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SKIN DISEASE DETECTION SYSTEM

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ABSTRACT:

Skin is the largest organ of the human body. It acts as a shield towards various factors resulting into infections or often diseases. It also holds in the water loss that may happen through the body. Dermatology is a one of major session of medicine that concerns with the diagnosis and treatment of skin diseases. Skin diseases are the most common diseases widespread in humans as well as animals. Even though the disease may seem superficial but negligence may have a lifetime effect on the skin of the patient. Anything that irritates or clogs the skin can cause symptoms such as redness, swelling and itchy skin. Rashes and hives are other signs of skin conditions. Some are quick and easy to treat, while others are chronic or more difficult to get rid of. The presented system is an automated dermatological Diagnostic system. We are going to work on four diseases, Ring worm, herpes, and psoriasis. The system works on two dependent steps - the first detects infected skin patches and the latter identifies the diseases. The system uses visual input i.e. high resolution color Images. It will be used to detect diseases of the skin and offer a treatment recommendation. This system uses technologies such as image processing. The image must be subjected to various pre-processing for noise elimination and enhancement of the image we are going to use classifiers such as LBP, SVM. For disease classification, the system will resort to feed forward back propagation artificial neural networks. It will be a free process and will not require any special imaging devices as normal cameras shall be sufficient enough to capture the images.

Keywords: Skin, Disease, Detect

I. INTRODUCTION

Dermatology is the branch of medical science that is concerned with diagnosis and treatment of skin based disorders. A successful CAD [Computer aided detection /diagnosis] system provides useful information for the clinician's diagnostic support. Most of researches are going on cancer, cardiac diseases which have alarming effects. But contemptibly very few mentioned the work related to skin disease. Modern medical science is looking for solution which could assist the doctors with any aspect of work using the new technology. Some of the common approaches used in this areas are Digital Image processing and Data mining. Proper identification of skin disease is difficult due to

similarities in symptoms with other diseases. Our proposed system helps user to recognize skin diseases and provide the user advises or treatments in a shorter time period.

Among different skin diseases,

1. Ringworm: A clinical condition is caused by fungal infection. It is not caused by worms there are no worms involved in this

   despite of name. A small area of infected skin tends to spread outwards. It typically develops into a rounded, red, inflamed patch of skin. The outer edge is more inflamed and scaly than the paler center.

   The funguses form a ring-shaped rash outside the body and remain alive during the infection stage. Misdiagnosis and improper treatment of it may lead to tinea incognito where funguses are spread out by far without any control. Therefore, it is very important to identify the ring worm at an early stage.
2. Psoriasis: A chronic skin disorder affecting more than 4.5 million men and women, producing silvery, scaly plaques on the skin. The first lesions of plaque psoriasis appear as red, dots that can be very small; these eruptions slowly get larger, producing a silvery white surface scale that is shed easily. One of the major issues in detection of a skin disease using skin color is how to choose a suitable color space. Numerous color models (RGB, CMY, HSI, (HSV), Normalized RGB, and YCbCr) are used for skin disease detection.

In this paper we have introduced local binary pattern for feature extraction to recognize the ring worm disease. LBP is very powerful feature for texture classification .Texture features are computed from digital image using LBP and we also introduced support vector machine (SVM) for pattern recognition. We are using color segmentation for analysis of psoriasis images. We have introduced probability density function with threshold values to compare and get final result.

II. RELATED WORK

The most recent work on detection of psoriasis was done using color histogram technique was done by B.V. Dhandra and group in 2013. The main factor of this project was that they detected various stages of psoriasis that is low, med and high so that the user may be able to proceed to the dermatologist as soon as possible. They diagnosed psoriasis only. The whole process involved color histogram as a threshold so as to identify the type of psoriasis. [1] Shamsul Arifin and group presented a model in 2012. This was the most advanced project involved in our survey. They proposed to create an automated dermatological diagnostic system. They used colour processing, K-means clustering and colour gradient techniques to find the infection. Color gradient was the main factor involved. The whole database rather than being collected by standard sites was rigorously collected by visiting several hospitals at Bangladesh. They were able to detect up to 6 diseases with diseased skin detection accuracy of 95.99% and disease identification accuracy of 94.016%. [2]

