A Survey on Automated Hand Fracture Detector

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Abstract – *In this world of digitalization computer aided diagnosis (CAD) system has become popular, because it improves the interpretation of the medical images compared to the primary diagnosis of the diseases for the doctors and also the medical experts. This kind of system depends on medical images to provide instantaneous diagnosis supported some discriminative features extracted from the pictures. Therefore, accurate diagnosis of bone fracture is a very important aspect in medical field. In this work x-ray images are used for bone fracture analysis. Developing a picture processing based efficient system for a fast and accurate classification of bone fractures supported the data from the x- ray images are going to be a savior. Images undergo processing techniques like preprocessing, edge detection and have extraction methods. The processed images are further classified into fractured and non-fractured bone.*

Key Words: **Canny Edge Detection, Histogram of Oriented Gradients, Support Vector Machine, k-Nearest Neighbours, Multi-Layer Perceptron.**

1. INTRODUCTION

The bone fracture could also be standard problem in people in generally which might occur because of high pressure when applied on bone, simple accident, because of osteoporosis or bone cancer. Bones are the solid organs within the shape that protects vital organs like brain, heart, lungs etc. A hand fracture is a break in one of the bones in the hand. This includes the little bones of the fingers (phalanges) and the long bones within the palm (metacarpals). During this project, we'll consider the matter of detecting fractures in hand bones with the assistance of X-ray images, as they're the foremost common ways to detect problems in bones similarly as other organs in body. X-rays provides images of dense structures like bone. X-Ray image are faster, cheaper, high availability and easier to use. Hence our aim is to propose an efficient system for a fast and accurate diagnosis of hand bone fractures supported the x-ray images.

1.1 Existing System

Detecting bone fractures was done using six steps namely pre-processing, noise removal, edge detection, segmentation, feature extraction and classification for x-ray image. In the preprocessing stage, the noise is removed using median filters by pre-processing techniques like RGB to grayscale conversion. One of the common noises found is salt and pepper which can be removed by applying mathematical transformation on the images.

1.2 Proposed System

We start by taking a collection of labelled x-ray hand images that contain normal additionally as fractured hands. The primary step is edge detection. The next is pre- processing of images and removal of noise are implicitly done by the canny edge detector. After smoothing the image and detecting the sides of the hand bone, proceeds with extracting useful and discriminating features of the hand bone image. Feature extraction is that the main step in various image processing applications. The final step is to make the classification algorithms supported the extracted features. Finally, in the testing phase, the performance and accuracy of the proposed system are evaluated. We aim to create a system that detects an x-ray image of the hand to be fractured or un-fractured.

2. DESIGN AND DEVELOPMENT

2.1 Objectives

The objective of this project is to solve the real life problem of detecting hand bone fractures. The main aim of this work is to propose an efficient system for a quick and accurate diagnosis of hand bone fractures based on the information gained from the x-ray images. To propose an efficient system which will automatically detect hand bone fractures using x- ray images carried out in three

steps namely, image pre- processing, edge detection and feature extraction. The software developed here will equip the orthopedic surgeons with the tool which is far much better than X-rays and MRI scans in analyzing fractures than the traditional machines and the methods. It can help them to detect even multiple fractures with an ease. It works on the methods and algorithms developed to perform various operations on images. This makes life easy for the surgeons. This system can assist the doctor by performing the first examination to screen out the easier cases, leaving a small number of difficult cases. This gives second confirmation to the doctors.

2.2 Tools and Technology

Python for designing the user interface and implementing algorithms.

UI Front End: The front end allows users to browse through the images and select an image. The selected image name will be displayed on the UI.

UI Back End: This is responsible for managing the data.

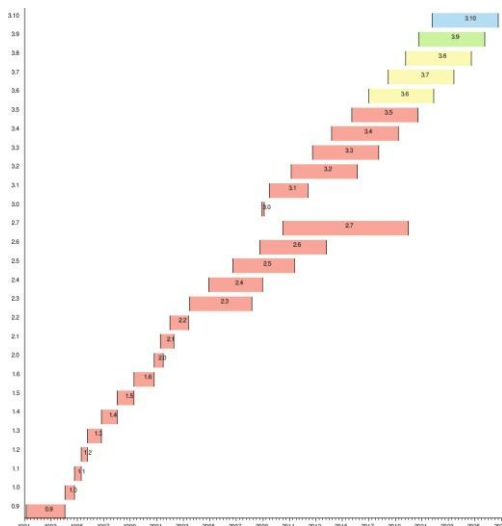Selected images are taken as input and the result is computed.

Chart -1: Graph representing different versions of Python Release

2.3 Methodology

Images are taken as input by Canny edge detector. Canny edge detection algorithm does both noise removal and edge detection. Canny edge detector detects edges with noise suppressed and smoothens the image with a Gaussian filter to reduce noise and unwanted details and textures. After smoothing the image and detecting the edges of the hand bone, proceed with extracting useful and discriminating features of the hand bone image. In various image processing applications, feature extraction is the main step. A combination of different sets of

features are used such as features from Histogram of Oriented Gradient (Hog).

After feature extraction, we proceed with the last step classification. Classification is to study a set of data and categorize them into a number of categories. Each category has its own characteristics. The data that belongs to the category have the same properties of this category. KNN, SVM and MLP algorithms can be used to classify dataset.
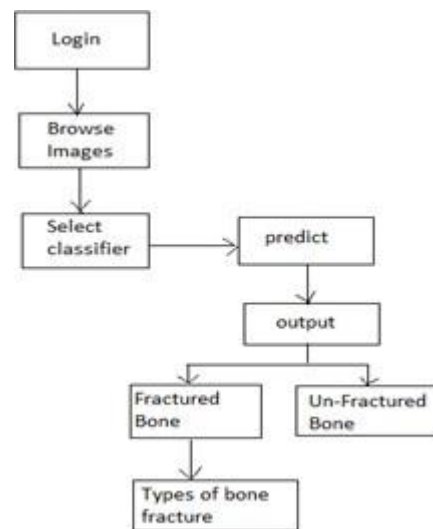

Fig -1: System overview diagram.

2.4 Contribution

It reduces human errors. It is well known that the performance of human experts can drop below acceptable levels if they are distracted, stressed, overworked, emotionally unbalanced, etc. It reduces the time or effort associated with training and hiring the employees. It helps doctors, patients and researchers who look for certain cases for research purpose

3. CONCLUSIONS

This survey addresses the problem of hand bone fracture detection and classification using x-ray images. If the bones of the hand are fractured, then the system notifies which type of bone got fractured and if not then the system notifies it as unfractured.

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