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Skin Disease Detection using Artificial Neural Network

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Abstract- *One of the most common and augmenting health problems in the world are related to skin. The most unpredictable and one of the most difficult entities to automatically detect and evaluate is the human skin disease because of complexities of texture, tone, presence of hair and other distinctive features.In this paper, we proposed a system which detects the skin diseases using Artificial Neural Network.The system successfully detects differenttypes of dermatological skin diseases. It consists of mainly three phases image processing, training phase, detection phase. In image processing phase we apply algorithms like grey scale conversion, RGB to HSV conversion to the input image. After getting HSV values disease corresponding to the input image gets detected by artificial neural network algorithm. Also, as an addition to the detection the percentage of infection is identified.*

KEYWORDS*: Neural Network, Dermatological Disease, Image processing, Back-propagation, ANN algorithm*

I. INTRODUCTION

Dermatology is the branch of medicine that deals with skin, hair and nails in the widest sense. A dermatologist detects dermatological and cosmetic diseases of the skin. Detection of diseases is very important in today's world scenario because the epidemics of skin diseases cause severe losses to people all over the world. Especially in developing countries there is a need for automated diagnostic system that would reduce manual efforts and time consumption of dermatologists and patients. We proposed a system that would help the patients as well as doctors to diagnose the disease to detect the diseases of the skin by just providing the image of the affected area of skin. Different from the existing detection systems relying on support vector machines or fuzzy logic mechanisms, our detection system uses features extracted from input image of skin through image processing algorithms along with feed forward back propagation neural network for classification and detection purpose. Basic features of image are extracted from the region of interest of skin image. These features are then applied to Back-propagation Neural Network algorithm for training in database or detecting disease from database.The Skin disease detection system consists of two parts where the first part is processing the image of infected region using image processing algorithms. The next part is detecting the disease using back propagation artificial neural network.

II. LITERATURE SURVEY

The primary purpose of our research is to detect a considerable number of dermatological diseases and indicate the percentage of infection to the fed image. Due to the lack of advances in this field in terms of medicine, there has been a need to conduct a research on the same. Initially, Shamsul et al[1] presented an automated dermatological diagnostic system for treatment of skin anomalies which uses k-means clustering and color gradient technique which was successful in merely detecting six diseases. Rajan et al [14] in their approach identified skin diseases by analyzing skin images with the help of GLCM but stuck to a single algorithm limiting the range of skin diseases. Diagnostic system using SVM and SFFS as classifiers, presented by Chuan Yu-Chang et al [9], could differentiate skin images into only three parameters- normal, spot and acne. Shuzlina et al [3] used fast correlation based filter and correlation feature selection technique which increased the response time but could only detect a few features. The k -nearest neighbour algorithm was the approach preferred by Hatice et al[10] which compared two types of K-NN algorithms and displayed the results for the same. Kabari and Bakpo [2] , constructed artificial neural network using feed forward technique and was capable of diagnosing selected skin diseases with a considerable accuracy. Deepti Sharma and Swati Srivastava [13], in their research proposed a system based on MATLAB for detection of skin cancer using statistical region margin algorithm and a couple of neural networks as classifiers.

III. PROPOSED SYSTEM

In this paper we propose a system which works in three phases. The first phase includes processing the skin image that is infected with disease to obtain substantial features like average color code of the region, the second phase is the training phase which is used to train the neural network for identifying the dermatological diseases and the

third phase includes detecting the disease using feed forward back propagation neural network. Here we have presented a complete architectural design of our system in brief.

