Breast tumour detection using segmentation technique from CT scan

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***Abstract*- This paper presents image processing technique to detect tissue information, biomedical images have the ability to assist physicians in detecting disease caused by cells abnormal growth. Developing algorithms and software to analyse these images may also assist physicians in their daily work. The key and hardest task is auto-extracting of tiny modules or tumour from the biomedical image, which if detected at initial stage gives the information of early cancer. This study combines image threshold, edge detection and segmentation helps in detection of cancer .**

Keywords— Image enhancement; Global Thresholding; Crop segmentation; Noise reduction; Edge detection.

I. INTRODUCTION

Medical imaging is one of the most useful diagnostic tools available in modem medicine. Medical diagnostic and imaging system are ubiquitous in modern health care facilities. The advantages of early detection of potential lesions and suspicious masses within the bodily tissue have been well established. It can be detected and assessed many different types of injuries, diseases, and conditions with the aid of the medical imaging that allows medical personnel to look into living cells non-instructively. Farzaneh Keyvanfard et al [1] To acquire the medical images of the organs and internal structures of the body, it is used X-rays, gamma rays, ultrasound, infrared thermograph and magnetic fields. In interventional radiology, imaging procedures are combined with other techniques to treat certain diseases and abnormalities to conclude it crystal clear-cut. Image processing is a series of operations that are applied to the images to enhance, alter, or select regions of interest. Diagnoses of the disease are usually based on visual recognition of abnormal cells and tissues and results can help in planning the developed to optimize patient treatment in the right direction. Doctors and technicians can more easily and exactly make a diagnosis, decide on a treatment prescribe medication, and perform surgery or any other treatments

The main aim of this work is the detection and extraction of tumour from CT images. The CT suspicious for cancer are found out for more detailed examination by the attending physicians. There are several image processing methods proposed for the detection of tumours in CT image. Although there are various tumor detection algorithms in the literature, the detection rate is still not high. Our algorithm is implemented using the concept of thresholding, crop segmentation and then finally smoothing the tumour image. Image segmentation is typically used to locate objects and boundaries in images. After segmentation we get the required portion of the image. The segmented output may or may not be a tumour. The segmented output may be a fatty tissue.

N. Lee *et al* [2] Digital CT is a technique for recording images in computer code instead of on x-ray film, The images are displayed on a computer monitor and can be enhanced (lightened or darkened) before they are printed on film. Images can also be manipulated; the radiologist can magnify or zoom in on an area. This screening will generate large number of CT images to be determined by a small number of radiologists resulting in misdiagnosis due to human errors caused by visual fatigue. The sensitivity of human eye decreases with increasing number of images. Hence, it may be helpful for a radiologist, if a computer-aided system is used for detection of tumours in CT images. Computer-aided detection (CAD) involves the use of computers to bring suspicious areas on a CT to the radiologist's attention. It is used after the radiologist has done the initial review of the CT. There are several image processing methods proposed for extract of tumours from CT image for better view of area and shape of tumour. In some cases the primary objective was to enhance the CT image. Even many algorithms are available for tumour detection and extraction the detection rate is still not high. This is due to the high variation in size and shape of the tumours.

II. ACQUISITION

Acquisition is the process of building the image, usually by applying some energy to the subject and sensing a response (e.g., a reflection, or transmission). L. Ludemann et al [3] A medical specialty that uses x-rays, gamma rays, high-frequency sound waves, and magnetic fields to produce images of organs and other internal structures of the body. A medical imaging system typically includes at least one medical modality that generates input pixel data representative of an image and a medical imager that forms a visible representation of the image based on the input pixel data. Different imaging modality may be used for imaging patient's body parts. Some of the imaging modalities like magnetic resonance imaging (MRI) systems, computed tomography (CT) systems, ultra sound systems, X-ray systems, positron emission tomography system and nuclear imaging (PET). In this paper CT scanned image was processed for tumour

extraction from diseased region. Invaluable images for identifying, diagnosing and treating physical conditions are provided by CT system by which the need for surgical diagnostic intervention can be reduced drastically.

