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Identification of Tumour from Ct Images using Contour Plot and Gui

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Abstract: ***The healthcare sector in terms of medical imaging is picking up significance with people preferring automation which is eventually fast and effective in determination of the problem which can give understanding to the picture way superior than to the human eyes. Brain tumour is a condition where it ranks second in terms of cancer related deaths for men and ranks at fifth place for women over the age group of 20 to 39.Brain tumours are extremely agonizing and it ends up being significant reasons for various ailments if not cured properly. Analysis of the tumour and its type is a very significant part in its treatment. Tumours are of two types benign and malignant, Distinguishing the type of tumour place an important role in its treatment .The principal reason for the rise in the number of malignancy patients is due to numbness towards its treatment at early stages. The whole idea of this paper is to create an algorithm that could educate the patient about the tumour with the help of image processing techniques. The basic image processing techniques are used to obtain the background by the sharpening the image, reduction of noise together with morphological functions such as erosion and dilation. To obtain the tumour images we are intended to subtract the background of the image and their negatives from the various set of images. Plotting contour and c-label of the tumour and its boundary provides us with information related to the tumour that can help in a better visualization in diagnosing cases. This procedure helps in recognizing the size, shape and location of the tumour. This in turn helps the doctors as well as the patient to comprehend the complexity of tumour with colour labelling for different levels of elevation. A graphical user interface would help the medicinal staff to access the reports and also find the background and contour plot of tumour within their finger tips.***

Keywords: Contour plot, Dilation, Erosion, Image processing, Noise removal, 3D Image.

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I. INTRODUCTION

The main impetus of this project is to maintain a crystal clear relation between both the doctor and the patient. Wherein, they can work in complete participation to accomplish better outcome. This straightforward approach would help the patient to believe in the process of the treatment and would make them feel secure, which would help the doctors to follow their procedures in a more composed manner with higher percentage of success rates.Brain tumour can be termed as the uncontrolled division of cells within the brain and around the central canal. Certain types of tumours are found to be cancerous and are supposed to be under the medical guidance and cure it on time. The precise reason for the brain tumour is not defined neither is the accurate set of side effects , thus, individuals might experience the ill effects of it without understanding the future risk. Primary brain tumours are of two types one being malignant (It is a cancerous tumour) and the other is benign (It is a non-cancerous tumour).Brain tumour is a medical condition in which there is a uncontrolled division of cells, growing abnormally. Tumour present in brain provides us an impression of a block of mass in undisguised shape when processed with the medical imaging techniques. Primary brain tumour and metastatic brain tumour are two possible types of brain tumour. The primary brain tumour is the state in which the tumour is developed and tends to remain in the brain whereas in the condition of the metastatic brain tumour the tumour forms in a part of the body and keeps spreading to various other parts of our body .The symptoms which are noticeable for brain tumours are relative to the location of the tumour, the accurate size and nature of the tumour. The symptoms are shown when tumour present compress the normal cells of the body and it creates a pressure. Besides that the symptoms can be experienced when the tumour blocks the locomotion of fluid that flows in the brain. The normal side effects that are caused are cerebral pain, fatigue, vomit and having problems in the balancing and the posture of the body. Brain tumour can be diagnosed with the help of the medical imaging techniques like CT and MRI. Both of the above techniques have their own pros in detection however depending upon the location and the need for the medical examination. In our paper, we have choose to opt the use of CT imaging because it is way simple to examine and gives us the accurate output on foreign mass location.A CT image acquired from the CT imaging machine gives us a two dimensional cross sectional perspective of the brain.

However, the output from the CT imaging would necessarily not extract the tumour and its location from the image. Therefore, there arises the need for image processing techniques to decide the seriousness of the tumour based on its size.

The reasons for opting CT imaging over MRI imaging are stated as follows:

1. CT provides results quicker than MRI, Therefore it is prescribed for cases of trauma as well as other neurological emergencies.
2. CT imaging is way lighter on pockets when compared to MRI.
3. CT is less delicate to the patient movement during the assessment.
4. This very imaging technique can be done in comparatively less duration which is a boon for heavy and claustrophobic patients.
5. This procedure involves minimal or no risks to the patient with implantable medicinal gadgets, like cardiac pacemakers, ferromagnetic vascular clips and stimulator for nerves.

