

Develop and Implement Different Methods of Region of Interest(ROI) for Medical Images

Patel Prakruti L.¹, Prof. D. N. Khandhar²

¹UG Student, ²Assistant Professor

^{1,2}Department of Electronics and Communication Engineering

^{1,2}C. U. Shah College of Engineering and Technology, Wadhwan, Gujarat, India

Abstract - Region of interest method on any medical image which will be given by doctor will be performed first of all. By applying region of interest method we can get our interested region only and can remove unnecessary part of the image. ROI also can be used for image compression. And then to improve quality of interested region image enhancement algorithm will be developed. And then image will be shown to doctor so that better quality image and this method can be used in medical application. And these whole procedure will be done on three type of image. ultrasound image, CT image and MRI image.

Keywords: image enhancement, region of interest(ROI).

I. INTRODUCTION

Engineers are developing technologies and tools, enabling the medical practitioners to provide efficient treatment. From the elaborate medical information, the doctor prefers to focus on certain selected region(s) of interest. Also the doctors are more comfortable with image processing and analysis solutions that offer subjective analysis of medical images than depending on the objective engineering results alone. Medical imaging is the technique and process used to create images of the human body for clinical purposes diagnose or examine disease or medical science including the study of normal anatomy and physiology.

Image enhancement is important issue in Image processing. It improves the quality (clarity) of images for human viewing. Removing blurring and noise, increasing contrast, and revealing details are examples of enhancement operations.

II. SYSTEM MODEL

2.1 Different medical modalities:

There are three type of images in medical application.

1) Ultrasound imaging(US)

2) Computed tomography (CT)

3) Magnetic resonance imaging(MRI)

2.1.1 Ultrasound Imaging:

Ultrasound waves have a frequency just beyond that of audible sound. Similar to sonar used by submarines, these waves are emitted and bounce back once they strike an object. As a clinical tool, ultrasound imaging can detect differences between solid and liquid material in the body. The concepts of ultrasound differ from other medical imaging modalities in the fact that it is operated by the transmission and receipt of sound waves. The high frequency sound waves are sent into the tissue and depending on the composition of the different tissues; the signal will be attenuated and returned at separate intervals.

2.1.2 Computed tomography (CT):

Computerized tomography (CT scan) — also called CT — combines a series of X-ray views taken from many different angles and computer processing to create cross-sectional images of the bones and soft tissues inside your body. The resulting images can be compared to looking down at single slices of bread from a loaf. In some cases, CT images can be combined to create 3-D images. CT scan images can provide much more information than do plain X-rays. A CT scan has many uses, but is particularly well suited to quickly examine people who may have internal injuries from car accidents or other types of trauma. A CT scan can be used to visualize nearly all parts of the body.

2.1.3 Magnetic resonance imaging(MRI)

MRI is short for Magnetic Resonance Imaging. It is a procedure used in hospitals to scan patients and determine the severity of certain injuries. An MRI machine uses a magnetic field and radio waves to create detailed images of the body. Common reasons people go in to get an M.R.I. are

for a sprained ankle or back pain. A strong magnetic field is created by passing an electric current through the wire loops. While this is happening, other coils in the magnet send and receive radio waves. This triggers protons in the body to align themselves. Once aligned, radio waves are absorbed by the protons, which stimulate spinning. Energy is released after "exciting" the molecules, which in turn emits energy signals that are picked up by the coil. This information is then sent to a computer which processes all the signals and generates it into an image. The final product is a 3-D image representation of the area being examined.

III. PREVIOUS WORK

3.1. Region of interest and its need in medical imaging:

Region of interest is the selected region in which we are interested and we want to perform some operation on that region only. For example in tumour detection of breast we are interested in tumour only. So we have to select that tumour region only. Engineers are developing technologies and tools, enabling the medical practitioners to provide efficient treatment. From the elaborate medical information, the doctor prefers to focus on certain selected region(s) of interest. Also the doctors are more comfortable with image processing and analysis solutions that offer subjective analysis of medical images than depending on the objective engineering results alone. For example if doctor wants to study about the brain tumour then other part of brain is unnecessary for doctor. so if we apply region of interest method then doctor can get only tumour and can study it in a efficient manner and also can apply any enhancement method to get more superior image of tumour.