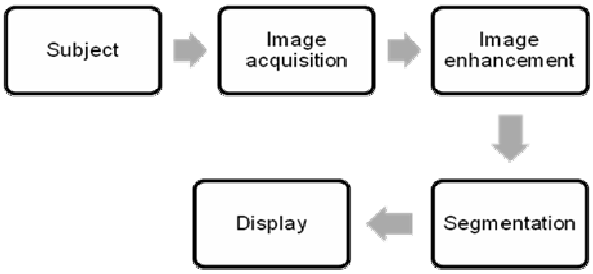


Fig1. Proposed approach

III. METHODOLOGY

A method for the detection of breast tumour using CT image is proposed, which is divided into three main stages. The first stage is an enhancement procedure. After enhancement, two type of segmentation is done in this section first is crop segmentation which use graphical user interface and other is thresholding, several filters are applied on image to smooth it. P. K. Sahoo et al [3] Thresholding method is frequently used for image segmentation. This is simple and effective .segmentation method for images with different intensities. The technique basically attempts for finding a threshold value, which enables the classification of pixels into different categories. A major weakness of this segmentation mode is to generates only two classes. Therefore, this method fails to deal with multichannel images. Besides, it also ignores the spatial characteristics due to which an image becomes noise sensitive and undergoes intensity in-homogeneity problem, which are expected to be found in CT image. Both these features create the possibility for corrupting the histogram of the image. To overcome these problems various versions of thresholding technique have been introduced that segments medical images by using the information based on local intensities and connectivity. Though this is a simple technique, N. R. Pal et al [5] still there are some factors that can complicate the thresholding operation, for example, no stationary and correlated noise, ambient illumination, busyness of gray levels within the object and its background, inadequate contrast, and object size not commensurate with the scene. In the digital, graphic design and photography industries, cropping refers to removing unwanted areas from a photographic or illustrated image. One of the most basic photo manipulation processes, it is performed in order to remove an unwanted subject or irrelevant detail from a photo, change its aspect ratio, or to improve the overall composition. In telephoto photography, most commonly in bird photography, an image is cropped to magnify the primary subject and further reduce the angle of view when a lens of sufficient focal length to achieve the desired magnification directly is not available. It is considered one of the few editing actions permissible in modern photojournalism along with tonal balance, colour correction and sharpening. A crop made from the top and bottom of a photograph may produce an aspect which mimics the panoramic format (in photography) . Edges define the boundaries between regions in an image, which helps with segmentation and object recognition. They can show where shadows fall in an image or any other distinct change in the intensity of an image. Edge detection is a fundamental of low-level image processing and good edges are necessary for higher level processing. The problem is that in general edge detectors behave very poorly. While their behaviour may fall within tolerances in specific situations, in general edge detectors have difficulty adapting to different situations. The quality of edge detection is highly dependent on lighting conditions, the presence of objects of similar intensities, density of edges in the scene, and noise. While each of these problems can be handled by adjusting certain values in the edge detector and changing the threshold value for what is considered an edge, no good method has been determined for automatically setting these values, so they must be manually changed by an operator each time the detector is run with a different set of data. Noise is removed by filters.

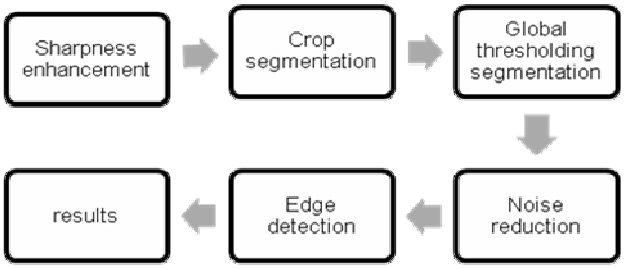


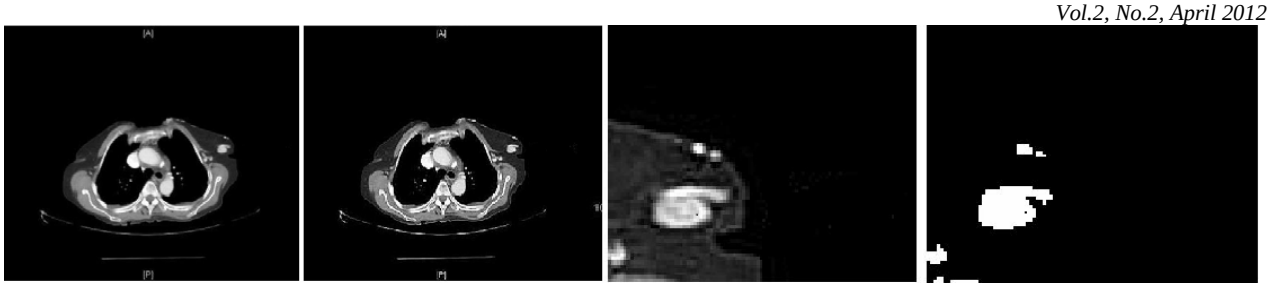
Fig2. Image processing algorithm flow

The main agenda behind all of my research was that according my survey I found that the ratio of cancers increases so much that in 10 people every fourth person is a victim of it, and i designed this algorithm to take a step in the cure of it. The initial step for detecting any cancer or tumour is a CT scan(Computed tomography)of that affected area it is used to generate a three-dimensional image of the inside of an object from a large series of two-dimensional X-ray images taken around a single axis of rotation

CT produces a volume of data that can be manipulated, through a process known as "windowing", in order to demonstrate various bodily structures based on their ability to block the X-ray beam. Although historically the images generated were in the axial or transverse plane, perpendicular to the long axis of the body, modern scanners allow this volume of data to be reformatted in various planes or even as volumetric (3D) representations of structures.

