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Bone Fracture Detection Using Random Forest Classifier

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A B S T R A C T

Here, we suggested automated fracture detection methods and approaches. Manually reviewing X-ray images takes time and is prone to mistakes. We utilized numerous pre-processing procedures to eliminate noise and blur from the image because X-ray images are more likely to have noise. As a result, the technology can detect fractures more precisely. Depending on the type of fracture, the system can detect it. The image is cleaned up of noise and made crisper so that the system can spot fractures with ease. To track bone, we used image processing techniques. The mechanism takes out any undesirable and smaller things. Finally, the system identifies fracture depending on the linked component. Bounding box around the fracture is displayed by the system. This system uses pre-processing techniques for images. Although CT and MRI images provide higher quality images of body organs than X-rays, the latter is faster, cheaper, more widely available and easier to use with some limitations. In addition, the quality level of X-ray images is sufficient to detect fractures. The motivations behind this system are: To save the time of patients to reduce the workload of doctors through a simple review of cases. To reduce the human errors caused by doctors in hospitals who manually examine a large variety of X-ray images to detect fractures**.** The proposed system is able to detect a misplaced bone with an 80% success rate and a large fracture with an accuracy of 60-70% and a small fracture with an accuracy of 50-60%.

Keywords: Image Processing, Biomedical Application, Fracture Identification, Canny methodology

1. Introduction

Today, medical imaging can be a branch of science that is reaching great heights in the healthcare industry thanks to technological advances and advancements in computer code. It plays an important role in defining diseases and treating patients, and helps doctors make choices about the type of treatment. Due to the many health problems in the fashionable society, it has become necessary to treat and detect fractures in many different age groups. It is also a typical deficiency in many already developed countries, where fractional varieties also increase cutting. Bone fractures can occur due to a minor intervention or due to some disease. Therefore, quick and correct naming is important when prescribing each treatment. Next, radiologists and doctors take X-rays to determine if a fracture has occurred and the exact type of fracture. Therefore, quick and correct naming is important when prescribing each treatment. Next, radiologists and doctors take X-rays to determine if a fracture has occurred and the exact type of fracture. The feature extraction process used a method called the Hough transform to detect lines. Model Karjuna Swamy M.S. focused on the development of a related cost-effective imaging system for rapid and accurate classification of fractures supported by information from photographs/CT images. Various image processing techniques such as extraction modes, segmentation, preprocessing and edge detection are used in this study. Such techniques are classified as broken or intact bone when comparing the accuracy of different programming modes. They describe the accuracy of the fracture detection system to one eighth of its effectiveness and limitations. They designed the system in four steps, namely preprocessing, bone detection, segmentation and feature extraction. Three different classifications such as Neural Propagation Network, Naive Bayesian support and vector machine classification were used in fusion classification. They cited results showing a huge improvement in both classification rate and detection rate.

2. Related work

AI is being applied in radiology for many different purposes, including as segmentation, quantification, classification, and automated illness identification. According to research, medical professionals cannot detect diseases from medical images more correctly than deep learning (DL), a particular subset of artificial intelligence (AI). The common focus of DL in medical imaging research is on computerised tomography (CT), X-ray, and bone magnetic resonance imaging (Bone MRI). Since the huge amount of data is burdensome for doctors or other medical professionals, we need modern and compatible DL methods to exploit the specific information of bone imaging. In Existing system KNeighborsRegressor algorithm is used.

3. Proposed System

The hospital's database of CT or X-ray scans, which includes pictures of both broken and healthy bones, was utilized. The first phase involved using pre-processing techniques, such as converting RGB images to grayscale, and then enhancing them by using filtering algorithms to get rid of image noise.

After that, further segment it by utilising edge detection to find its edges in the image. Following segmentation, each image is transformed into a set of functions using a feature extraction method. Accordingly, a classification algorithm was created using the characteristics that were extracted. The method's accuracy was then verified. In proposed system RandomForestClassifier and Decision tree algorithm is used. It performs better in classification and regression tasks. Random Forest provides accurate predictions that are easy to understand. A random forest generates accurate forecasts that are simple to comprehend. Large datasets can be handled effectively. In comparison to the decision tree algorithm, the random forest algorithm offers a higher level of accuracy in outcome prediction. It creates decision trees from several samples, using their average in the case of regression and majority vote for classification. The proposed system is able to detect a misplaced bone with an 80% success rate and a large fracture with an accuracy of 60-70% and a small fracture with an accuracy of 50-60%.

