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Deep Learning based hybrid clustering technique using brain tumor segmentation

Gudapuri Sudheer, Assistant Professor, ECE Department, Kodada Institute Of Technology and Science for Women, Kodada, Telangana, India
sudheergudapuri@gmail.com

Abstract: Image segmentation refers to the way of apportioning an image into totally unrelated districts. It tends to be considered the most fundamental and essential cycle for encouraging the delineation, characterization, and visualization of regions of interest in any medical image. Regardless of escalated research, segmentation stays a difficult issue because of the assorted image content, cluttered objects, occlusion, non-uniform object surface, and different variables. There are numerous calculations and methods accessible for image segmentation yet at the same time their necessary to build up a proficient, quick strategy for clinical image segmentation. This paper presents an effective image segmentation approach utilizing the K-means grouping procedure incorporated with morphological operations. It is trailed by thresholding and level set segmentation stages to give an accurate brain tumor detection. The proposed procedure can get advantages of the K-means clustering for image segmentation in the parts of insignificant calculation time. What's more, it can get points of interest of morphological operations are the parts of exactness. The experimental results clarify the effectiveness of our proposed approach to deal with a higher number of segmentation problems by means of improving the division quality and exactness in minimal execution time.

Keywords — Image segmentation, K-Means clustering, Fuzzy C – means clustering techniques, Segmentation algorithms

I. INTRODUCTION

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In today's 21st century, all the information's represented in digital procedures. Digital procedures are especially utilized in the medical field. Brain tumors occur with the abnormal accumulation of cells within the brain. The brain has neurons or glial cells, that are atrocities and ependymal cells. It can be occurred by cancer located in other organs which are called Primary tumors. Cancers which are originated in other organs can make the brain cells metastatic and invade the brain, which is called Secondary tumors. The cancerous neoplasm has formed in another organ in the body, the same cancer cells get spread from the primary tumor and then enter the lymphatic system and blood vessels. In this way, it gets circulated through the bloodstream, which makes formation in the brain. Any age group of children and adults are affected by brain tumors, but older adults are more tend to get affected by it.

Each year in UK, 9000 people are affected with primary brain tumors. Out of which, half people are benign and the other half have malignant. This algorithm is proposed to rectify the difficulty and find the affected region of the brain. We will identify the tumor with some stages of operation in this paper. With the help of MRI images and information given by radiologists about the tumor location, further can make a plan for its surgical removal.

II. TYPES OF BRAIN TUMOR

There are various types of brain tumors that can be distinguished as benign and malignant(non-cancerous). In tumors, we classify them according to the tumor size, location, and its symptoms. The health organization distinguishes brain tumors by its cell origin and the way cells behave from benign (less aggressive) to malignant (more aggressive). Tumor types are arranged in grades ranging from Grade 1(less malignant) to Grade 5(more malignant), this indicates the growth rate of the tumor. Variations occur in the grading system according to the tumor type.

1) Characteristics

i. It occurs from the cells which makes a protective sheath around nerve fibers.
ii. The tumor growth arises from the eighth cranial nerve, but it

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is also found near other cranial or spinal nerves.

2) Symptoms

i. Being deaf in one ear.
ii. Numbness in the face and tingling.
iii. Unable to walk and balance issues.
iv. Lack of coordination in the body and sensory organs.

III. RISK FACTORS OF BRAIN TUMOR

Brain tumors occur mostly in people that received radiation to the brain as a child as their treatment for leukemia. Brain tumors mostly occur after 10-15 years of radiation. Radiation-induced tumors happen in rare case. Due to the increased risk of radiation therapy, it is only given to the head after examining carefully the possible benefits and risks to the patient. Cellphones have radio frequency rays, a form of energy on the electromagnetic spectrum in FM radio and which are used in microwave ovens, and radar and satellite stations. Cellphones do not have ionizing radiation which can cause cancer by damaging the DNA inside the cells. It is a matter of concern that phones which have inbuilt antenna may raise the risk of brain tumor by placing the phone close to the head.