The Main focus of our project is to identify brain tumour using CT images and present it in a more straight forward manner its representation with an end goal that is easy to understand by everyone. People in general prefer coloured images over the greyscale for better understanding, thus, we are utilizing coloured images to make the portrayal easier enough to comprehend by the patient along with the doctors. The representation of the tumour is programmed in a way wherein we could achieve the 3D visualisation using a 2D image with the help of contour plot and c label of the tumour. A user-friendly GUI is created which in turn helps the doctors and the medicinal staff to get the output without the complex task of the coding by hiding all the background information.

II. OBJECTIVE & PROBLEM STATEMENT:

The aim of our paper is detection of brain tumour using CT imaging techniques. The fundamental purpose behind detection of brain tumour is to provide clinical procedure for the cure .Our aim is to provide an algorithm that ensures the presence of a tumour by consolidating several procedures and techniques to provide a robust method of tumour detection using ct imaging. The various methods and functions that are used for this process are filtering the image, adjustment of the contrast, subtraction of the image from one another, erosion and dilation, and the outline the tumour. The main focus of our project is to provide a method in which we could extract the tumour using CT imaging and make it simpler such that it is easily understandable by everyone. The end goal of this work is to get some useful data that is more straightforward to the users, especially for the medical staff treating the patients. Aim of our paper is to characterise an algorithm that will result in separated image of the tumour from the CT cerebrum picture. This in turn will provide us an overall idea about the tumour , its size and the location and the magnitude of it. which in turn helps in perfect identification of the tumour and the solution for the cure can be easily found by the doctors and provide medical treatment accordingly.

III. PROCESSES IN WORKING:

i. Modules:

1. Preliminary processing:

Preliminary processing enhances the image quality. Our proposed system consists of techniques that are developed to eliminate the skull portion enclosing the tissues in the images to be processed in a scene. Edges are also boundaries of object surface, leading often to localised intensity changes in an image.Sobel operator is used in this framework for edge detection. This operator is based on converting the given image with a tiny, separable and integer-valued filter along with vertical and horizontal directions and is therefore computationally relatively.

A. Conversion of image:

After the elimination of unwanted portions, the image is transformed to gray scale image, for contrast, which aids to given accurate information regarding the tissues.

B. Re-scaling:

An important step in preliminary processing is re-scaling. It is needed for various functions such as to view, store and transmit images. When an image has to be displayed, the resolution of the device used for displaying the maximum size of screen display vary.. The derived image is rescaled according to the system requirement. Resizing is done to accommodate the system user interface. The gray scale image is rescaled to be 256 by 256 pixels in size.

C. Edge Detection:

It is the process in which sharp discontinuous in the image are detected and are located. The sudden shifts in the resolution of the pixel are responsible for the object boundaries inexpensive. That is, mathematically two 3x3 kernels are used by the operator which in turn are translated to the original image to evaluate derivative approximations, One each for the vertical shift and horizontal shift.

2. Morphological operation:

Further in complex sequences of opening and closing, dilation and erosion operators are used. Two erosion and dilation processes comprise the opening, used to eliminate all the pixels to contain the structuring component in the smaller regions. Further the closing operation plugs narrow breaks, removes small holes and cover gaps in the contours.

The compliment of the gray scale image is taken after the opening and closing of reconstruction phase to evaluate the regional maxima.

To obtain an smooth edge of the foreground objects, The regional maxima of the reconstructed image is determined. Then, on the original image, we superimposed these markers.

3. Segmentation:

The watershed algorithm evolves images, even of low contrast .Which helps in differentiating the distinct regions. The original image gradient is used to determine the watershed transform in order to identify the boundaries of the catchment basins in the high gradient points.

4. Feature Extraction:

We collect certain features of the image, after segmentation and feed it into a classifier.

Thereby, the main objective of this extraction function is to reduce the original datasets by estimating certain features. For this a GLCM-Grey level co-occurrence matrix Classifier is used. The matrix of GLCM contains columns and rows equivalent to the number of gray levels.

The GLCM functions depict the texture of the image by evaluating the frequency with which pixel pairs with specific values appear in the image and in a given spatial relationship. Thereby generating a GLCM, and then reducing the statistical measures from the matrix given.