- Effective application of image processing
- Fracture detection using automation.
- This system will make orthopedics easier.
- 60 to 70 accuracy level.

4. Methodology

4.1 Preprocessing

It is a method for altering any image in a digital format and carrying out any procedures to acquire an improved version of the image to some degree. This type of signal transmission uses an image as an input, like a photograph, and frequently outputs a distinctive image connected to the input. The stages of image preprocessing are image reading, image resizing, noise removal (Denoise), segmentation, morphology (edge smoothing)..It is often used to increase a model's accuracy, as well as reduce its complexity. There are several techniques used to pre-process image data. Examples: resize an image, convert images to grayscale and add an image

4.2 Edge Detection

The edges area unit placed within the image with a robust distinction of intensity. Since edges typically appear where images depict item boundaries, edge detection is widely used to segment images when it's necessary to divide the image into regions that represent various things. Representing a picture by its edges has the additional benefit of considerably reducing the number of knowledge whereas keeping most of the data regarding the image. Since high frequencies make up the majority of the perimeters, find the sides by applying a high pass frequency filter to the picture while rotating it around a suitable core in the abstraction domain. By adjusting the intensity of a picture, edge detection works to identify edges by their position and existence. In image processing, many methods are employed to find edges. It is capable of detecting variations in grey levels, but when it detects noise, it responds right away. The job of edge detection in image processing is crucial. The primary tool in pattern recognition, picture segmentation, and scene analysis is edge detection. It is a particular kind of filter used to extract the edge points in a picture. When an image's edge contours across its brightness, the image undergoes abrupt changes. Edges are understood as a single class of singularities in image processing

4.3 Segmentation

The fundamental technique for separating images and removing data from them is picture division. It is the process of dividing a picture up into a group of related arrangements of pixels. The primary motivation behind the division method is to acquire additional information in the area of energy for an image that aids in scene clarification. The region approach, the limit approach, and the edge approach are the three primary approaches to picture the division. In this work, the dynamically appropriate edge-based division for the bone picture is used. One of the most frequently used assignments in applications that require determining the breaking points of objects in a picture is edge acknowledgment. Examining the image's power changes is required for this. Often based on the properties of the image's pixels, image segmentation is a widely used method in digital image processing and analysis to divide an image into multiple parts or regions.

Because it extracts the objects of interest for later processing, such as description or recognition, this stage of the image recognition system is crucial. It is common practice to divide up a picture into segments for pixel categorization. In this paper, an extraordinary perspective on the structure of the bones is presented using the Canny methodology.

4.4 Feature Extraction

The most informative and distributive equality angle can discover this algorithm. The classification step of information analysis involves learning a collection of data and categorizing it into different groups. Additionally, a wide variety of theoretical decision-making methods for image identification are included. For data classification in this project, a random forest classifier was used. The dimensionality reduction method, which divides and condenses a starting set of raw data into smaller, easier-to-manage groupings, includes feature extraction. As a result, processing will be simpler. The most important characteristic of these massive data sets is the large number of distinct variables they include. Processing these variables takes a lot of computational

power. In order to efficiently reduce the amount of data, feature extraction helps to extract the best feature from such large data sets by choosing and combining variables into features. These features properly and distinctively describe the actual data set while being straightforward to utilise. The three different methods of feature extraction are diagonal, vertical, and horizontal.

4.5 Results

Image processing is an approach which converts images in digitally enable formats and applying many operations on it for getting an enhanced image or for extracting required featured out of it. Edge detection in image processing is a tool that detects areas of images with sudden changes in image. It is particularly helpful for all kinds of imaging tasks in artificial vision. It is used to reduce the amount of data in an image and to preserve only those that are important for further processing. Finally, the system identifies fracture depending on the linked component. System displays bounding box around the fracture.