IV. LITERATURE REVIEW

Image segmentation is the bisection of the image with similar feature regions. In this paper, we will discuss a technique of pre-processing segmentation, extraction, and classification. This approach will enhance the segmentation performance that is made up of mixing methods from definite regions of the tumor image. This paper is analyzed by new image, segmentation, and classification techniques with a combination of growing and detection edges. The combination of the two methods helps to avoid characteristics of segmentation errors and noise removal of an image occurring while using region growth and edge detection separately.

V. PROPOSED METHOD

Here, we have proposed segmentation of the MRI scan images of the brain to detect brain tumors with the help of K-Means clustering with morphological technique. A cluster can be termed as a

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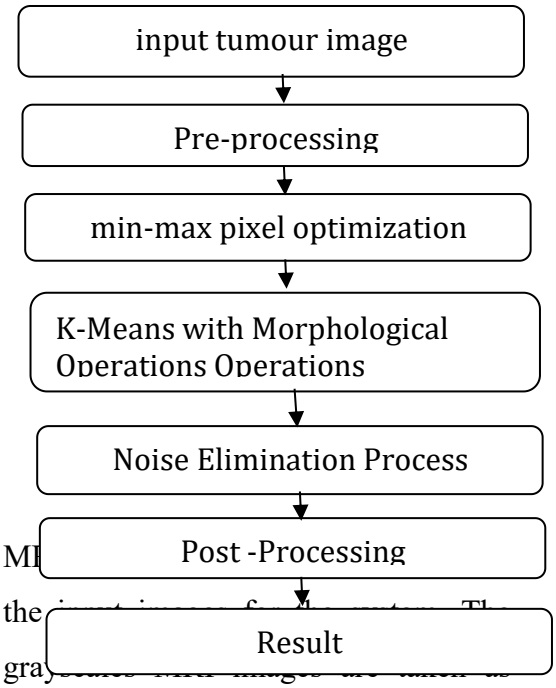
group of pixels, where more than one pixel in a certain group is defined by a similar relationship. In this, the K-Means clustering algorithm for the segmentation of the image is utilized for tumor detection from MRI Brain images.

The block diagram is shown below:



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input. The preprocessing stage will help in converting the RGB input image into the grayscale. Incase, if any noise is present, then it will be removed by using median filter. The image will be sharpened using the Gaussian filtering mask.

a) Image Acquisition

Images are carried out by using the MRI scan and the scanned images can be displayed in two-dimension matrices in pixels as their elements. The matrices are dependent upon the matrix size and its field view. Images can be stored in an image file and can display as a grayscale image. The entries of it will range from 0 to 255, where 0 shows the black color and 255 shows the pure white color.

b) Pre-Processing Stage

In this stage, the image will be better so that the image will be visible with finer details and the noise will be reduced simultaneously. The enhanced image will have more sharpened edges without the blurring effect from the image. Amongst the enhancement, image segmentation will also be applied. A better and improved image will help in detecting the edges and enhances the quality of the overall image. Edge detecting will help to find the exact location of tumor.

a) Noise Removal

Various filters are used to remove the noise from the images. various noise can be removed by the average filters,

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as the pixels value is replaced with its neighborhood values various noises can also be removed median filter but the weighted average filter is the variety of this and can be untiled accordingly and gives good results. In the median filter value, the pixel is contained by the median of the neighboring pixels. It is less sensitive than others.