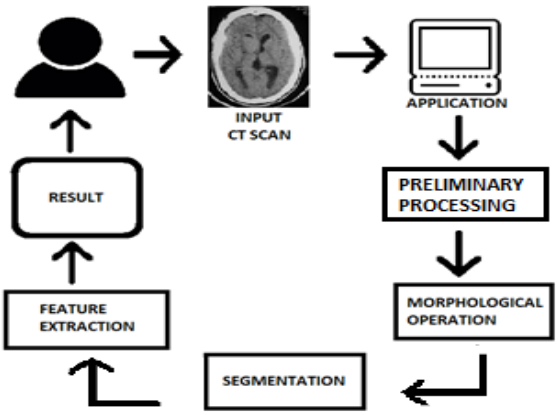

Figure1.

ii. Algorithm:

Watershed is a widely used image segmentation technique. Digital image segmentation is the process of splitting it into a number of disjoint regions so that each region's pixels have similar visual characteristics[7]. The objective is to simplify or alter the representation of an image for further analysis. This is one of the important functions in pattern recognition and classification, visualisation, object based image compression etc[7]. The watershed algorithm is one of the most regularly used segmentation algorithms in the processing of medical and material science images. It is based on depicting a gray scale image as a topological relief, water flooded, where watersheds are lines that separated water areas from different basins[7].

The watershed segmentation algorithm is based on the portrayal of an image as a topographical relief, where at this point the value of each image element characterises its height[7]. These algorithms can handle 2-D images as well as 3-D images. For better results, Watershed segmentation is mostly applied to the result of the distance transform of the image instead of the original one[7].

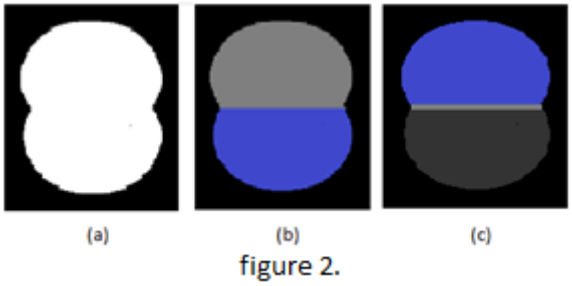

Figure2: Segmentation differences (a) image after initial stage (b) result after segmentation without watershed lines (c) result after segmentation with watershed lines.

IV. RESULT ANALYSIS

i. Existing System and proposed system:

A. Drawbacks of existing system:

1. Noises existing in the brain's MRI images are quite multiplicative, thus reducing these noises is a complicated task.
2. They often fail due to unknown and intermittent noise, in homogeneity, inadequate contrast and low limits inheritent in the images.
3. Results are not accurate.
4. Unable find the shape of the tumour.

B. Proposed System:

The CT image of the brain needs to undergo certain pre-processing operations in this system. The image is transformed into gray scale image in these operations, it is rescaled and then edges are detected.

The pre-processed image is made to undergo certain morphological operations such that the image's texture becomes smoother. Small holes and gaps are eliminated and filled in such a way that it helps to segment the image in the next stage.

The segmented image is provided input to the GLCM matrix, which extracts different features.

These features are sent to the classifier as input. The superimposed image is compared and contrasted to the original image with the training phase, detecting the type and degree of haemorrhage and the error calculated.

C. Advantages of our proposed system:

Using image segmentation, the exact location of necessary objects and boundaries can be identified in images.

1.CT scanning provides different medical information from other imaging studies such as ultrasound, MRI, SPECT, PET or nuclear medicine.

2.CT scans are extensively used and generally inexpensive t han MRIs.

3.Therefore, the usage of CT imaging in our project would help us achieving the results in easy and quick and accurate ways.

V. CONCLUSION

The concepts and frameworks of Processing modules and Watershed algorithm was explained and how they both together contribute to detect Brain Tumour which is a major cause increase in the number of cancer patients. The proposal would help in the timely identification of the problem which turns out to be advantageous for its cure. This will be achieved by creating a GUI based application with the help of all processing methods to give a clear picture of the underlying problem. Thus using this application we can help diagnose and cure several patients' tumour in a comprehensive, swift and affordable method.

VI. TESTING REQUIREMENTS:

A.HARDWARE REQUIREMENTS:

i. System : Pentium IV 2.4 GHZ
ii. Hard Disk : 40 GB or above.
iii. Floppy Drive : 1.44 Mb or above.
iv. Monitor : 15 VGA Colour.
v. Mouse : Any Compatible models.
vi. RAM : 512 MB or above.

B.SOFTWARE REQUIREMENTS:

i. Operating system : Windows 7 or above.

ii. Coding Language : Python.

iii. Front End Tool :Anaconda

iv. Database :MSSql.

v. Back End Tool :Spyder

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