

An Efficient and Robust Fracture Detection in Femur Bones



CMAK Zeelan Basha, G Kalyan Jaya Simha, Y Vamsi Krishna

Abstract: *There are several bones in the body but the femur is especially the important bone in the body which is from the hip to knee. The Red blood cells(RBC) are created because of bone called femur. In this paper we have given a method to know where the bone has broken by the methods of image processing..We will preprocess the image in order to show the interested domain . In this paper, foreground is taken as our interested domain in order to hide the background details. There are many mathematical and morphological operations which are used for this process, by using these methods and operations we highlight the foreground and the objects in the foreground will be highlighted by using edge detection. The support vector machine in the preprocessed image to know where the bone has fractured and where the bone was not fractured*

Keywords : *Average filtering, Median filtering ,Sobel Edge detection, Canny Edge detection*

I. INTRODUCTION

Now a days the Digital processing is one of the useful and using technologies in the medical field because its microprocessor is very less in cost, [1]It helps us in to make changes in the image and taking as much information from the image by using 'n' number of algorithms. The results given by these algorithms are precise. There are many standards which is used to exchange ,transmit and store the biomedical image DICOM is one of those standards. The biomedical image can be captured by many instruments but for bone fraction because of less cost X-ray is used. In the year 1895 Willhelm Roengton invented X-ray, At present medical imaging is one of the best diagnostics services. Various medical applications are using this digital processing very often for the efficient results. In this paper we are mainly concentrated on the modification of the X-ray images of different type of femur bones which helps us to give the results precisely. The femur fracture is arranged in three segments. They are 1.Bone shank 2.Bone head or the subjacent end which is immediate to the patella.

The occurrence of the fracture happens when a high is put against a bone stronger than the bone. There are many fractures that are not identified by the doctor in the image (i.e) X-ray the Digital processing is used to identify the minor and small fractures. [5]The human being may not be accurate all the time but the digital processing will be accurate all the time. We have given an approach to detect the minor factures by using digital processing [3]There are many challenges for detecting the fracture like reduction of noise, classification and the feature extraction. The Gaussian noise can be improved by using algorithm called filtering algorithm The noisy image is use to determine from noise extent, the noisy extent changes the pixel of the focus with the average of the total sum of the adjacent pixels. [4]The salt and pepper noise is a major problem which will be faced during the stage of preprocessing. This problem can be solve by using k fill algorithm by counting the number of black or white pixels in a 3*3 window. [2]If the given images are damaged by the demonstration of noise as a sum of arbitrary process like Poisson and Gaussian, the scale criterion of the poisson and the mean and variance of Gaussian can be evaluated. Finally we should initialize the problem which was related to augmentation of the page and the reduction of speckle by means of technique called filtering. Feature extraction will be the next step, Canny Edge Detection(CED) and Sobel Edge Detection(SED) are the techniques used for the feature extraction. The SED which mainly focuses on 2 masks vertical and horizontal. Masks are normally used in 3*3 matrix. Especially,the smoothing effect of random noise of storage is caused by the 3*3 matrices in the MATLAB. It is differential of two columns and two rows because it looks thick and bright.We have done another research in detection of fracture in bone by calculating neck shaft angle of femur. The classification is the final step, Lim proposed that SVM is a binary classification technique and used for classification .If we use three classifiers it will give better accuracy than the single classifier. In order to capitalize this the author proposed support vector machine to identify the fracture in the bones.

There are many bones in the body but femur bone is one of the best bones in our body. In this paper we identify the place where the bone is damaged by using an algorithm through image processing .This process is mainly concentrated on identifying very minor fractures in the femur by using techniques of image processing. We will preprocess the image in order to show the interested domain . In this paper, foreground is taken as our interested domain in order to hide the background details. There are many mathematical and morphological operations which are used for this process,

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by using these methods and operations we highlight the foreground and the objects in the foreground will be highlighted by using edge detection.

The flowchart of our approach is shown in Fig. a. The paraphrasing techniques are given below

A. Preprocessing

There are many unwanted features of image in which noise present in the image will be removed and changing of contrast will be done in order to be useful for the next step (i.e) Feature extraction

The removal of noise can be done by using median filter and average filter. The average of the magnitude of pixel in around the equivalent input pixel is equal to value of output pixel for both filters. The magnitude of an output pixel will be given by the median filter which is equal to the neighborhood pixels median value, rather than the mean. The mean is very more subtle than the median to extreme magnitude and called as outliers. To eliminate the outliers median filtering is more effective

Logarithmic algorithm is used for image enhancement. To improve the contrast of the image arithmetic operation is used.

Here b is the factor, f is the image to be done enhancement. Here the b will be decided empirically for exact level of image. The preprocessed image will be done feature extraction. Here the foreground is highlighted by hiding the background details. Erosion and dilation are used in morphological operations

A. Morphological Operations

If we apply a constitute element to an input image it will produce the output image of similar size. Through these operations through the comparison equivalent pixel in the input image with its neighbors is established through the magnitude of each pixel in the output image. If we select the size of the neighborhood pixel, a morphological operation which is good to. The predominantly used morphological operations in the input image is created. erosion and dilation. In the process of dilation the value of the output image pixel is maximum among all the pixels. The minimum value will be assigned to the pixels beyond to the image border.