- 1) Region of interest using manual cropping: Manual cropping is achieved using Matlab® function (imcrop), but it may cause false cropping rectangle and it is tedious work.
- 2) Automatic cropping is saving more work and it is reducing processing time over and above the cropping rectangle is truly detecting. Auto cropping approach, firstly, determine the positions of ones in image, then calculate minimum and maximum coordinates from these positions, minimum coordinate will be the first corner (upper-left), the second one (lower-right) will be determined by subtract minimum coordinate from maximum coordinate. After that image cropping will be used with these corners. But here ROI will be selected based on intensity of pixel only. so I proposed new method of selecting region of interest.

3.2 Disadvantage of finding region of interest using IMCROP function:

In MATLAB using imcrop function we can find region of interest (ROI). But there are some disadvantages of using MATLAB function imcrop. These disadvantages are as follows:

- (1) For large images running imcrop function takes too much time. So it can't be used in medical application. In medical application speed is an important consideration.
- (2) Using imcrop function we can select only square and rectangular shape.
- (3) Imcrop function's output gives already zoomed image of region of interest. while some application might need image of region of interest without zooming.

IV. PROPOSED METHODOLOGY

4.1 Proposed methods of finding region of interest:

Two methods are possible for finding region of interest. In first method we can find region of interest using but while selecting ROI whenever closed shape will be formed of any shape in input image it will take it as region of interest and it will give output of that interested region. But these method is very faster than matlab function. And it doesn't give already zoomed image. Magnetic resonance imaging is useful for taking the image of brain. And from that image we can find tumour from that image. In medical application only tumour is necessary for analysing it. So by using free hand method of finding region of interest we can get tumour only from whole brain MRI image. Here input and output of finding region of interest in brain MRI image is shown in figure 1 and 2.

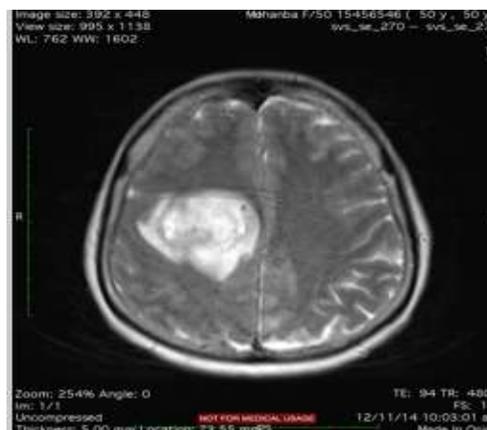


Figure 1. MRI image of brain tumor

For ultrasound image of liver also we can apply these region of interest method. Here appendix swollen ultrasound image and its output for these method is shown in figure 3 and 4.

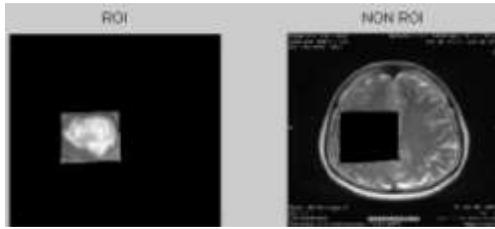


Figure 2. Region of interest image

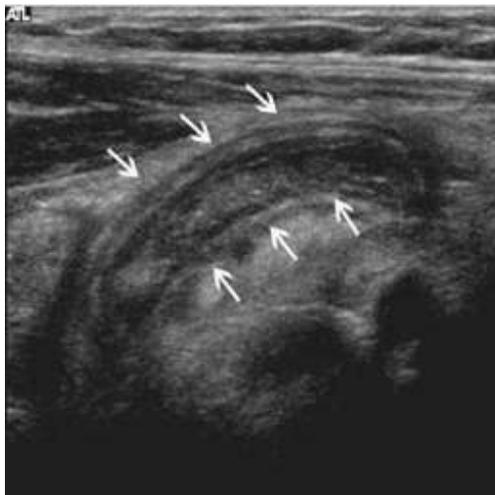


Figure 3. ultrasound image of swollen appendix

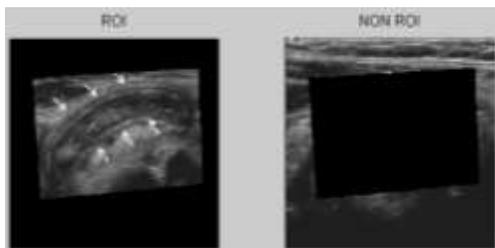


Figure 4. region of interest image

2) In our second proposed method it will remove all the disadvantages of imcrop function. Here, I had used free hand method of finding region of interest. so using these method we can use any shape to create region of interest. It will also take less time than imcrop function. And at the output of these method we can get original region of interest without zooming. And if zooming is required in some application, then we can apply it to region of interest. Here, input and output of free hand method is shown in figure 5 and 6.

