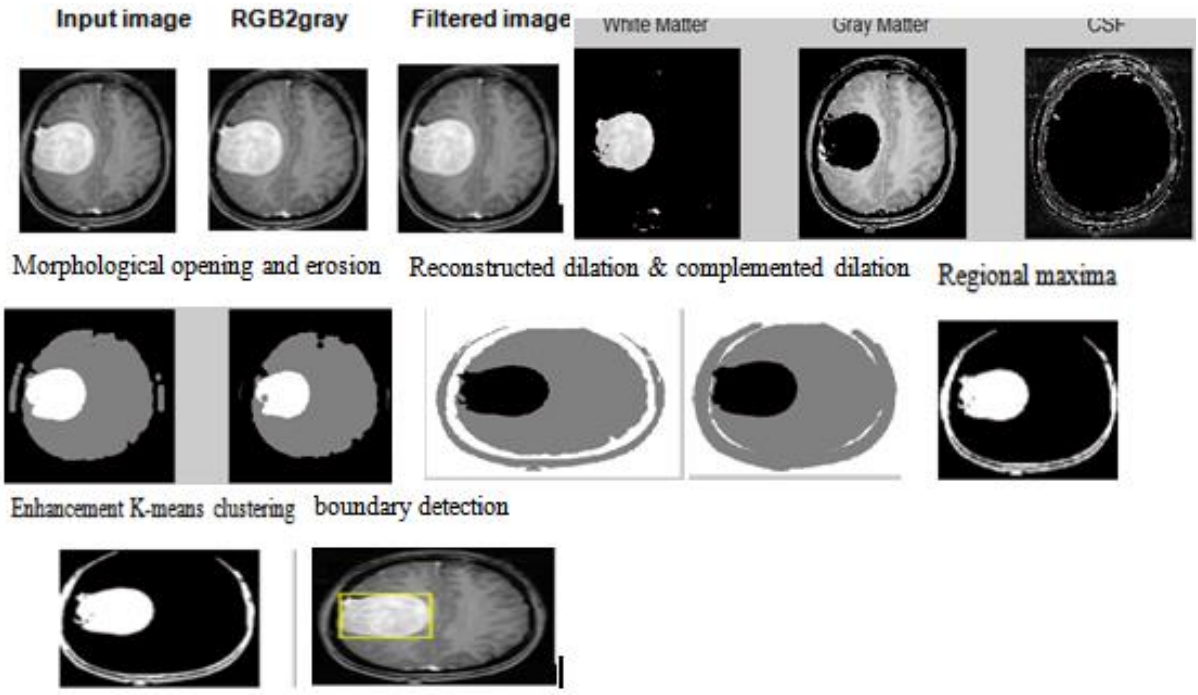

Fig 2: Output of all the stages

CONCLUSION AND FUTURE SCOPE

The proposed technique is based on global optima rather than local optima; hence iteration computation also reduces time consumption. This work does not need any further inputs like thresholding and equalization process. This algorithm finds better initial centroids and also group suitable data points to the appropriate clusters; hence it increases accuracy. The time taken for identifying the tumor or neoplasm using this algorithm is very less approximately 0.074 seconds and has good accuracy for finding exact location of tumor cells. For future scope, the algorithm will be used to find out or distinguish between healthy and tumorous cells.

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