

Identification of Bone Fracture using Image Processing

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ABSTRACT

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In current period, broken bones is a typical problem in normal human happens because of high weight is applied on bone or basic mishap and furthermore because of cancer of bone and osteoporosis. So, the exact determination of bone crack is significant viewpoints in therapeutic arena. From this research X-beam/CT pictures are utilized for object crack analysis. The picture handling systems are helpful for some applications, for example, science, security, satellite symbolism, individual photograph, medicine, etc. The techniques of picture handling, for example, picture upgrade, picture division and highlight extraction are utilized for crack recognition system. This paper utilizes canny edge location strategy for segmentation. Canny strategy produces ideal data from the bone picture. The principle point of this examination is to recognize human lower leg bone crack from X-Ray images.

The tests we lead show that the proposed framework is precise and efficient.

Keywords : Bone Fracture, Noise Removal, Image Processing.

I. INTRODUCTION

Bone break is basic issue even in most created nations and the quantity of cracks is expanding rapidly. Bone break can happen because of a basic mishap or various sorts of ailments. In this way, speedy and accurate determination can be difficult to get achievement of any endorsed process [2]. Uncertain the live object specialists individual for such a basic posterity have cause insufferable mistakes. Thus, the possibility of programmed conclusion methodology has consistently been an engaging one. The principle objective of this paper is to identify the lower leg bone crack from X-Ray pictures utilizing MATLAB software. The lower leg bone is the second biggest bone of the body. It is comprised of two bones, the tibia and fibula. The fibula bone is littler and more slender than the tibia. In any case, the tibia break is

most usually happens because of it conveys a critical segment of the body weight. Among the four modalities (X-beam, CT, MRI, Ultrasound), X-beam finding is generally utilized for bone crack identification because of their minimal effort, fast and wide accessibility. Despite the fact that CT and MRI images gives emend quality tempers for live human organs compare to X-beam images, in the end quicker are less expensive, appreciate more extensive accessibility and are simpler to utilize barely any constraints. In addition, the degree of nature of X-beam images is sufficient combined the end goal of bone crack discovery [2]. Many various selective restorative presume devices are affable to finding various kinds of variety from the regulation, for ex., X-beam, CT scan image, MRI image, ultrasound and so on. X-beams and CT are most every now and again utilized in crack determination since produced result

fastest and minimum in demand route for the expert to consider the trends of bones and flexures. Specialists generally utilize x-beam pictures to decide if a crack is being, and the place of the fracture. The main storage is DICOM images. At current period clinics, therapeutic pictures are put away in the "standard DICOM design which incorporates content in form of the pictures. Any endeavor to recover and show these pictures must experience "PACS ("Picture Archives and Communication System") equipment.

II. Related Work

Representation of a few calculations were created for bone break location. By observing the area an expansive diagram of the writing is introduced, beginning from major information in "Vijaykumar "V" at al.[1] displayed a sifting calculation for the "Gaussian clamor expulsion. Prime assessing the measure of commotion from the uproarious picture, at that point supplant the inside "pixel by the "mean of the whole of the encompassing pixels dependent on a limit esteem. Contrasted with other separating calculations, for example, mean, "alpha-cut mean, "Wiener, K-implies, respective and "trilateral, this calculation provides "lower Mean Absolute Error" and higher Peak Signal-to-Noise Ratio in short respectively MAE and PSNR.

Samuel FebriantoKurniawan, et al. [3] introduced the Canny Edge Detection technique to help radiologists in identifying broke bones from X-beam pictures. They see that reproduction result demonstrates that the framework should be enhanced its presentation and diminish the reaction time. This work can be made end that the exhibition and exactness of the identification strategy influenced by the nature of the picture. Ms.SnehalDeshmukh, and other researcher, et al. [4] applied image form handling techniques to explore or extract crack in piece of bone. The main producer observed at the different edge identifiers

and delineate the preferences and impediments of "these indicators. It is that the "Canny technique produce equivalently great tremendous edge with the smooth nonstop pixel chunks and dainty crack. The "Sobel edge identification method can't create glossy and narrow edge with"contrasted with "Canny technique. Yet, different strategies pretty similar, "Sobel and "Canny techniques likewise touchy to the clamor pixels. At some point all the boisterous picture can't be separated splendidly. Tai PengTian, Ying Chen, Wynne Hsu, et al. [5]. Creators start with preprocessing systems, for example, twofold change and edge identification methods. Chased by k-implies division and GLCM strategy for include elicitation. "Hao, S.:at al [6] Expected a programmed division technique for in x-beam hand pictures. They initiates with identifying the cracks of the picture, at that point naturally deciding the area of intrigue lastly fragmenting the picture to remove the carpal bones as it were. "Bielecki,"A."at al [7] proposed a computerized calculation to register the bridge diameter in the x-beam pictures of the given object. As per the research, result is attempted to program arrangement of "bone crack utilizing picture handling techniques dependent on data picked up from X-beam/CT pictures with great exactness and first time attempted to every one of the sorts of bone break without focus on specific kind of crack. And furthermore pursued for "CT" pictures with few constraint.