For ultrasound image of appendix swollen liver image these new method of region of interest is applied and its input and output are shown in figure 7 and 8.

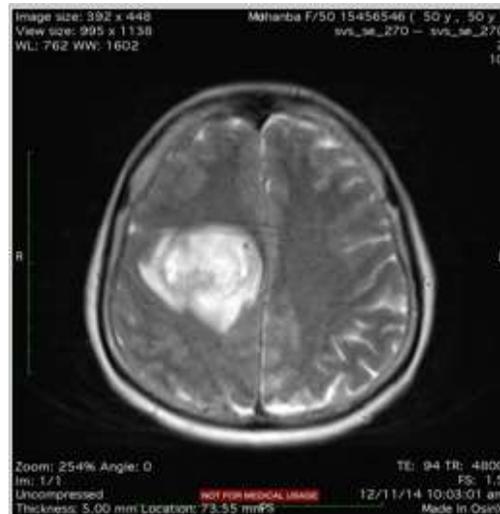


Figure 6 .MRI image of brain tumour

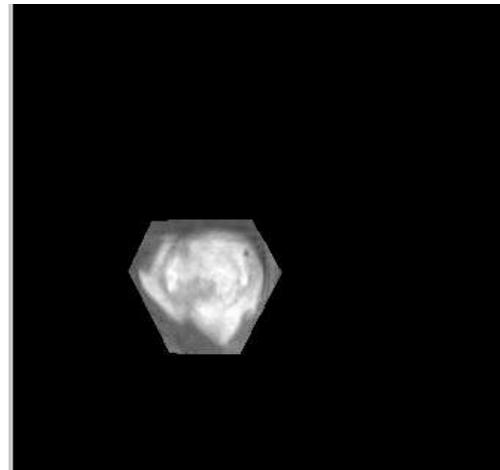


Figure 7. Region of interest image

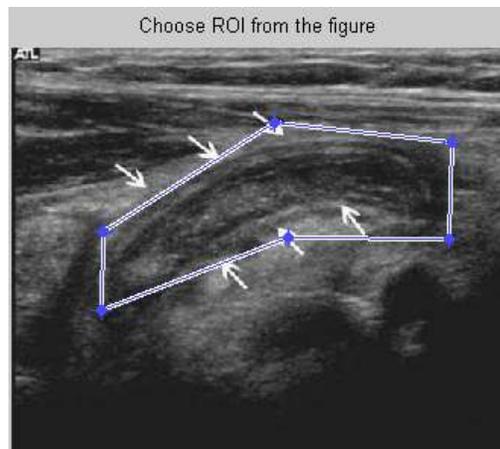


Figure 7 ultrasound image of swollen appendix

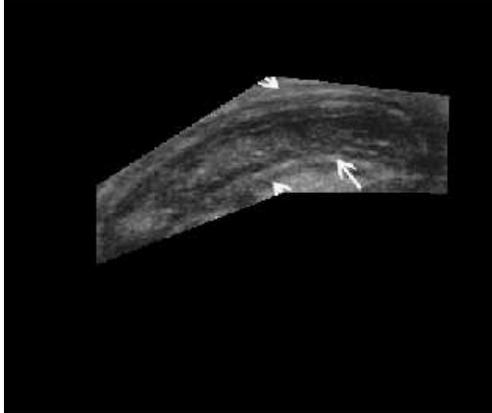


Figure 8 Region of interest image

4.2 Proposed algorithm:

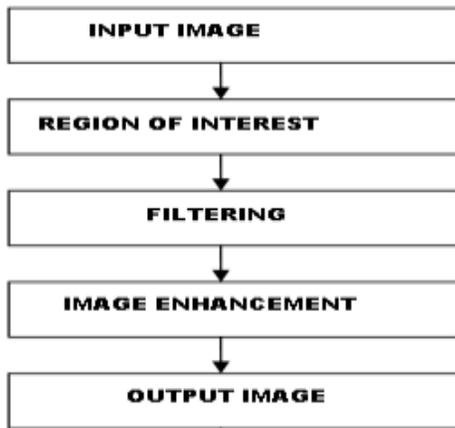


Figure 9. Proposed algorithm of work

As shown in algorithm first of all input image will be taken and region of interest method will be applied on that image. Then filter which will give best result on input image will be applied to image to remove its noise. And then to improve the quality of interested region different image enhancement method will be applied to that region only. So that we can get best quality output image of our interested region only.

4.2 Image enhancement in medical imaging:

Medical imaging is the technique and process used to create images of the human body for clinical purposes diagnose or examine disease or medical science including the study of normal anatomy and physiology. Although imaging of removed organs and tissues can be performed for medical reasons, such procedures are not usually referred to as medical imaging, but rather are a part of pathology. By the increasing use of direct digital imaging systems for medical diagnostics, digital image processing becomes more and more important in health care. Image enhancement is

important issue in Image processing. It improves then quality (clarity) of images for human viewing. Removing blurring and noise, increasing contrast, and revealing details are examples of enhancement operations. For example, an image might be taken of an endothelial cell, which might be of low contrast and somewhat blurred. Reducing the noise and blurring and increasing the contrast range could enhance the image. The original image might have areas of very high and very low intensity, which mask details. An adaptive enhancement algorithm reveals these details. Adaptive algorithms adjust their operation based on the image information (pixels) being processed. In this case the mean intensity, contrast, and sharpness (amount of blur removal) could be adjusted based on the pixel intensity statistics in various areas of the image.