IV. RESULTS

The image we obtained through CT scan is a gray scale image and it includes a lot of noise and other distractions that a

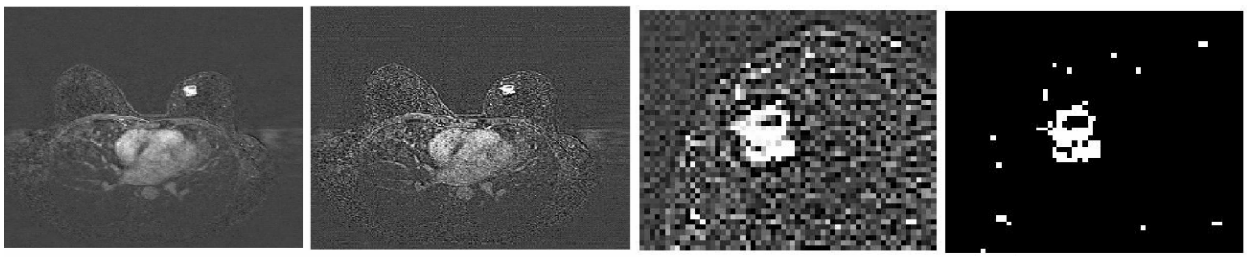


(a) (b) (c) (d)

Fig 3. Segmentation results for Breast tumors .(a) Original CT scan of breast cancer (b) Enhanced representation of original CT scan for better human perception (c) Result of crop segmentation applied on tumour (d) Result of Global threshold applied on cropped image.

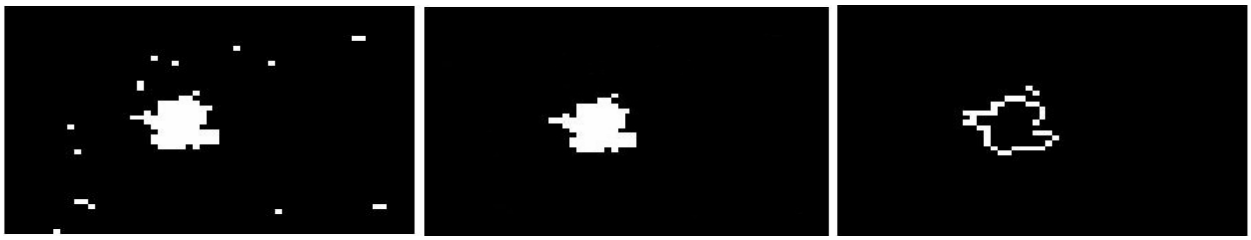
(a) (b) (c)

Fig 4. Noise removal filter results of Breast tumour CT scan .(a) Hole is filled with in this image which occurred in thresholding stage(b) Noise reduction by removing unwanted pixels (c) Sobel edge detection



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

Fig 5. Segmentation results for Breast tumors .(a) Original CT scan of breast cancer (b) Enhanced representation of original CT scan for better human perception (c) Result of crop segmentation applied on tumour (d) Result of Global threshold applied on cropped image.



(a) (b) (c)

Fig 6. Noise removal filter results of Breast tumour CT scan .(a) Hole is filled with in this image which occurred in thresholding stage(b) Noise reduction by removing unwanted pixels (c) Sobel edge detection

doctor took it very hard to analyse it properly and accurately as u can see that in images (fig3.(a) and fig5.(a)). To increase human perception we introduce pre-processing as sharpness as enhancement method on the picture so that u can clearly determine all minor and major details in it. Results of sharpness enhancement can be seen in fig 3.(b) and fig 5.(b).Results showed in Fig3.(c) in fig 5(c) is a cropped image of ROI(region of interest)from the whole image by using GUI (graphic user interface) the benefit of this is that the crop segmentation segment the region of interest from whole image

which increase the speed performance of algorithm and we have limited area to apply rest of our commands , results in fig3. (d), and fig 5.(d) is obtained by applying global thresholding segmentation to convert the cropped image to more desired form because noise removing filters can only be applied on binary image, thresholding convert the cropped image into binary image and removed most of the noise, after that results in fig 4.(a) (b) and fig 6(a) and (b) is obtained by hole fill to smooth the object area which is tumour and by removing white unwanted pixels respectively . Results in fig 4 (c) and fig 6 (c) are obtained by detecting edges with sobel method of edge detection. Same procedure is applied to other CT image and results of both CT are shown above

V. CONCLUSION

A technique is proposed in this paper which is used for detection of breast cancer using CT images. In this proposed scheme we are using image enhancement for enhancing the features so that this enhanced image is further used for processing. Enhancement makes image more immune to noise and does not give false impression because of noise. In this scheme we are integrating Global thresholding with crop segmentation. Results shows that proposed scheme able to detect breast cancer accurately. Also to get better results we also use filters for removal of artefacts. So by integrating enhancement, thresholding and segmentation we are able to detect breast cancer more accurately as shown in the results.

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