Detection Of Brain Tumor Using Mri Image

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Abstract: — **Medical images play a vital role in identifying diseases and detecting if organs arefunctioning correctly. Image processing related to medical images is an active research area in which various techniques are used in order to make diagnosis easier and various image processing techniques can be used. In this project, image processing is done for automatically detecting the presence of brain tumors in a given brain scan. We propose an automatic brain tumor detection and localization framework that can detect andlocalize brain tumor in magnetic resonance imaging. The proposed brain tumor detection comprises following steps: Image pre-processing (BGR to gray scale conversion), Histogram equalization, Smoothening, Erode and dilate, Blob detection.**

Index Terms— **MRI-Magnetic resonance image, open cv-open source computer vision, BGR-blue green red, blob detection**

I.INDRODUCTION

Brain imaging has greatly advanced in the last 20 years, due to better understanding of the electromagnetic spectrum and radiofrequency waves, in relation to protons in individual molecules within the cells of the brain. New technologies allow non-invasive spatial mapping, (morphology), and observations of processes within the brain during set tasks. By sequencing scanned sections of the brain, activity between neurons in different parts of the brain can be observed and monitored. More recent Technologies using a higher frequency resolution can identify the distribution of individual metabolites (large complex molecules), and pharmaceutical drugs.

Biomedical image processing is similar in concept to biomedical signal processing in multiple dimensions. It includes the analysis, enhancement and display ofImages captured via x-ray, ultrasound, MRI, nuclear medicine and optical imaging technologies. Image reconstruction and modeling techniques allow instant processing of 2D signals to create 3D images. When the original CT scanner was invented in 1972, it literally took hours to acquire one slice of image data and more than 24 hours to reconstruct that data into a single image. Today, this acquisition and reconstruction occurs in less than a secondthe objective of this project is to detect brain tumor using MRI image with the help of opencv library. MRI uses strong magnetic field to align the nuclear magnetization that follows by changes the alignment of the magnetization by radio frequencies that can be detected by the scanner. The main aim of this project is to detect tumor intensity accurately so it can be synthesized.

A. Biomedical Imaging

Biomedical imaging concentrates on the capture of images for both diagnostic and therapeutic purposes. Snapshots of in vivo physiology and physiological processes can be garnered through advanced sensors and computer technology. Biomedical imaging technologies utilize either x-rays (CT scans), sound (ultrasound), magnetism (MRI), radioactive pharmaceuticals (nuclear medicine: SPECT, PET) or light (endoscopy, OCT) to assess the current condition of an organ or tissue and can monitor a patient over time over time for diagnostic and treatment evaluation.

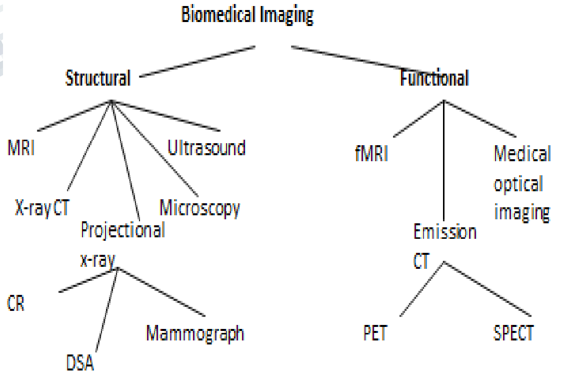


Figure No 1.1:Types of biomedical imaging

II. MRI IMAGING

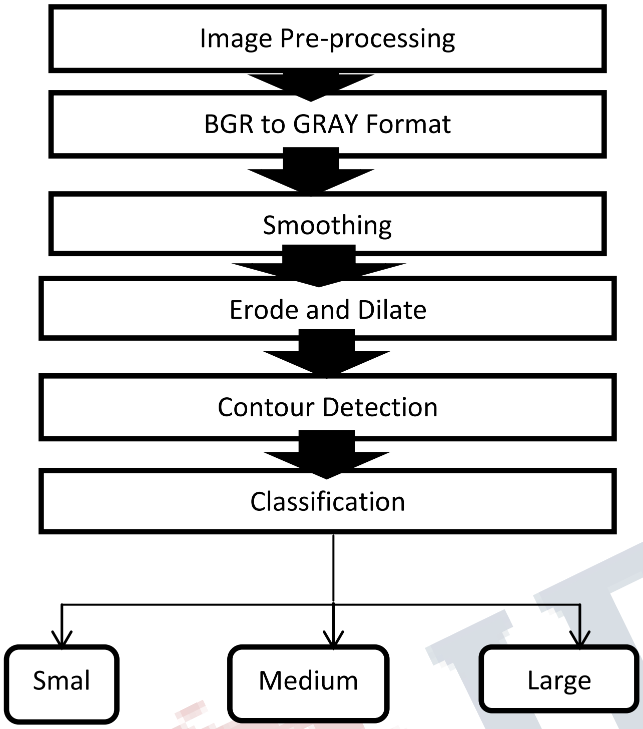


Figure No2.1 Flow chart of brain detection technique

An MRI scanner uses a strong magnetic field and radio waves to create pictures of the tissues and other structures inside the brain, on a computer. The magnetic field aligns the protons (positively charged particles) in hydrogen atoms, like tiny magnets. Short bursts of radio waves are then sent to knock the protons out of position, and as they realign, (relaxation time), they emit radio signals which are detected by a receiving device in the scanner. The signals emitted from different tissues vary, and can, therefore, be distinguished in the computer picture.