III. METHODOLOGY

The CT/X-beam pictures are acquired from the medical clinic that consist of ordinary just as cracked bones pictures. According to primary step, implementing preprocessing methods, for ex., "RGB to grayscale convert and improve the results by using shifting calculation to expel the clamor "from the picture. As per direction it recognizes the in pictures "utilizing edge location techniques and sectioned the picture. In next division, it takes different form over

each picture into a lot of climax by utilizing few content fetching procedure[10]. At this direction we fabricate the order calculation dependent on separated “highlights. Finally, the presentation and precision of the planned framework are approached. The stream outline of planned framework for distinguishing the “bone break in X-beam/CT pictures is established as succeed.

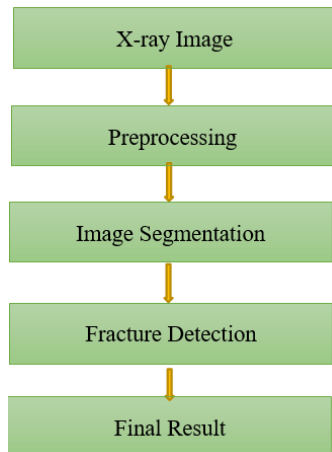
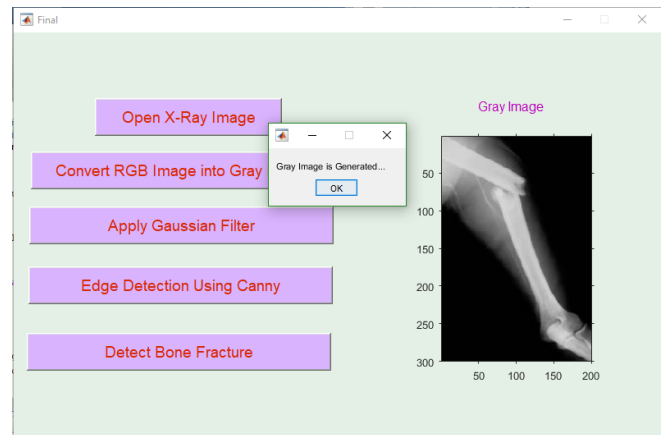


Fig 1 System Flow Diagram

3.1 PRE-PROCESSING

In PC supported finding of the therapeutic pictures, picture preparing devices for outcry evacuation, image division and making mark and assume final extraction a significant work in the accomplishment of this frameworks[11]. The CT/ X-beam pictures are gotten from the medical clinic that consist of ordinary just as cracked “bones pictures. In the initial stage, applying preprocessing procedures, for example, RGB to grayscale transformation and expel the clamor from the picture by utilizing the middle channel.



(b) Gray Image

3.2 SEGMENTATION

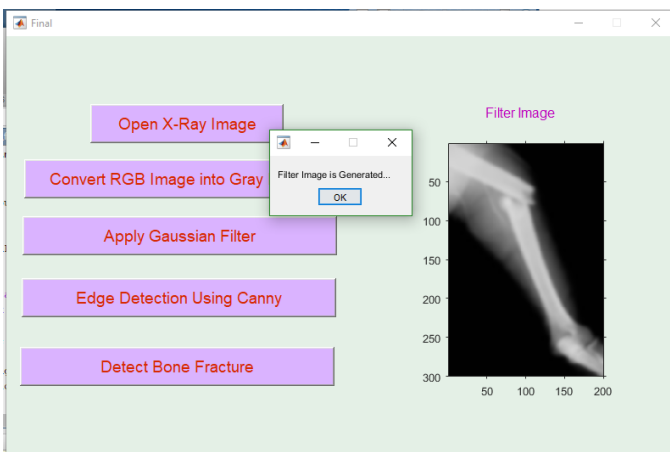
Image segmentation is the key advance to observation image also, separate collection of data from them. It is an action of separating an object into an assortment of connected with pixels set. The main fundamental desire backside division movements is to fetch maximum information in the area of intensity for an image which guide in interpretation of the item scene. There are mainly three principal technologies of an image partition which are area approach, limit approach what's more, crack advent. In research work, edge based division is mostly used which is progressively appropriate for similar like bone image. Edge discovery is one of the majorly widely used actions in function that needed determining objects' borders in an image[10]. It back on dissecting the improvement in the power in the image object. This paper depicts the correlation of the outcomes of various edge finders, for example, Sobel, prewitt, Robert and Watchful indicator. As indicated by the test results, Canny administrator is as opposed to other edge detectors. The edge limits of Sobel and prewitt edge finders are definitely not ceaseless and don't show the significant information since a large portion of them lost the significant structure. In Robert edge identifier, the pixel of the picture is uproarious and the edges are not smooth and thin. In this paper, Canny strategy is utilized to create great perspective on the bone structure.