B. Detection of Image edge

[6][7] In this process we are detecting the bone edge in the input processing images. The background will be distinguished because the edge of the bones detected, to get exact edge of bone. This techniques that can be utilized are vigilant edge detection (CED), Gaussian edge detection (GED) and Sobel edge detection (SED). In the methodology that we are utilized in this paper has the best outcome acquired utilizing sobel edge detection (SED). The 2-D spatial angle estimation was performed by the Sobel administrator on a picture and grows the locales where spatial recurrence is high that relate to edges. At each point in input grayscale picture it is utilized to ascertain the rough total slope greatness. In fig b the administrator comprises of a couple of 3×3 convolution parts. [8] One piece is pivoted by 90 degrees and the other one is as appeared. the picture is applied over bit and each direction produces distinctive

estimation of the inclination segment (C_x and C_y). They join all together to ascertain the total estimation of the slope at each point and their direction. Here all the angles are evaluated anti-clockwise except the orientation means in the course of most extreme complexity from dark to white from left to directly on the picture. Much of the time, the non negative estimation of the pixel, is the client envision the two segments of the angle and are determined two segments are included a solitary go into the information picture utilizing the administrator called pseudo convolution as appeared in the fig c. The kernel magnitude is given by. This technique of detection gives a bone having sharp edge of processed image and this image will be arranged using classifiers.

C. Classification of image

[9] In this approach we will classify the X-ray image which is preprocessed into fractured and non fractured. We have taken 30 images of X-ray to classify the data. The support vector machine is used to classify the preprocessed image. Support vector machine is a one class classifier and it is also a binary classifier. It reduces the error and gives effective result because it performs both regression estimation and binary classification. [10] We use training data set for classification and testing data set for the accuracy of classification. In this approach we have used two dataset in order to classify the Fractured and un fractured part of the bone.

II. RESULTS



Fig. X-ray images dilation and erosion

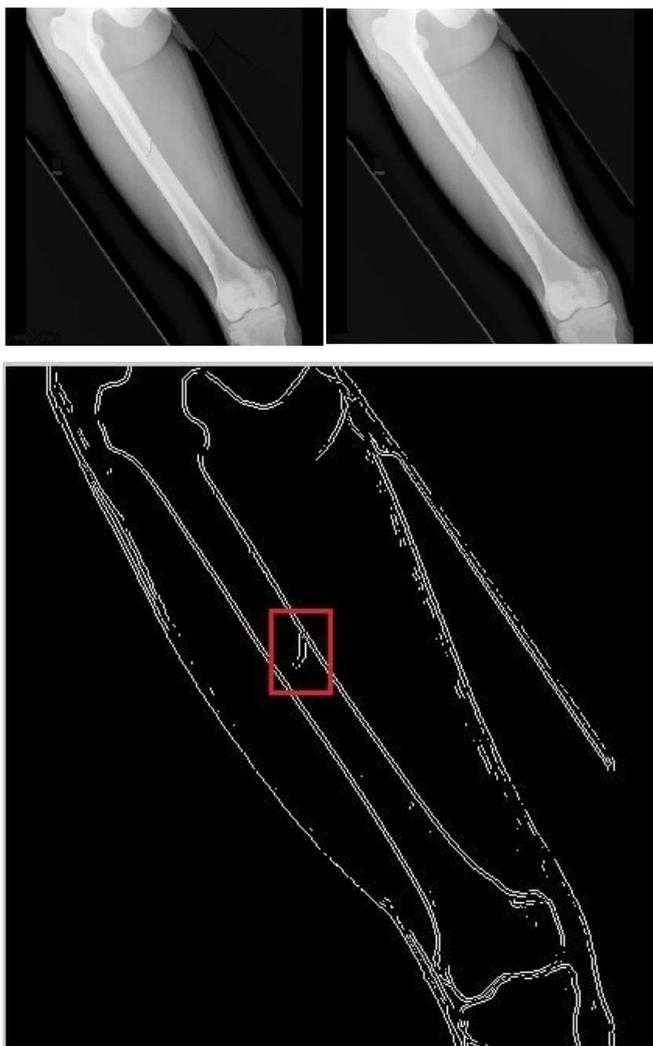


Fig. Proposed method for detection of fracture



Detection of Canny Edge which was used in X-ray image

RESULT AFTER PROCESSING IMAGES

No.	Training data set images	Testing data set images	Result	Result Percentage
1.	30	14	12	79.6 %
2.	30	5	9	80 %
3.	30	24	21	87.5

We have made an approach in order to get accurate and efficient result for detection of fracture in femur . Firstly , the RGB has X-ray image which is stored in it so conversion will be done to image pre- processing stage from grayscale prior. The radio graph is used to take the collection of 30 x-ray images and these images will be given to the training data set. We developed our approach modifying the version of sobel edge detection(SED).The noise in the X-ray image will be removed by using average and median filters in preprocessing. Then by using logarithmic operators we will improve the contrast of foreground like in the fig e. Erosion and dilation are the morphological operators are used in the fig f for processing the X-ray image and the SED is another approach to clear bone edge like in the fig f.. The other edge detection techniques are compared with our result like canny which is in fig. 8, the CED is able to detect edge of the bone accurately but not accurately to detect fracture edges. The result of image classification is in TABLE NO 2. The classification accuracy on average is 82.7%, which can be improved by using training data set, which will support vector machine to do classification more accurately

Our proposed approach has following advantages:

- 1.Noise removal will be removed by using average and median filters.
- 2.Enhanced foreground will come if we use logarithmic operator
- 3.The modified SED gives clear edge of the bone and radius bone structure.

III. CONCLUSION

Presently a days crack in femur bones is normal and expanding exceptionally quick everywhere throughout the world. In the area of medicinal science, it is fundamental and need to know the exact consequence of the bone break. In our methodology we have done characterization of both cracked and un broke bones. Noise removal will be removed by using average and median filters. Enhanced foreground will come if we use logarithmic operator. The modified SED gives clear edge of the bone and radius bone structure. The SED is a technique which gives accurate results. The SVM is used for process the input image .We have taken two data sets training data set and testing data set which will accuracy of 82.7% it will improve if we use efficient training data set

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