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A Non-invasive Diagnosis of Early Stage Diseases through human nail using Neural Networks

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Abstract

The human hand nail is analysed to detect numerous disorders at an early stage. In the healthcare area, the investigation of a person's hand nail colour assists in illness diagnosis. In such a setting, the proposed system assists in the prognosis of disease, where the system's input is a photograph of a human nail. The human nail possesses a variety of characteristics, and the proposed system discerns the characteristic of nail colour variations for the identification of disease. The initial training set is constructed using the open cv tool, using photos of people with certain conditions. To obtain the result, the feature extracted from the acquired image of nail is computed with the training dataset. Using the colour feature of nail images, it is discovered that on average, 65 percent of results appropriately match to the training set data.

Keywords: Image Processing, Pre-processing, Neural Network

1. Introduction

Numerous disorders can be anticipated in the healthcare arena by analysing the colour of human nails. Doctors examine a patient's nails to aid in disease detection[2]. Generally, pink nails suggest a healthy individual. The suggested system will extract colour information from a human nail image in order to predict disease. The technology is primarily concerned with image recognition utilising human nail colour analysis [3][4]. Numerous disorders[5] can be detected by studying the nails of human hands. In this proposed system, image of the nail is captured and uploaded for processing to obtain region of interest. This is followed by

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processing for obtaining attributes of nail like color. Hence prediction of diseases is obtained using Matcher algorithm in the proposed method.

2. Literature Review

Matthew Burnette in his work "Nutritional Element Detection in Human Nails using Microplasma Induced Breakdown Spectroscopy", intended to determine the nutritional elements in human nails for creating a new simple, and a device for analyzing dietary shortfalls. Peilun Du , titled "Classifier Refinement for Weakly Supervised Object Detection with Class-Specific Activation Map", explained a Weakly Supervised Object Detection (WSOD) as a challenging visual understanding task.

Trupti S. Indi ,"Early Stage Disease Diagnosis System Using Human Nail Image Processing", in his work proposed a method to detect Early Stage Disease of Nail. Using Weka tool , training set data is prepared from patients nail images with diseases and implemented with neural network. Ting wie-houe , "An image preprocessing method for fingernail segmentation in microscopy image", in this paper introduced an image preprocessing method, for segmenting different parts of nail. The work drawback is that the poor image quality. Roopa M., et.al, "Non-interference blood glucose screening based on laser beam and galvanic skin response recorder",[4] proposed a non-invasive method for dragonizing diabetes based on galvanic skin response recorder.

2.1 Existing Systems

There are various ways of diagnosis of disease such as through different tests (blood test) and symptoms available in different parts of body guides toward disease diagnosis patient should wait for the report to analyze the problem

2.1.1 Disadvantage of the Existing Systems

Person cannot immediately realize when some changes in their body happened until the disease is almost grown and needs to go to hospital.

3. Proposed System

The suggested method collects an image of the damaged nail and pre-processes it using currently available techniques. The input image is processed to remove noise and improve the image quality for processing. Following the pre-processing stage, RGB values

are averaged to conserve space and minimise file size for easier processing. The input image is then given to the trained model, which compares it to predetermined features of the damaged nail. The disease can be recognised based on the examination of the input image over the trained model.

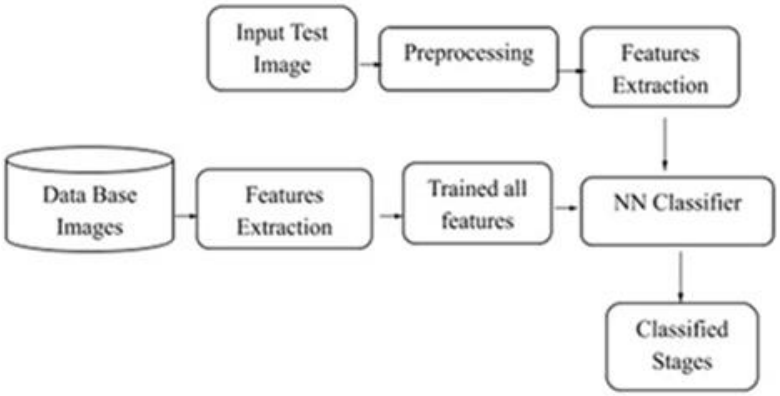

Figure 1. Block Diagram of the Proposed System

Module 1: Image Acquisition and Preprocessing from Input

Module 2: Extraction of Features

Module 3: Neural Network Implementation

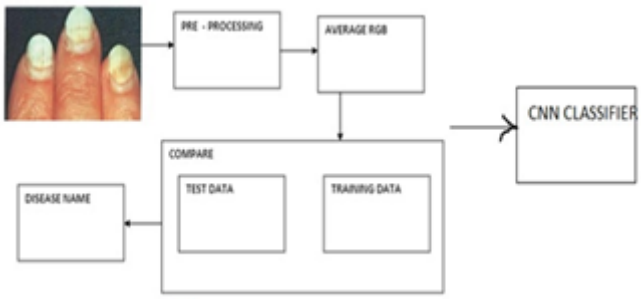

Figure 2. Real time Data Acquisition

3.1 Processing Digital Images

The process of image identification begins with techniques such as noise removal, after which feature extraction to discover possible places with certain textures takes place. The better method is to interpret groupings of these forms as separate objects, for example, automobiles using a highway or malignant cell visuals on a microscope slide. One issue is determining which characteristics belong to which object and which one of these are backdrop or shadows, for example. While the human visual system conducts these tasks

largely instinctively, a computer's performance must approach that of humans through skilled programming and ample processing capacity. Manipulation of data in the form of an image using a variety of approaches. A computer can process a picture visually or digitally.