3.3 NOISE REMOVAL

Clamor is demonstrated as added substance white Gaussian commotion (AWGN), where all the picture pixels go amiss f rom their unique qualities following the Gaussian bend. That is, for each picture pixel with power esteem O_{ij} ($1 \leq I \leq M$, $1 \leq j \leq N$ for a $M \times N$ picture), the relating pixel of the loud picture X_{ij} is given by,

Where, each clamor esteem G is drawn from a zero - mean Gaussian conveyance. Numerous Gaussian clamor evacuation systems require the information on the standard deviation as a proportion of the degree of debasement to set limits, separating window size and so forth. One powerful approach to accomplish this goal is to utilize Immerkaer's quick strategy [8] in which the loud picture X of size $M \times N$ is convolved with the mask defined as

$$MASK = \begin{bmatrix} 1 & -2 & 1 \\ -2 & 4 & -2 \\ 1 & -2 & 1 \end{bmatrix}$$



(C) Filtered Image

Contrast, Brightness and Darkness Noise. In case of all three noises, we will use histograms tool for resolve their presents. Normally, the histogram is used to perform the concentration range for the pictorial

object. In this case of histogram factors are concentrated in intensity level on the lower side, then that object of picture is considered as darkness noise, and when the histogram factors are biased toward the high side of the scale, then we can consider that image is brightness noise effected[11]. On next side, when highest contrast is introduced in image noise, the histogram factors spread area of a wide range of the intensity scale with very few vertical lines being much larger than the else, and when the low contrast noise case, the factors of a histogram will show as a lean range appear towards the half way of the intensity scale. Histogram equalizer having these many types of noise, which can handled by utilizing a process of histogram equalization. Fig. 4 Result of use of histogram fig and equalizer process.

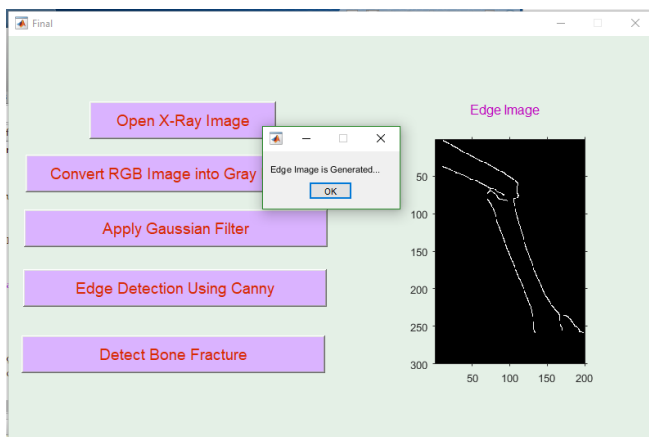
3.4 EDGE DETECTION

The last phase of this framework is crack identification it is performed by the methods. To begin with, the valuable highlights such as straight lines can be extricated from the picture. And afterward, these highlights are utilized to distinguish crack or non-break picture. In this work, the straight lines in the picture can be a great component to recognize break or non-crack. After improving and division the information picture, the procedure is extricated the highlights in parallel picture by utilizing Hough change. The Hough change is an element extraction strategy it is worried about the recognizable proof of straight lines, shapes, and bends in a given picture. It accepts a parallel picture as an input. In this work, it is utilized to distinguish the presence of a line in the picture[10].

$$= x \cos \theta + y \sin \theta$$

A line can be spoken to as Where, r (Distance) is the opposite line from root to the test line, θ (Angle) is between the opposite line and the horizontal hub and afterward x, y are constants. A line in the Picture space is mapped to a point in the parameter space .Likewise, every pixel of the picture space is changed

to a parameterized bend of the parameter space. Each changed point in the parameter space is considered as a possibility for being a line and amassed in the relating cell of an accumulator. Finally, a cell with a neighborhood greatest of scores is chosen, and its parameter facilitates are used to speak to a line portion in the picture space. The goals of the gatherer decides the accuracy with which lines can be recognized[11].



(D) Edged image

CANNY EDGE DETECTION

Watchful edge main handler is considered as extensive edge discovery data controller among the compliant administrators dependent on the test results. It eminent black out cracks all the more productively even in loud picture and Show Street include. In this work, Canny technique is fit to stamp every single existing edge in the picture and safe boisterous condition. Vigilant edge location is a multistage calculation to identify a wide scope of edges in pictures.

