Brain Tumor Detection Based On Segmentation Using Object Labeling Algorithm

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Abstract—Brain tumor is inherently serious and life-threatening. Tumors are of different types and they have different Characteristics and different treatment. Tumor is an uncontrolled growth of tissues in any part of the body. This paper introduces an efficient detection of brain tumor from cerebral MRI images. Most Research in developed countries show that the number of people who have brain tumors were died due to the fact of inaccurate detection. CT scan or MRI that is directed into intracranial cavity produces a complete image To detect the tumor some preprocessing steps are used i.e. median filtering and morphological operation. After this by applying K means method then binarized image is labeled using Object Labeling algorithm. The purpose of this algorithm is to label different objects within the image. The tumor is extracted from the MR image and its exact position and the shape also determined. The stage of the tumor is displayed based on the amount of area calculated from the cluster.

Keywords: Image segmentation, MRI images morphological operations, K-means method, Object labeling algorithm.

I. INTRODUCTION

Brain tumor is an abnormal growth of cells inside the skull. Normally the tumor will grow from the cells of the brain, blood vessels, nerves that emerge from the brain. There are two types of tumor which are benign (non-cancerous) and malignant (cancerous) tumors. The former is described as slow growing tumors that will exert potentially damaging pressure but it will not spread into surrounding brain tissue. However, the latter is described as rapid growing tumor and it is able to spread into surrounding brain. Tumors can damage the normal brain cells by producing inflammation, exerting pressure on parts of brain and increasing pressure within the skull.

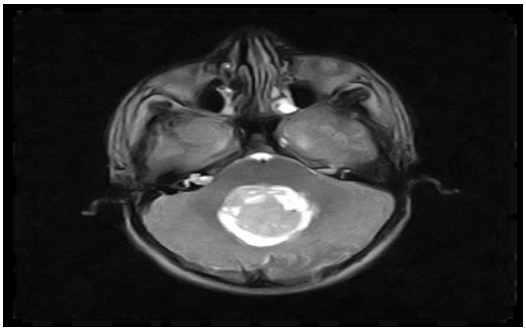

Figure 1: Presence of brain tumor

Primary (true) brain tumors are commonly located in the posterior cranial fossa in children and in the anterior two-thirds of the cerebral hemispheres in adults, although they can affect any part of the brain.[1] The following are the most common symptoms of a brain tumor. However, each person may experience symptoms differently. Symptoms vary depending on the size and location of tumor.

- Headache
- Vomiting (usually in the morning)
- nausea
- Personality changes
- Irritability
- Drowsiness
- Depression
- Decreased cardiac and respiratory function and, eventually, coma if not treated.

A. Tumor Grades

Doctors group brain tumors by grade. The grade of a tumor refers to the way the cells look under a microscope:

• Grade I: The tissue is benign. The cells look nearly like normal brain cells, and they grow slowly.

• Grade II: The tissue is malignant. The cells look less like normal cells than do the cells in a Grade I tumor.

• Grade III: The malignant tissue has cells that look very different from normal cells. The abnormal cells are actively growing (anaplastic).

• Grade IV: The malignant tissue has cells that look most abnormal and tend to grow quickly. Cells from low-grade tumors (grades I and II) look more normal and generally grow more slowly than cells from high-grade tumors (grades III and IV).

B. Diagnosis

Imaging plays a central role in the diagnosis of brain tumors. Early imaging methods—invasive and sometimes dangerous— such as pneumo encephalography and cerebral angiography, have been abandoned in recent times in favor of non-invasive, high-resolution techniques, especially magnetic resonance imaging (MRI) and computed tomography (CT)-

scans. Neoplasms will often show as differently colored masses in CT or MRI results. Radiologists examine the patient physically by using Computed Tomography (CT scan) and Magnetic Resonance Imaging (MRI). MRI images showed the brain structures, tumor's size and location. From the MRI images the information such as tumors location provided radiologists, an easy way to diagnose the tumor and plan the surgical approach for its removal.

II. LITRATURE SURVEY

The Segmentation of an image entails the division or separation of the image into regions of similar attribute. The ultimate aim in a large number of image processing applications is to extract important features from the image data, from which a description, interpretation, or understanding of the scene can be provided by the machine. The segmentation of brain tumor from magnetic resonance images is an important but time-consuming task performed by medical experts. The image segmentation is entailed with the division or separation of the image into regions of similar features. In this paper, we will discuss an illustrate a number of approaches and show improvements in segmentation performance that can be achieved by combining methods from distinct categories such as techniques in which edge detection s combined with thresholding. The definitive aim in image processing applications is to extract important attributes from the image data, from which a descriptive, interpretative, or understandable prospect can be obtained by the machine. Time consumption during the segmentation of brain tumor from magnetic resonance imaging is a crucial drawback. Thus, we have studied the foundations of brain segmentation and edge detection, by various techniques employed by researchers. The segmentation & edge detection approaches were studied under 5 categories. These are as follows- 1) Thresholding approaches, 2) Region growing approaches, 3) Genetic Algorithm approaches,4) Clustering approaches ,5) Neural network approaches. Several authors suggested various algorithms for segmentation.