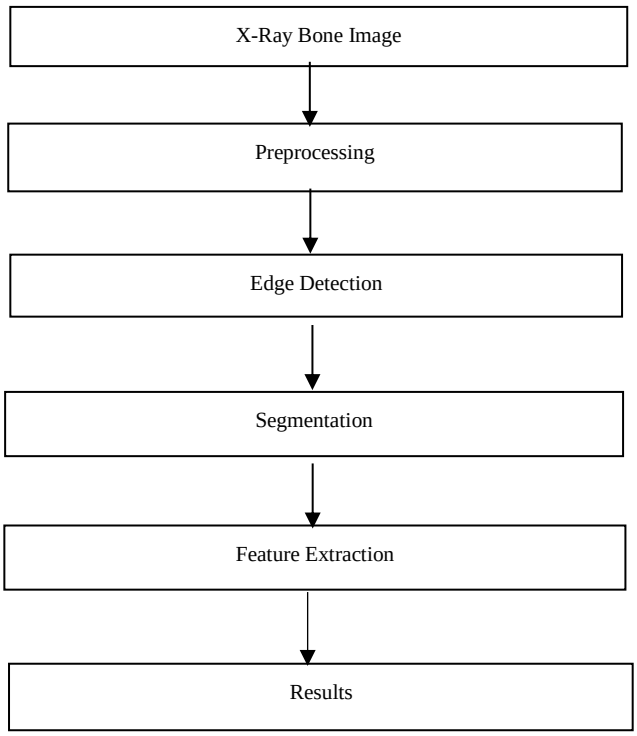

Fig. 1. Flow diagram

Fig. 2. (a) Grayscale Image

Fig. 3. (b) Black and White Image

Fig. 4. (c) Bounding Box

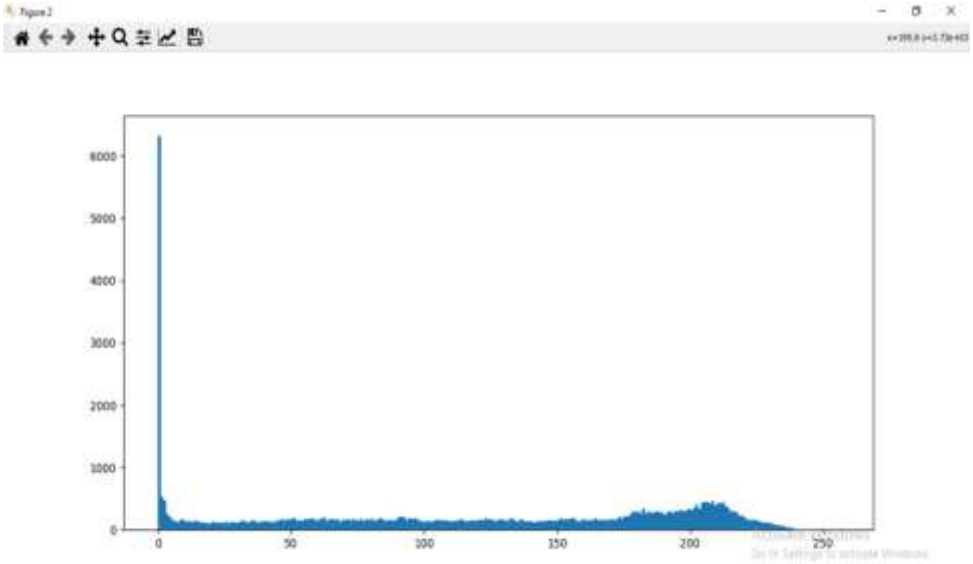

Fig. 5. (d) Accuracy Graph

5. Result and Discussion

This paper presents a computer-based analytical approach for detecting bone fractures using X-ray/CT images, beginning with preprocessing to eliminate noise and edges found by a edge detector. The area of the fracture is estimated after segmentation. The procedure was tried on a collection of photos, and the results were reviewed. Each application has advantages and disadvantages. Most of the requirements have been met by the project. Because the coding is mostly structured or modular, it is easy to add more requirements and make improvements. Improvements can be added by modifying or adding new modules. The application can be improved further, allowing us to develop accuracy in a more useful and algorithmic manner than currently available.

6. Conclusion

X-ray imaging techniques can be used for a lot of things, like detecting metals or fractures. Powerful and broad examination was at that point been directed and there is likewise more than adequate space for additional examinations around here of the clinical field. In this examination article, many imaging methods were explored upon like, edge identification, picture division, PC helped conclusion, and so on. In conclusion, the applicability of image processing techniques is explained by these parameters. The primary objective of this work is to develop a faster, more accurate, and more efficient method for identifying body-wide bone fractures. By additional working on this work, the procedure can be made more proficient and useful.