1. The first picture is smoothed actualizing with a Gaussian channel. The outcome is a picture with less haze. It is planned to acquire the genuine edges of the picture.
2. The edge is recognized with Sobel administrators for discovering even (Gx) and vertical (Gy). Sobel piece in x and y headings are given as

follow:

$$\begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix}$$

GxGy

Sobel Mask

3. From that point onward, the inclination size and bearing of the picture can be determined utilizing the accompanying conditions: $|G| = \sqrt{Gx^2 + Gy^2}$
4. At that point, the calculation tracks along these districts and smothers any pixel that isn't at most extreme called
5. Non-greatest concealment. It is done to safeguards all nearby maxima in the angle picture, erasing everything else this outcome in dainty edges.
6. The last advance is binarizing the picture pixels by applying two edge (lower and higher) values. The yield of non- maxima concealment despite everything contains the neighborhood maxima made by commotion. Subsequently, twofold thresholding is utilized for staying away from this issue. At the point when the edge pixels more prominent than the higher edge that are set apart as 1 and on the off chance that the edge pixel not exactly the lower edge, at that point it is set to 0. On the off chance that the edge pixel falls in the middle of the two limits and is contiguous with higher pixel, at that point it is set to 1, else it is set to 0. Show the outcome pictures of various edge finders[11].

IV. EXPERIMENT AND RESULT

The consequences of "preprocessing, "edge location is appeared in determines I/P x-beam picture of broke bone of femur. explains the crack identified picture and determines handled yield picture. The "GLCM"

highlights are Computing for “the fragmented picture and dependent on “these highlights discover “whether break endure or not. The propound strategy has “been tried on set of “X-beam/CT” pictures comprising of cracked and typical pictures. The main information comprises of completely forty pictures, twenty cracked pictures and 20 “non-broke pictures.

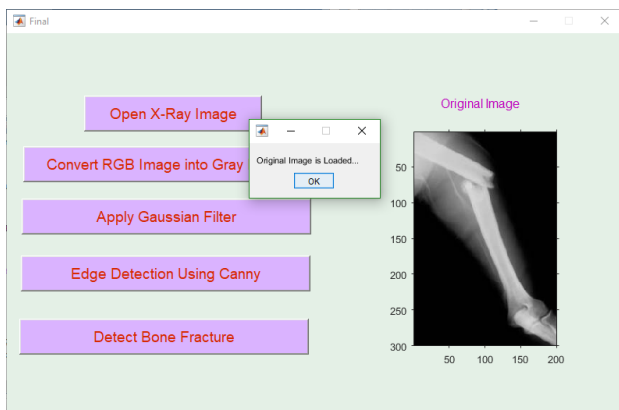
In next the element fetching process the pictures are ordered into typical and cracked pictures dependent on “GLCM highlights. The execution of the propound framework is assessed as far as

The performance of the proposed system is evaluated in terms of accuracy, precision, sensitivity and specificity.

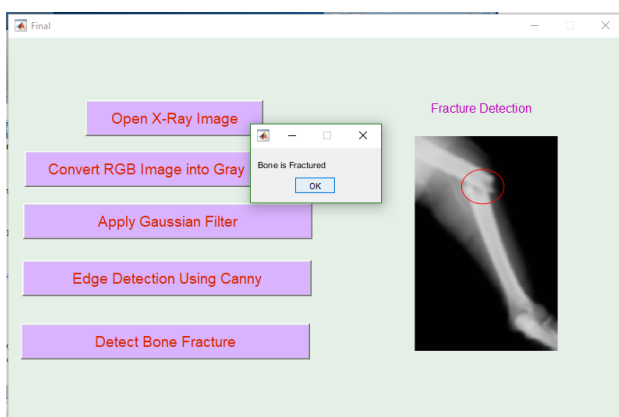
Accuracy= $(TP+TN)/(TP+TN+FN+FP)$.

Precision= $TP/(TP+FP)$ Sensitivity= $TP/(TP+FN)$

Specificity= $TN/(TN+FP)$



a. Input Image



b. Identification of Edge

In case of DT (Decision Tree) classifier and NN (Neural network) having accuracy is 53.25%, 75% and 50%.

As per statics of individual classifier is not one of great. To overcome, we need to merge or make combination to increase improvement that can give result up to 85% accuracy, 76.9% sensitivity, 70% specificity.

V. CONCLUSION

The Digital investigation procedures for “the identification of “bone break utilizing “CT/X-beam pictures has “been displayed in current work. It begins from the “preprocessing to evacuate the clamor what's more, edge identified by utilizing sobel “edge indicator. “After the division the territory of the break is determined. This technique has “been tried on a lot of pictures and outcomes have been assessed dependent on “GLCM highlights. Investigation indicated that outcomes got are acceptable and exactness of the technique was mentioned “85%.The constraint of mentioned strategy is in “CT and a few instances of “X-beam pictures hard to discover the region of crack, In subsequent work is, it is completely actualized to CT pictures and furthermore order the sort of crack is happens.

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