b) Image Sharpening

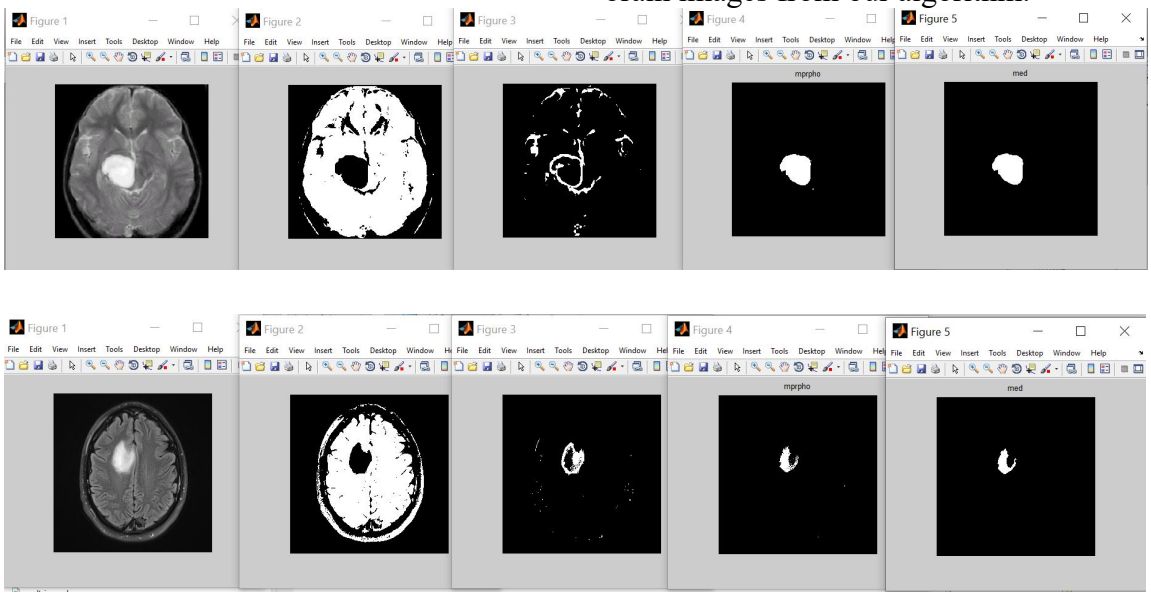
Image sharpening can be done by using various high-pass filters. As the noise is removed by using low pass filters, now we have to sharpen the image so that we get the sharp edges which will help us to detect the location and boundary of its tumor. high pass filters are highly used to get finer details of the project.

c) Segmentation Using K-Means Clustering

Segmentation is an important process to get information from medical images. Its major aim of it is to bifurcate the image into different regions. So that each region has its own particular place

VI. RESULTS

We have different MRI Scan images of the brain for brain tumor testing by using our proposed algorithm. The brain tumor location is detected with the application of our proposed algorithm. The location of the brain can be seen after the final clustering of brain images from our algorithm.



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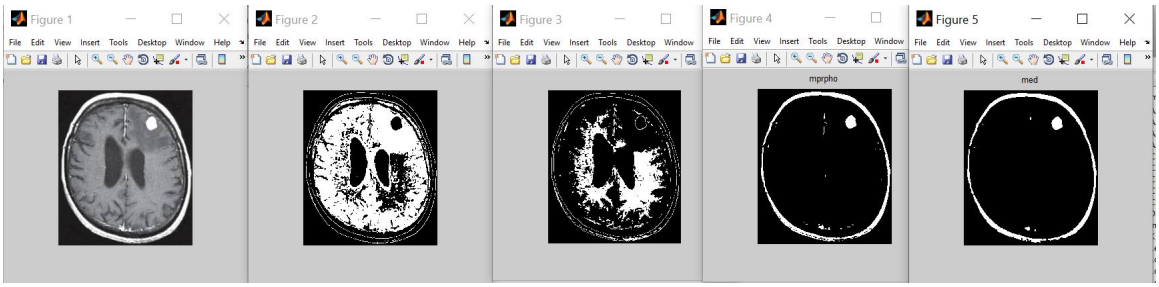

VII. CONCLUSION

Segmentation of brain image is crucial for surgical planning and diagnosis in the medical field. In this project, we have detected brain tumor location by using the K-Means clustering algorithm. The detection of brain tumors has three steps: Image acquisition, Pre-processing, and K-Means clustering. With the application of K-Means clustering with morphological operations gives optimum and better results. It helps in the enhancement of the location of the tumor image and its growth. Finally, we have been able to segment brain tumors from various MRI images from the database. In Future analysis development of 3D MRI brain tumor detection techniques by using machine learning and artificial intelligence analysis.

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