Bone Fracture Detection Using Image Processing

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1. Abstract:

As cases of bone-related fractures and Bone-related diseases like Arthritis are increasing at a rapid rate, the identification problem has become more critical now. Unfortunately, we are still using old X-ray techniques and technologies for the identification of bone fractures, which makes it tedious, and time-consuming, and sometimes not able to recognize correctly. So identifying these symptoms correctly and quickly is of utmost priority. We can solve it using image processing techniques, which are more precise and less expensive, so more affordable to common people.

2. Introduction:

In every country, bone fractures are very common and are increasing day by day. Bone fractures can occur due to accidents and some bone disease. Quick and accurate identification is very crucial and affects its prescribed treatment. Depending on experts for some critical matter have to cause intolerance errors. So saving time and for correct identification, we developed an automatic bone fracture detection using Image Processing Techniques and MATLAB software. Which detect bone fractures from X-ray images.

The motivations of this system are:

- Saving time for patients to lower the workload of doctors by screening out the easy case.
- To cut back human errors as a result of doctors in hospitals manually examine an outsized variety of X-ray pictures for fracture.

3. Methods:

A. Preprocessing and Denoising.

First, the X-ray image is converted into GrayScale format, then the noise is removed from the image by using Gaussian filter, finally, the resultant image is sharpened by using the Laplacian Filter. This increases the performance of the subsequent stages.

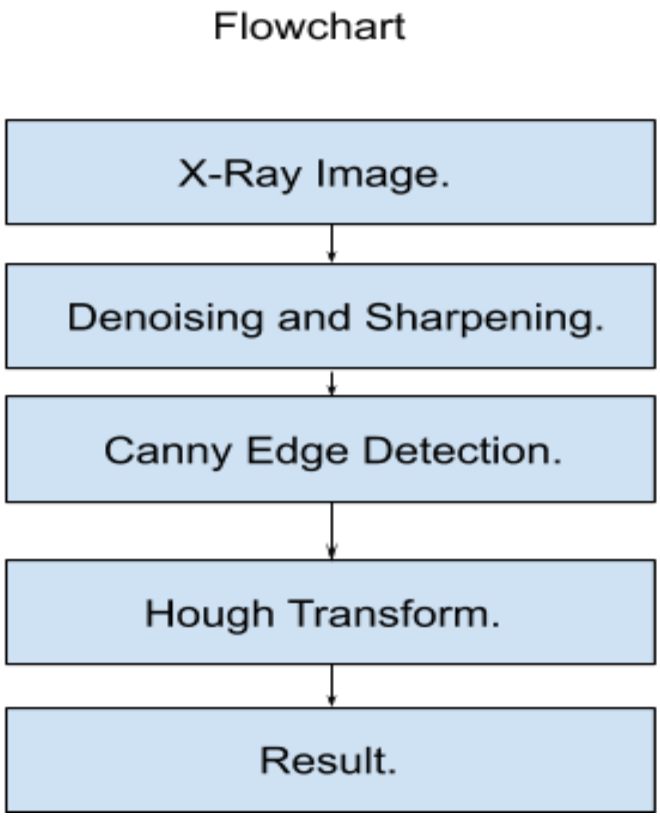
B. Edge detection using Canny.

The next step is to apply the edge detection algorithms to find the edges of the bones, all the edge detection algorithms are based on analysing the intensity change between neighbouring pixels, there are different algorithms for edge detection like Sobel,

Canny, Laplacian but the best results were obtained using Canny edge detection algorithms.

C. Hough Transform.

Hough transform is based on the fact that every line can be written in the form $r = x\cos\theta + y\sin\theta$ where 'r' is the perpendicular from the origin and θ is the angle measured from the positive x-axis, so here we varies r,θ and plot the graph.In the last we choose the pixels having the maximum value and hence we obtain r and θ values.



4. OBSERVATION:

We observed that we are able to detect the fracture by checking the peaks of the Hough Transform, i.e., when two or more peaks occur, we say that there is a high possibility of having a fracture. We were able to accomplish the core aim of the paper with some constraints; furthermore, some of the notable constraints that we faced while implementing are also described in the other section of this document.

5. RESULTS :

The main result of the paper was to detect the fractures in the X-ray using image processing techniques and algorithms. The process included Denoising and sharpening of the image, which is followed by Canny edge detection and hough transform to finally detect the fracture. We were able to get the desired result with significant accuracy along with some constraints.

6. CONSTRAINTS:

The main constraint is the quality of images, for the bad quality images it might not give accurate results. As in this project we mainly focused on longer bone and due to technology constraints we can get accurate results on smaller bones. Also in some cases where the fracture is very minor, it goes unnoticed.

7. CONCLUSION :

This project report introduced the Digital Image Processing methods using X-ray images to identify the bone fracture. The fully automatic detection of bone fractures. As the observation of test outcome, the system has been done successfully to recognize the bone fractures. The better quality images give more accurate results. In the future work, we can focus on various works like detection of fractures on small bones, lower leg splits, etc may be considered.

8. Reference:

https://www.researchgate.net/publication/342163523_Bone_fracture_detection_using_Image_Processing

http://www.ijstr.org/final-print/june2016/Detecting-Leg-Bone-Fracture-In-X-ray-Images.pdf