Detection Of Bone Fracture Using Machine Learning

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Abstract— **Applied excessive pressure to the bone, a simple accident, osteoporosis, and bone cancer are all causes of bone fractures, which are a widespread problem in humans. The usage of image processing techniques is extensive, including in fields including biology, security, satellite images, personal photography, and medicine. The fracture detection system uses image processing techniques such image enhancement, image segmentation, and feature extraction. For segmentation in this project, we employ the Canny edge detection approach. The bone image yields perfect information using the Canny approach. This project's primary goal is to use X-Ray pictures to identify human lower leg bone fractures. The suggested system consists of three steps: segmentation, fracture detection, and preprocessing. When a feature is extracted, this . The results from various simulation show that the proposed system is very accurate and efficient.**

I. INTRODUCTION

Using computer algorithms to do image processing on digital images is known as digital image processing. N rows and M columns make up the 2D continuous image. A pixel is the point at which a row and a column intersect. In addition, the image may depend on other factors such as depth, color, and time. An image that has been provided as a transparency, slide, photograph, or X-ray is first digitalized and stored in computer memory as a matrix of binary numbers. A high-definition television monitor can then be used to process and/or display this digitalized image. To provide a visually continuous display, the image is kept in a rapid-access buffer memory for display, which refreshes the monitor at a rate of 25 frames per second.

A. Supervised Algorithm

Machine learning includes convolutional neural networks (CNN or convnet), which are a subset of it. It is a subset of the several artificial neural network models that are employed for diverse purposes and data sets. A CNN is a particular type of network design for deep learning algorithms that is utilized for tasks like image recognition and pixel data processing. Although there are different kinds of neural networks in deep learning, CNNs are the preferred network architecture for identifying and recognizing objects. As a result, they are perfect for computer vision (CV) tasks and for applications where precise object detection is essential, like facial and self-driving car systems.

A deep learning system known as a support vector machine (SVM) uses supervised learning to classify or predict the behavior of groupings of data. Supervised learning systems in AI and machine learning give input and intended output data that are labelled for classification.

B. Unsupervised Algorithm

The Canny method is the most effective edge-detection technique that edge offers. The Canny approach uses two separate thresholds (to detect strong and weak edges) and only includes weak edges in the output if they are connected to strong edges, which distinguishes it from other edge-detection methods .

II. LITERATURE REVIEW

1) Bone Fracture Detection and Classification using Deep Learning Approach 2020:
The bone is a crucial component of the human body. Bone gives the body its ability to move. Bone fractures are a common occurrence in the human body. The doctors can see the shattered bone on the X-ray image. The manual fracture diagnosis approach is labor-intensive and prone to error. In order to identify the shattered bone, an automated system must be developed. The Deep Neural Network (DNN) is commonly used in the modelling of power electronic equipment. In the current study, a deep neural network model was developed to classify fractured and healthy bone. The small amount of data causes the deep learning model to be overfit. To increase the size of the data set, data.

2) Bone fracture detection using Convolutional neural networks 2022:
The most significant and frequent problems that many people experience are bone fractures. These fractures frequently happen in accidents. Doctors use x-rays to forecast these fractures. Manual interpretation of the x-rays can sometimes make it difficult to determine whether it has been fractured. These x-rays provide a clear picture of the damage, but the primary problem is that some doctors fail to spot the minor fractures that could later cause significant harm to the patient. Model that clearly assesses and categorizes images of fractures of the hand, leg, chest, fingers, and wrist. There are numerous alternative methods for spotting these fractures, and this research was shaped by various AI tools that used machine learning and deep learning methods.

III. METHODS OF FRACTURE DETECTION

A. Preprocessing

These stages consist of the procedures that enhance the features of an input X-ray image so that he result image improves the performance of the subsequent stages of the proposed system.

B. Edge Detection

It is based on examining how the image's intensity varies. However, noise, the density of edges in the picture, objects with similar intensities, and lighting conditions all have a significant impact on how well edges are detected. There are various edge detection techniques, including Canny, Laplacian, and Sobel. In our tests, a modified version of the Canny edge detection technique that boosts contrast via a histogram equalization step produced the greatest results.

C. Segmentation

Image segmentation is the first stage in image analysis and data extraction. It is the technique of breaking up an image into various connected pixel groupings. The main reason for interest in the photograph is that it helps with the annotation of a scene in an item. The three fundamental approaches for segmenting images are the region approach, boundary approach, and edge approach.

D. Image classifier

An issue in supervised learning is image classification: To train a model to recognize a set of target classes (things to identify in images), specify the target classes and use labelled example photos.

E. Fracture detection

To detect the location of the fracture in the image, the system use shape detection with image matching process expressed when the line has an end, and give the result in percentage if and only if image will match with fractured image i. e. input x-ray image.

IV. CONCULSION

This study demonstrated a bone fracture detection image processing technology. Fully automatic fracture identification in the leg bone is a significant but challenging issue. The system was developed to find the bone fracture, per the test findings. One can draw the conclusion that the image quality has an impact on how well the detecting method performs. The outcome system improved as the image quality increased. Future work may investigate concentrating on additional tasks, such as identifying smaller bones or ankle fractures, etc.

APPENDIX

The Canny Edge Detection machine learning algorithm (SVM, CNN) was used in this investigation.

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