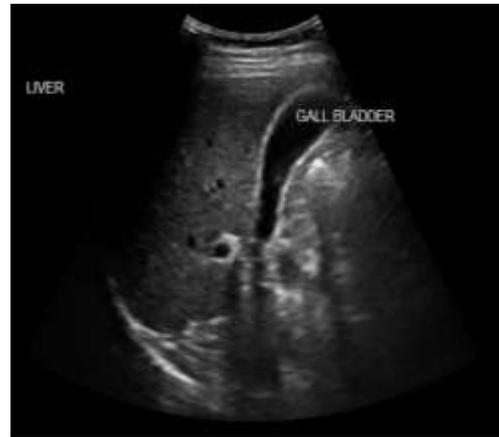


Figure 10. original image[11]



Figure 12. histogram equalization[11]

Different image enhancement methods are as follows: Image negative, contrast stretching, Gray level slicing, Bit plane slicing, power law transformation, gamma correction, thresholding, histogram equalization. Among all these

methods histogram equalization gives best result on ultrasound images. Because it has maximum entropy value.



Figure 13. original image[11]

Different filters in spatial and frequency domain also can be applied on medical image. Over all these filters median filter gives best result on ultrasound image as shown in figure.



Figure 14. Median filtered image[11]

But, here we apply image enhancement technique on whole image. which is not necessary for doctor all the time. So I had taken doctor's guidance and image enhancement technique will be applied to that region only which is helpful to doctor. That region is called region of interest(ROI).so that region only can be viewed more efficiently and useful information can be taken from image.

V. CONCLUSION

This paper proposed new approach of determining region of interest from medical image so that we can get image of interested region only of any shape. Here, I remove all the

disadvantage of previous method in new proposed method and this new method can be applied to all three medical modalities.

VI. FUTURE WORK

In future I will apply different image enhancement method on that region only. so we can get more clear image of interested region. That image can be used in various medical applications. In future we can discover new enhancement method and filter to improve the quality of interested region. And image can be of any type like CT, MRI, ultrasound image.

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A BRIEF AUTHOR BIOGRAPHY

Patel Prakruti Lalit Kumar has completed her bachelor of engineering in electronics and communication engineering from Gujarat technological university. She is currently pursuing master of technology in electronics and communication engineering at C.U.SHAH college of engineering and technology. She is interested in image processing.

Prof. D. N. Khandhar is Head of the department in electronics and communication engineering department at C.U.SHAH college of engineering and technology. He has completed his bachelor of engineering, and master of engineering in image processing. And he is currently doing his Ph.d. in image processing.