To digitally process an image, the image must first be reduced to a set of numbers that the computer can alter. Each integer that represents the image's brightness value at a given position is referred to as a picture element, or pixel. In which larger images are becoming more prevalent. If it is digitised, it can be used in the computer for three fundamental procedures. In the output image ,the pixel value is dependent on a value in the input image for a point operation. In a global operation, each input picture pixel contributes to the value of the output image pixel.

3.2 Image Classification

Digital Image Processing employs three distinct image kinds. They truly are.

- Binary Image
- Grayscale Image
- Colour Photograph

3.3 Preprocessing

The purpose is to improve the image data by removing unnecessary distortions and improving certain visual features that are important for processing. Image restoration is the process of finding the original image from noisy image. Image restoration is aimed to accentuate attributes of the image to make the image more clear to the observer, but not necessary to create realistic data.

The image enhancing tricks supplied by "Imaging packages" (such as contrast stretching or nearest neighbour de-blurring) make assumptions about the process of the created the image. While noise can be efficiently removed by picture enhancement by surrendering some resolution, this is not acceptable in many situations.

3.4 Networks of Neural Networks

Neuronal networks are predictive models that are loosely modelled after the behaviour of actual neurons. While both Neural Networks (NN) and General Regression

Neural Networks (GRNN) have comparable structures, they do classification when the target variable is categorical.

Each NN network consists of four layers:

- Input layer –Single neuron predicts each variable in the input layer. By subtracting the median and dividing the interquartile range, the input neurons (or processes preceding the input layer) normalise the range of data. The values are then fed to neurons in the hidden layer by the input neurons.
- Hidden layer – Each neuron in this layer corresponds to a case in the training data set. Along with the goal value, the neuron keeps the values of the case's predictor variables. When presented with the input layer's x vector of values, a neuron which is not seen calculates the test case's Euclidean distance from the neuron's centre point and the RBF kernel function is applied using the sigma value (s). The generated value is transmitted to the pattern layer's neurons.
- Pattern layer / Summation layer — The pattern neurons accumulate the values associated with the class they represent .

The Proposed System's neural network consists of

1) Layer of Input:

The black vertical bar represents the input vector, designated by p. It has a dimension of R where R equals three in this paper.

2) The Radial Basis Layer (RBL):

Radial Basis Layer determines the vector distances . This distance is defined in this context as a dot product of two vectors. Assume that W has the dimension QR. The dot product of p and the i-th row of W results in the i-th element of the distance vector ||W-p||, which has the dimension Q1. The minus sign, "-," denotes the distance between two vectors In NN, the transfer function has been included into a distance criteria relative to a centre. It is defined in this work as radbas(n) = 2 n e- (1)

3) Layer of Competition:

In this, the vector is multiplied by matrix and layer weight .

4. Simulation Result

Neural network is implemented in recognising and differentiating various sets of signals. The work involves choosing a best architecture and learning module. The proposed system finally chosen has an input layer with 500 inputs, first hidden layer with 10 nodes, and transfer function T ANSIG. The second hidden layer is incorporated with 7 nodes, and output layer with 2 outputs and PURELIN transfer function .

Figure 3. Simulation output of Sample 1

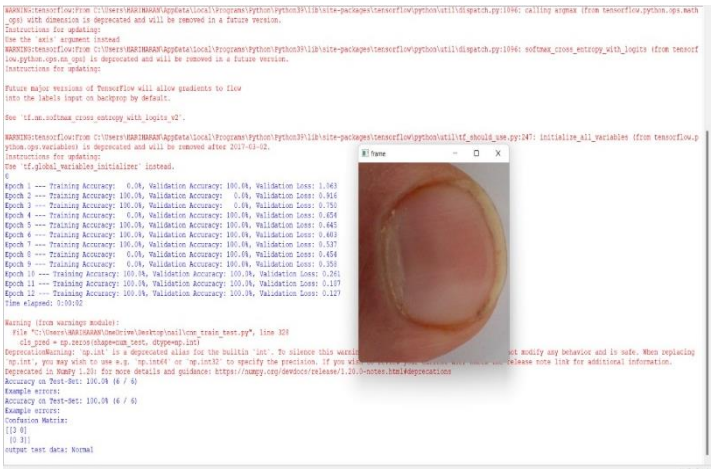

Figure 4. Simulation output of Sample 2

5. Conclusion

In this paper, a model has been trained to classify the disease based on the pattern on the nail. This proposed technology is capable of accurately predicting disease based on the nail pattern. It is also capable of identifying minor patterns, which results in a better success rate for the system. This suggested model overcomes the constraints of the existing model.

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