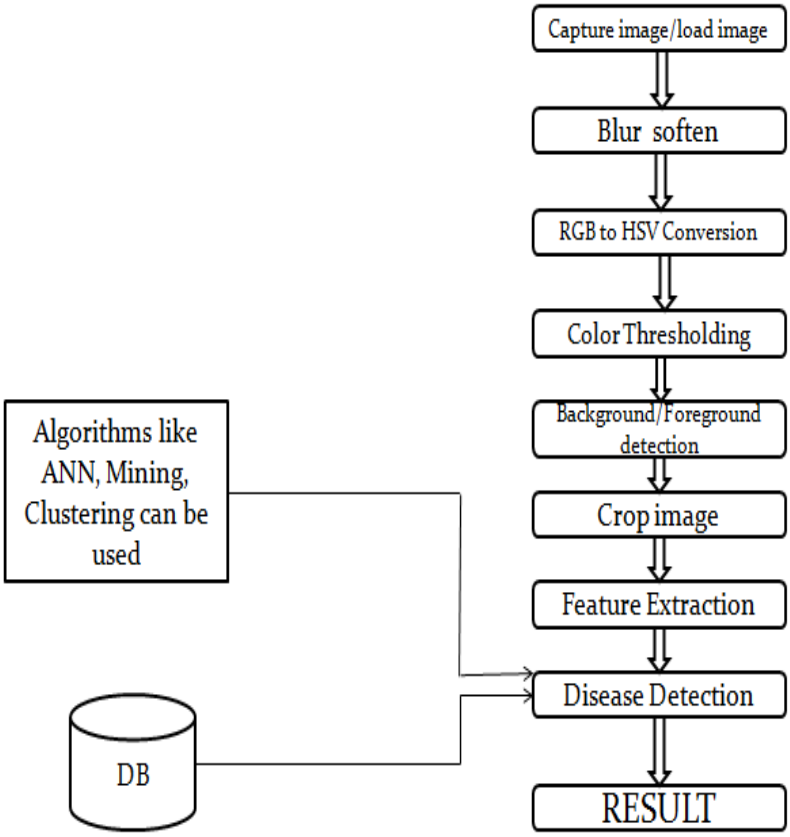

Figure 1. Architecture of the system

3.1. Image Processing

In the first phase, the image is processed by applying algorithms like grey scale conversion, RGB to HSV conversion, blob detection and the features are extracted from the interested regions of skin image.First, we grayscale the image, then blur it. After that, the HSV values are calculated from the image. After Blurring the image we use Blob detection technique.Blob detection is a method that aims at detecting regions in an image that differ in properties like brightness or color, compared to surrounding regions. The values that we get in blob detection is the block of interest (it contains rectangle co-ordinates). After this we select rectangle from the original image from the coordinates of blob detection and get their HSV values which were calculated before. These features are applied as inputs to the Artificial Neural Network Algorithm.

Figure 2. Image for Psoriasis

Figure 3. Binary Image

3.2 Artificial Neural Network Algorithm

An artificial neuron network (ANN) is a computational model. It is based on the structure and functions of biological neural networks. Neural Network facilitates in estimating the most cost-effective and ideal methods for reaching at solutions while defining computing functions or distributions. ANNs have three layers that are interconnected. The first layer consists of input neurons. Those neurons send data on to the second layer, which in turn sends the output to neurons of the third layer. There are different types of Neural Networks such as Feedback, Feed-forward, Back propagation, Classification-Prediction, etc. In our system,Neural Networks are used in the automatic detection of skin diseases by using Back propagation algorithm. Neural network is chosen as a detection tool due to its well known technique as a successful classifier.

Artificial Neural Network Algorithm contains two phases– training and testing phase and detection phase. In training phase these features are trained to the database using back propagation algorithm.The training and testing processes are among the crucial steps in developing an accurate process model using ANNs. The dataset for training and testing processes consists of two parts; the training features set which are used to train the nueral network model. While a testing features sets are used to verify the accuracy of the trained using the BP network. In the training part, connection weights were always updated until they reached the defined iteration number/suitable error. In detection phase the features of input image whose disease is to be recognized are compared with the features in database using Artificial Neural Network.

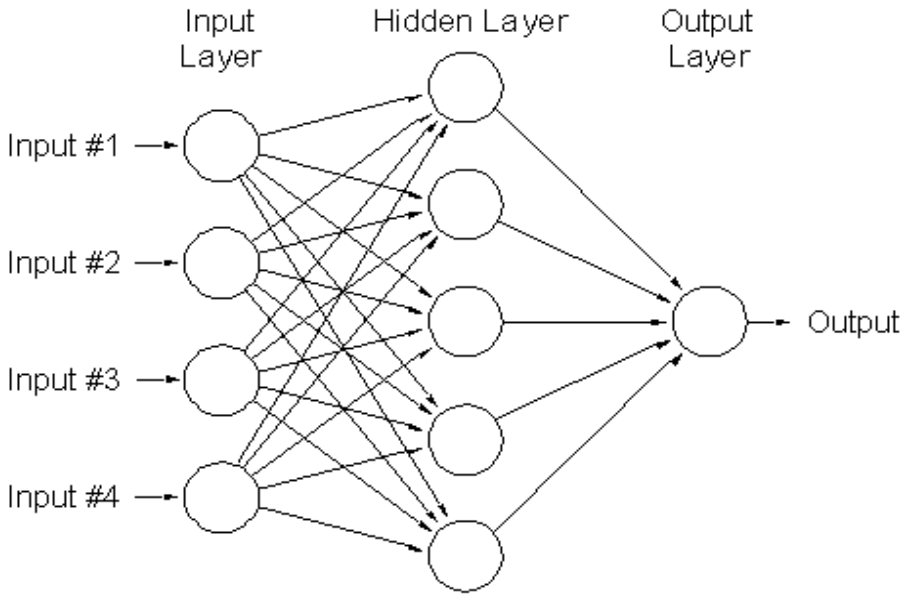

Figure 5. Feed Forward Back Propagation Neural Network

IV. CONCLUSION

We proposed a neural network based disease detection system for skin diseases. Unlike, the other disease detection systems that depend on support vector machines or fuzzy logic mechanisms for classification and detection, our

system makes use of back propagation artificial neural network which detects skin disease based on the image values obtained from ROI of the input image through image processing. We implemented the detection system and calculated its performance on both small scale experiments and large-scale simulations. Our results showed that the system precisely detects the disease and provides output for the corresponding skin image.

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