III. IMAGE PREPROCESSING:

A. *BGR To Gray Scale Conversion*: When converting an image in Opencv from color to grayscale, following methods are use the lightness method averages the most prominent and least prominent colors: (max(R, G, B) + min(R, G, B)) / 2. The average method simply averages the values:

(R + G + B) / 3.

The luminosity method is a more sophisticated version of the average method. It also averages the values, but it forms a weighted average to account for human perception. We're more sensitive to green than other colors, so green is weighted most heavily. The formula for luminosity is
0.21 R + 0.71 G + 0.07 B

B. Smoothening: There are different types of noise encountered by different techniques, depending on noise nature and characteristics namely Gaussian noise and impulse noise. We will use smoothing image filters for reducing Gaussian noise from MRI images & sharpening filters for highlighting edges in an image. It was observed that smoothing and sharpening filter does not remove noise completely from original image. Filtering is as shown in fig.3 and fig 4.

***C. Erode And Dilate*:** A set of operations that process images based on shapes. Morphological operations apply a *structuring element* to an input image and generate an output image.

- The most basic morphological operations are two: Erosion and Dilation. They have a wide array of uses, i.e. :

a) Removing noise
b) Isolation of individual elements and joining disparate elements in an image.
c) Finding of intensity bumps or holes in an image

- We will explain dilation and erosion briefly, using the following image as an example:

Figure No3.1: Dilation

- This operations consists of convoluting an image A with some kernel (B), which can have any shape or size, usually a square or circle.

- The kernel B has a defined *anchor point*, usually being the center of the kernel.

- As the kernel B is scanned over the image, we compute the maximal pixel value overlapped by B and replace the image pixel in the anchor point position with that maximal value. As you can deduce, this maximizing operation causes bright regions within an image to "grow" (therefore the name *dilation*). Take as an example the image above. Applying dilation we can get:

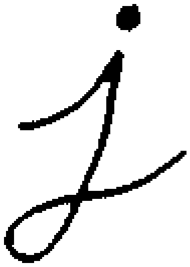


Figure No3.2: Dilation

The background (bright) dilates around the black regions of the letter.

EROSION

- This operation is the sister of dilation. What this does is to compute a local minimum over the area of the kernel.

- As the kernel B is scanned over the image, we compute the minimal pixel value overlapped by B and replace the image pixel under the anchor point with that minimal value.

- Analogously to the example for dilation, we can apply the erosion operator to the original image (shown above). You can see in the result below that the bright areas of the image (the background, apparently), get thinner, whereas the dark zones (the "writing"(gets bigger.

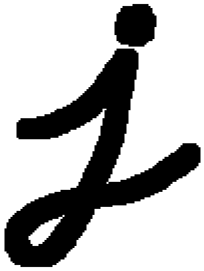


Figure No3.3: Erosion

D. Contour Detection

Contours can be explained simply as a curve joining all the continuous points (along the boundary), having same color or intensity. The contours are a useful tool for shape analysis and object detection and recognition.

- For better accuracy, use binary images. So before finding contours, apply threshold or canny edge detection.

- Find Contours function modifies the source image. So if you want source image even after finding contours, already store it to some other variables.

- In OpenCV, finding contours is like finding white object from black background. So remember, object to be found should be white and background should be black.

To draw the contours, cv2.drawContours function is used. It can also be used to draw any shape provided you have its boundary points. Its first argument is source image, second argument is the contours which should be passed as a Python list, third argument is index of contours (useful when drawing individual contour. To draw all contours, pass -1) and remaining arguments are color, thickness etc.

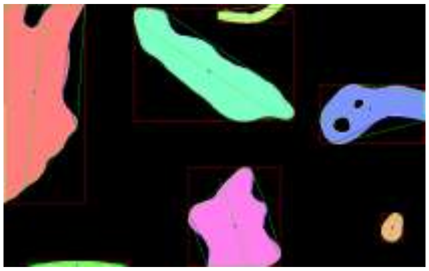


Figure No 3.4: *Contour detection*

IV. IMPLEMENTATION

We are using open cv library in this project.OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code.

The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc. OpenCV has more than 47 thousand people of user community and estimated number of downloads exceeding 7 million. The library is used extensively in companies, research groups and by governmental bodies.