REFERENCES

[1] Abhishek Upadhyay, Akanksha Singh Rajput, Ajay Pal Singh, "Automatic detection of fractures within the bones of the thighbone by image processing", 2009.

[2] Donnelley M., Knowles G., "Computer-aided long bone fracture detection", Embedded Systems Laboratory, School of Informatics and Engineering, Flinders University, GPO Box 2100, Adelaide SA 5001, Australia, 2005.

[3] Eksi Z., Çakıroğlu M. "Performance evaluation of the popular segmentation algorithms for bone fracture detection", II. World Conference on Information Technology, Antalya, Türkiye, 23-27 Kasım 2011.

[4] F. Meyer, S. Beucher, Morphological segmentation, journal of visual communication and image representation 21-46.

[5] Harish Kumar J.R., Chaturverdi A., "Edge Detection of Femur Bone - A Comparative Study", MIT, Manipal, NITK, Surathkal, Karnataka, India, 2010. International Conference on Mathematical Sciences (ICMS 2020) Journal of Physics: Conference Series 1770 (2021) 012008 IOP Publishing doi:10.1088/1742-6596/1770/1/012008

[6] J. Sutha Merlin Viji Amutha Mary," An Approach for Quick & Efficient Detection of Duplicate Data –Survey", IJAER Vol 11 , No 5 2016.(Scopus)

[7] Mallikarjunaswamy MS, and Rajesh Raman, "Bone fracture detection exploitation image process methods", International Journal of Computer Application, National Conference on Power & Industrial Automation (NCPSIA, August 2015

[8] N. Umadevi, Dr. S.N Geethalakshmi," Multiple organization for detection fractures in photography pictures of bones "2012, pages 1-8

[9] S. K. Mahendran and S. Santhosh adult male, "Ensemble Systems for Automatic Fracture Detection", International Journal of Engineering and Technology (JACSIT), vol. 4, February 2012, p.7-10

[10] S. Myint, A. S. Khaing and H. M. Tun, "Detection of bone fracture within the leg X-ray images", International Journal of Scientific & analysis, vol.5, June 2016,

[11] Tie-Rui S., Wei Z., "The Research of X Ray Bone Fracture Image Enhancement Algorithms", College of Electronic and Information Engineering, Hebei University, China 2010.

[12] V. D. Vegi and S. L. Patibandla, S. S Kavikondala, "Computerized X-ray fracture detection system", International Journal of management Theories and Applications, vol. 9, November2016, p.615-621.

[13] Vijayakumar R., Giresh G., "Quantitative Alaysis and Fracture Detection of Pelvic Bone X-Ray Images", Mahendra Engineering College, Namakkal, Tamilnadu, 2013.

[14] Yuancheng ― MIKEl Luo and Ramani Duraiswami, Canny Edge Detection on NVIDIA CUDA, Computer Science & UMIACS, University of Maryland, College Park.

[15] Zolqernine, Habibollah Haron, Mohammed Rafiq Abdul Kadir, Comparison of Canny and Sobel Edge Detection in MRI Images, Universiti Teknologi Malaysia.

[16] Ding Feng (HT040297J), Dr. Leow Wee Kheng (Associate Professor), Segmentation of Bone Structures in X-ray Images, School of Computing, National University of Singapore.

[17] Kabiraj, A.; Meena, T.; Reddy, B.; Roy, S. Detection and Classification of Lung Disease Using Deep Learning Architecture from X-ray Images. In Proceedings of the 17th International Symposium on Visual Computing, San Diego, CA, USA, 3–5 October 2022; Springer: Cham, Switzerland, 2022.

[18] Jha, S.; Topol, E.J. Adapting to artificial intelligence: Radiologists and pathologists as information specialists. JAMA 2016, 316, 2353–2354. [CrossRef] [PubMed]

[19] Ko, S.; Pareek, A.; Ro, D.H.; Lu, Y.; Camp, C.L.; Martin, R.K.; Krych, A.J. Artificial intelligence in orthopedics: Three strategies for deep learning with orthopedic specific imaging. Knee Surg. Sport. Traumatol. Arthrosc. 2022, 30, 758–761. [CrossRef] [PubMed]

[20] Debojyoti, P.; Reddy, P.B.; Roy, S. Attention UW-Net: A fully connected model for automatic segmentation and annotation of chest X-ray. Comput. Biol. Med. 2022, 150, 106083.