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MORPHOLOGY BASED TEXT SEPARATION AND PATHOLOGICAL TISSUE SEGMENTATION FROM CT IMAGES

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Abstract*:* In this paper two different problems patient information separation and segmentation of CT scan brain images are handled. Medical images carry patient sensitive information. It restricts the public access to such images. Also segmentation of pathological tissues from medical images is also one of the challenging tasks. This paper presented the simple and effective solution to these two problems. Morphological erosion and dilation is used to separate the patient information from the CT scan brain images and the same image is processed further to extract abnormalities from it.

Keywords: Computed Tomography (CT), Morphology

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INTRODUCTION

Image segmentation is one of the important steps in Medical image processing. Segmentation partitioned image into different segments. CT scan imaging is used to visualize the brain abnormalities using x-ray mechanism. Higher density tissues like blood, fresh blood and bone appeared white in CT image. While lower density tissues like air and water appeared dark. Brain tissues are between high and low hence appeared as gray. On this imaging characteristic the Brain image segmented into three main regions White matter (WM), Gray Matter (GM) and Background. Medical Images contain the patient personal information like patient name. The images are sheared online and offline for different purposes like medical education, research. Disclosing such information publically is sensitive issue. So for that the proposed work carried out preprocessing step to separate the patient information from medical images.

I. LITERATURE REVIEW:

Researcher reviewed the literature related to brain tumor segmentation especially using morphological techniques. Many earlier researchers used K-means clustering, watershed segmentation and thresholding for brain image segmentation with morphological erosion and dilation.

Mr. Vishal Shinde et. al [1] proposed K-means based tumor segmentation technique. The proposed technique is applied on MRI brain images. Morphological technique is used to identify shapes of the extracted region. Abhishek Thakur et. al.[2] presented a technique for intracranial hemorrhage detection from CT scan brain images. Sub-Blocking rule based criteria and Multi-level local segmentation approach is used for their work. Alyaa Hussein Ali et al. [3] [9] presented method for brain stroke region identification using median filter for noise removal and thresholding for stroke region extraction. Roopali R. Laddha et.al [4][5] presented a method for brain tumor detection from MRI images by applying watershed segmentation and wavelet based method for tumor detection resply. In [5] they applied this technique on CT and MRI brain images. Rachana Rana et. al [6] conducted comparative study of medical image segmentation approaches like Fuzzy-C-mean, K-mean clustering, Neural network used by earlier researchers. Swe Zin Oo et.al [7] used morphological operations and watershed segmentation for brain tumor in MRI images. They also calculated the volume of the tumor. Rohini Paul Joseph et.al [8] proposed K-means clustering and morphological filtering for MRI brain image segmentation. Mohammed Y. Kamil [10] extract tumor region and calculates the area of tumor from CT scan images. Contrast-limited adaptive histogram equalized method for image enhancement.

Morphological closing is used. U. Vanitha et. al [11] proposed technique to extract tumor region from MRI brain images using morphological erosion. They preprocessed images by resizing images to size 120 X 120 and adjusted the contrast of the image. Image is eroded by disk size 20 and applied the Otsu's method for thresholding. Radha S et. al[12]used K-means clustering for tumor region extraction. They applied strl contrast enhancement filter for image enhancement. Skull stripping is used to create the skull mask and applied K-means clustering on soft tissues.

From above literature by observing the data used and results obtained by these researchers it is found that it is easy to identify the abnormalities lies insides the brain tissues. But no one shows the separation of abnormal tissues and the skull tissues where the abnormalities connected to skull tissues. So for this research such images are chosen and processed for abnormality detection.

II. METHODOLOGY:

In this work two different tasks are carried together one is separation of patient information from image data and second abnormality detection from CT scan images. The proposed technique is shown in following Fig 1.

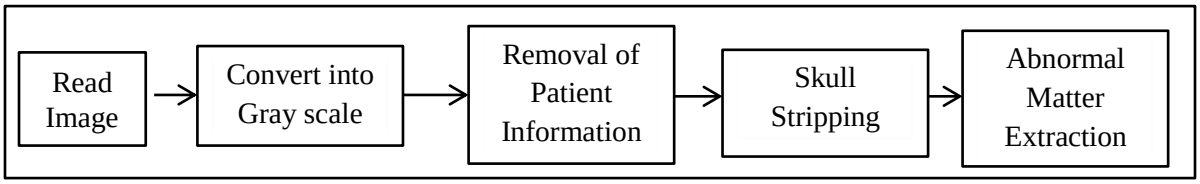


Figure 1 Proposed method

Mathematical morphology is a tool for extracting image component and description of region shape. Dilation grows the objects in binary image and Erosion shrinks objects in binary image. Where the thickening and shrinking is controlled by a structuring element of different shapes like disk, line, diamond, square etc.

Mathematical notation of dilation of image I by structuring element s is as follows

$$I \oplus s = \{z|(\hat{s})_z \cap I \neq \emptyset\} \qquad (1)$$

The mathematical notation of erosion of image I by structuring element s is as follows

$$I \ominus s = \{z|(s)_z \cap I^c \neq \emptyset\} \qquad (2)$$

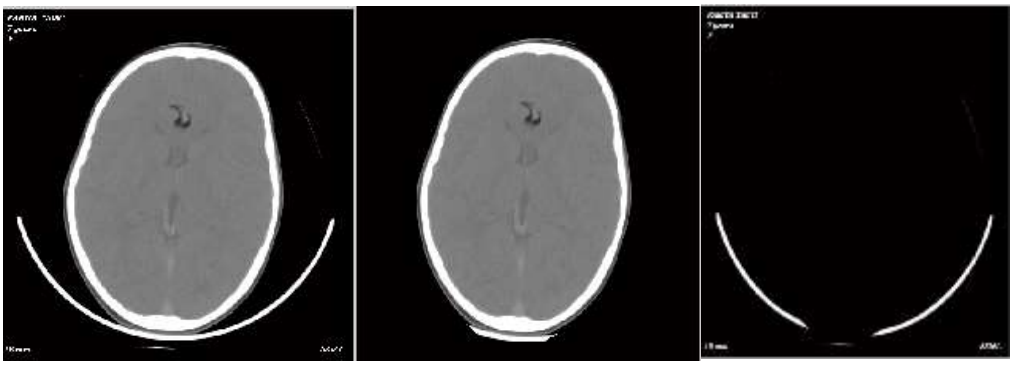
Proposed Algorithm:

1. Read Image:-In this step CT scan image is read.
2. Conversion:-In this step CT scan image is converted into gray scale image.
3. Patient information removal:-Patient information is removed using morphological erosion followed by dilation. Disk type structuring element of size 35 is used for erosion and size 40 is used for dilation.
4. Skull Stripping:-The abnormality lies inside the brain tissues. Hence, In This step Skull tissues are removed from the original image by using the morphological erosion using disk type structuring element of size 35.The resultant image contain the image with brain tissues only.
5. Abnormal matter detection:-In this step abnormal region extracted from brain tissues.

Abnormalities appear brighter than brain normal tissues.

III. RESULTS:

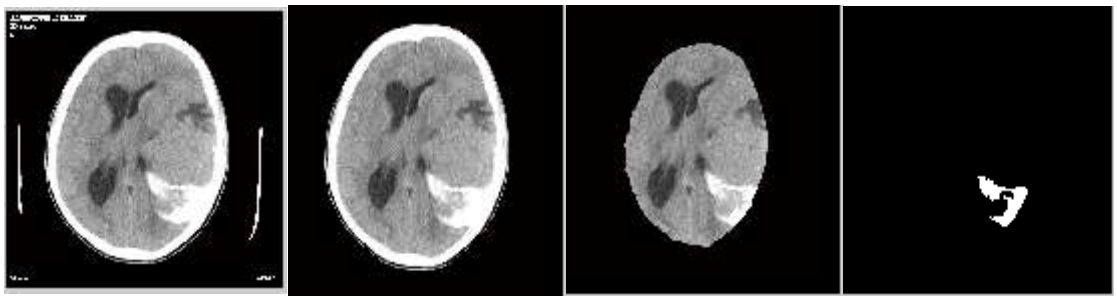
The proposed technique is applied on CT scan brain image data. Real images are collected for this work from trauma centers. The following figure Fig. 2 shows results obtained for patient information removal. Health care is very sensitive area. The medical images carried patient personal information. This is not suitable to use these images publically. So it is important to remove the patient information from images. This textual information also contents the modality information used to capture the images like slice thickness, Axial (view of image). Such types of keywords are used to classify the different types of medical images and for content based image retrieval (CBIR). Hence, by using the proposed technique we can collect such tokens from Text separated image using OCR techniques.



(a) (b) (c)

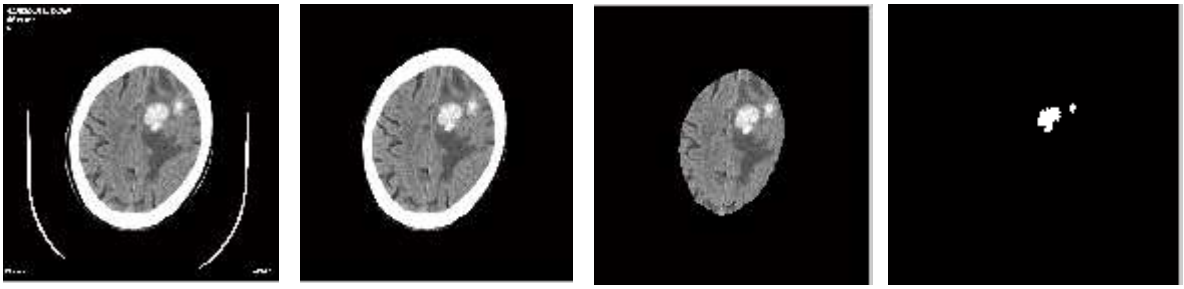
Figure 2 Patient information removal (a)original Image (b) Image without text (c) Text separated Image

The Image without text is furthure processed for abnormality extraction from CT scan brain images.CT Scan brain image can be segmented into three regions Skull,Brain tissues(Gray Matter GM) and Abnormal tissues(White matter WM).The intensity values of the skull tissues are the brightest tissues in image.Whereas the Brain tissues appear gray and abnormalities appeared as brighter than brain tissues.In this work it is found that abnormal tissues can also of equal intensity of skull.That time if the abnormalities are connected to skull then it is very diffcult to segment abnormal tissues.Hence,morphological erosion is used for skull stripping which separate the skull tissues from the brain matter.After which abnormal tissues are easily segmented from brain tissues as shown in figure Fig.3. Fig 4 shows the results of the proposed technique applied on the CT scan brain image in which the abnormality lies inside the brain tissues.



(a) (b) (c) (d)

Figure 3 (a) original Image (b) Image without text (c) Brain tissues with abnormality connected to skull (d) Abnormal tissues



(a) (b) (c) (d)

Figure 4 (a) original Image (b) Image without text (c) Brain tissues with abnormality (d) Abnormal tissues

IV. CONCLUSION:

In this paper morphological erosion and dilation is used for Patient information removal and Abnormality detection. CT scan brain images are segmented to separate the abnormalities from brain. The experimental results a show the proposed technique is effectively separate the brain image and patient information and correctly segment the abnormal tissues from image. Morphological operators convert image into binary and hence processing time is very less.

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