Along with well-established companies like Google, Yahoo, Microsoft, Intel, IBM, Sony, Honda, Toyota that employ the library, there are many startups such as Applied Minds, VideoSurf, and Zither, that make extensive use of OpenCV. OpenCV deployed uses span the range from stitching street view images together, detecting intrusions in surveillance video in Israel, monitoring mine equipment in China, helping robots navigate and pick up objects at Willow Garage, detection of swimming pool drowning accidents in Europe, running interactive art in Spain and New York, checking runways for debris in Turkey, inspecting labels on products in factories around the world on to rapid face detection in Japan.

It has C++, C, Python, Java and MATLAB interfaces and supports Windows, Linux, Android and Mac OS. OpenCV leans mostly towards real-time vision applications and takes advantage of MMX and SSE instructions when available. A full-featured CUDA and OpenCV interfaces are being actively developed right now. There are over 500 algorithms and about 10 times as many functions that compose or support those algorithms. OpenCV is written natively in C++ and has a template interface that works seamlessly with STL containers.

The image of brain tumor using MRI image as shown below

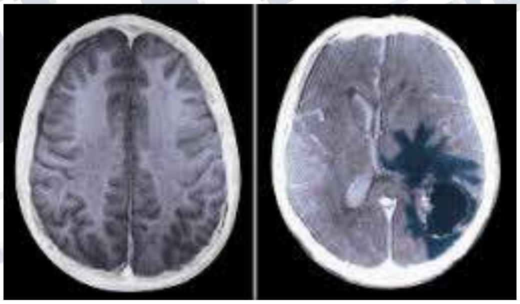


Figure No 4.1: a) MRI image of brain with tumor and without

The steps involve in this project as shown below

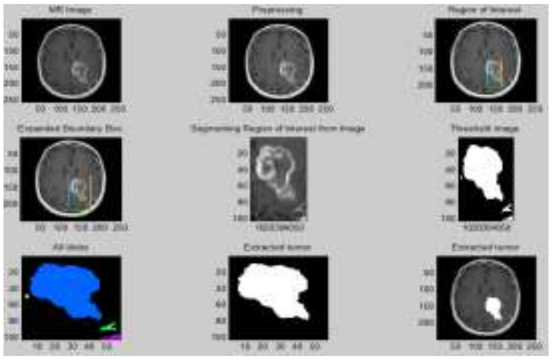
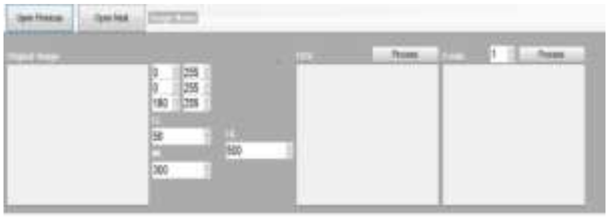


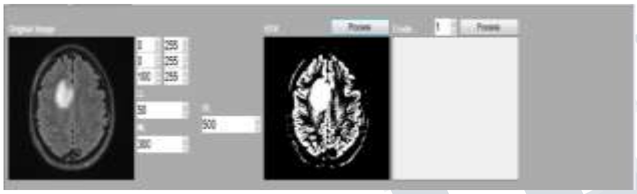
Figure No 4.2: Various steps involve in MRI of brain tumor

V. RESULTS

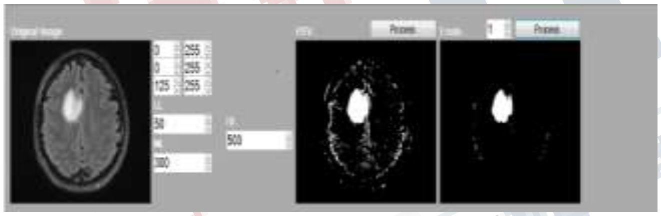


Graphical user interphone 1st step of project then open the image that we have to detect by using open next and open previous.

Firstly image going through HSV process then erode and likewise all steps will done one by one and we can detect tumor.



Result of step 1- HSV conversion



Result of step2- Erosion

VI. CONCLUSION

We propose an automatic brain tumor detection and localization framework that can detect and localize brain tumor in magnetic resonance imaging. The proposed brain tumor detection comprises following steps: Image pre-processing (BGR to gray scale conversion), Histogram equalization, Smoothening, Erode and dilate, Blob detection. After morphological operations, tumors appear as pure white color on pure black backgrounds. And then after finding blob area we can classify it as small tumor, medium tumor, and large tumor.

Using this method we will be able to detect the smallest possible symptomatic malignant (cancerous) tumors that is in early stage and the smallest possible asymptomatic tumors in the screening process. Basically, there are many factors that can influence the appearance of tumors in different kind of processed images despite some common features of malignancies because of variation in the type of tissue and tumor. For large tumor, characteristic features often to be found while in small tumors, these features of malignancy do not appear to be many and some of them might represent themselves by secondary effects such as distortion in its architecture.

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