III. SYSTEM DEVLOPMENT

A. Introduction

Edge-based method is by far the most common method of detecting boundaries, discontinuities in an image and segmentation. The parts on which immediate changes in grey tones occur in the images are called edges. Edge detection techniques transform images to edge images benefiting from the changes of grey tones in the images. As a result of this transformation, edge based brain segmentation image is obtained without encountering any changes in physical qualities of the main image .This image processing consist of image enhancement using histogram equalization, edge detection and segmentation process to take patterns of brain tumors, so the process of making computer aided diagnosis for brain tumor grading will be easier.

Median filter can be used to remove noise because it does not create any new intensity image pixel and widely used in image processing. Erosion and dilation these two morphological operations are used. In literature there exist two major classes of segmentation techniques: Watershed segmentation approach and region based segmentation approach. Watershed technique is a fast speed and the large numbers of segmented region result is reliable. Segmentation algorithms are mainly based on,

- Histogram Based Methods(Thresholding)
- Edge Based Methods
- Watershed Transformation
- Region Based Methods

In this paper K-means Clustering Algorithm is used. Clusters are regions of segmentation Clusters are sets of pixels with the same properties (position, color) K – means clustering – Assign each pixel to cluster minimizing variance K-Means algorithm is an unsupervised clustering algorithm that classifies the input data points into multiple classes based on their inherent distance from each other. After K-means binary image is constructed by threshold approach by applying threshold intensity over segmented image. In gray scale image 255 is considered as foreground or object pixel and 0 is considered as background pixel. Brain contains three primary tissues such as White Matter (WM), Gary Matter (GM) and Cerebrospinal Fluid (CSF); shown in figure 2, so these regions of interest (ROI) can be farther detected. Object labeling algorithm is used to labeled binarized image. Different objects can be labeled with the help of this algorithm.[2]

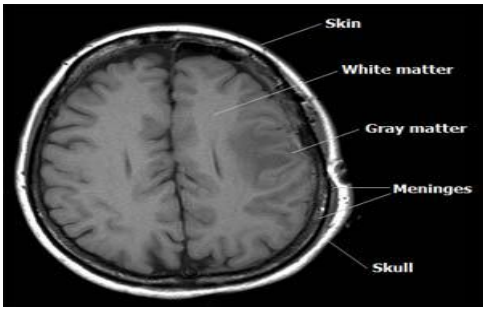

Figure 2: Sample MR Image with main tissues marked.

Tumor region is detected from labeled MRI image. Maximum frequency can be determined as follows:
Step 1: Let there are n labels *{l0,l1,l2 ,l(n-1)}* in the labeled image. Count frequency (occurrence) of each label from the labeled image. Let the frequencies are *{fo , f1, f2, f(n-l)}* for labels *{l0,l1,l2 ,l(n-1)}* respectively.
Step 2: Find max *{fo , f1, f2, f(n-l)}* Let this frequency is *fmax.*
Step 3: Search for the label *lk,0 < k < (n - 1)* from the set *{lo, l1, l2, l(n-1)}* which have the frequency value *fmax.*
Step 4: Perform 8-adjacency with respect to *lk* in the labeled image.
Step 5: Construct binary image from the labeled image.

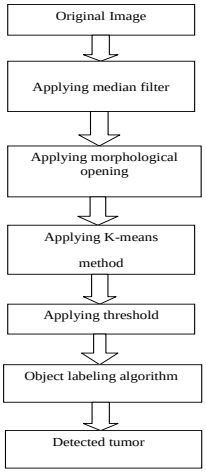

Figure 3 Steps for System implementation

B.Experimental results

Output of this code is number of images which are output of each stage, and are combined in one plot using 'subplot ()'. The shape and size of the tumor is different and varying from image to image.

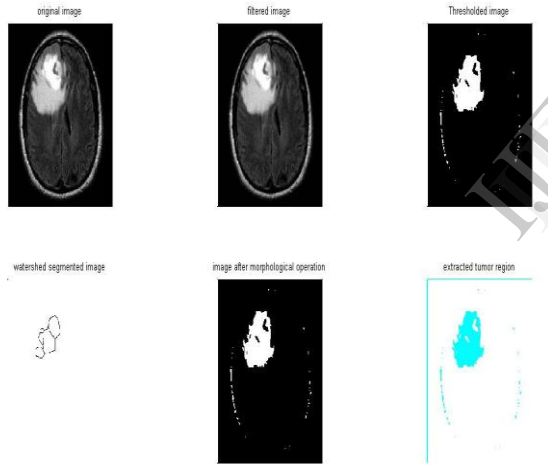

Figure 4:Output of an algorithm

C. Conclusion

Image processing has become a very important task in today's world. Today applications of image processing can be found in number of areas like medical, remote sensing, electronics and so on .If we focus on medical applications, and image segmentation is widely used for diagnosis purpose. Thus, to find a appropriate Segmentation algorithm based on application and the type of inputted image is very important. In this paper, brain tumor is detected from MRI images using K-means followed by Object Labeling algorithm.

D. Application

Main application of brain MRI segmentation is in medical field. In this case, segmentation can be used for proper diagnosis of brain tumor. Diagnosis can be made using tumor location and its size. Once the diagnosis is done i.e. type of tumor, its stage, it becomes easy for further treatment of patient.

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