Nidhal K. Al Abbadi also presented a paper on psoriasis detection in 2010. In this paper they designed a system to detect psoriasis using skin color and texture features. This was the method which involves a developing library due to involvement of Neural Network. Neural network

also is adaptive and hence learns from error. They took psoriasis as example and hence created a skin diagnostic system that can easily identify infected and healthy skin. They also involved texture detection for more accurate results. [3]

In 2008 Rajeshwar Chibbar and group patented a project on analyzing skin condition using digital images. This project involved UV radiation as a detection method. They detected the skin condition by comparing the skin patch images under white and UV light. They tried to find out the pores on human face by comparing the two images and also found out the total number of pores on the face. They also tried to identify the wrinkles, hydration levels, skin tone etc. They took the digital images and compared them pixel by pixel for detection. [4] In 2006 M. Ries Robinson and group patented a project on cosmetic skin conditions. This patent involved calculation of various skin properties such as Elasticity, Pigmentation intensity or uniformity of the skin, dermal thickness etc. using an illumination system. They detected these properties using scattering of light on skin. Light was incident from the source and then after it hit the skin and the detected the changes in the skin were easily observed and found out. [5]

Vladimir Vezhnevets and group implemented a paper on skin color detection techniques in 2001. This paper involved detection of skin color because it is very important feature while doing image processing on images consisting of skin. They used various color models such as RGB, HSI, and YCbCr for a more clear output. [6] Robert R. Alphana and group presented a project on detection of tumor tissue in 1993. The project involved detection of benign, malignant or normal tumor tissue by using a beam of infrared light. They used Raman spectroscopy. They detected the cancerous tissues in breast for breast cancer detection. [7]

Srimanta Kundu and group were one of the first groups implementing projects on skin based projects. They implemented ringworm detection using LBP. This paper was made to detect ringworm using LBP (Local binary pattern) Method. They also used Support vector machine (SVM) as a classification tool. They also tested various classifiers and generated results out of which SVM was the best. [8]

III. PROPOSED WORK

We are trying to build a system which shall use the images provided by the patients and find out the diseases involved in it. As skin diseases are vast in number we narrowed down our project to 2 major diseases i.e. Psoriasis and Ringworm. These diseases are the most widespread diseases in our area.

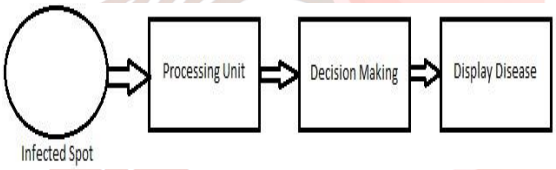
We will take the images provided to us by the patients and input it to the system. The system shall preprocess the image and then scan for any abnormalities present on the skin. These abnormalities shall be scanned and then compared with the database present on the system. Once the image gets matched with the one in the database the name of the disease shall be displayed to the patient so that he\she can go to the dermatologist and begin the treatment on the disease. Each and every disease will have its own detection system. Ringworm shall be detected using implementation of LBP (Local Binary Pattern) algorithm. This algorithm was proven best based on the research we have done on ringworm based projects. LBP (Local Binary

pattern) is used to find out the borders of the anomaly thus making it the best method to analyze ringworm.

Similar to ringworm psoriasis was detected using Color segmentation techniques as present in the The major feature of Psoriasis is that the infected patches are spread over a large area making density high over certain regions. Color segmentation shall identify the red patches making the detection possible and easier as well.

If possible we can also set Hue and Saturation as the threshold values as the color content density for both the diseases is different. Ringworm is spread over a large area with small amount of red present only over the borders, while psoriasis is highly dense over a small area making the color density easier to be defined and the threshold to be set.

IV. BLOCK DIAGRAM



The above figure clearly defines the methodology the project is based on.

STAGE 1

Primary stage includes image acquisition using optical sensors such as a camera. This stage shall be the one in which patient has to capture the image in such a way that minimum distortions are present on the image. This image is act as input for next step. Therefore the image captured by patient must be clear and with proper brightness that the further processing on image will be accurate and easy. The patient should have a camera with proper quality so that the processing will be proper and no faults would occur.

STAGE 2

The next step is pre-processing so as to make image suitable for performing various operations such as enhancement, restoration etc. This is done so as to confirm that image can be processed clearly and operations can be performed without any errors. First we are converting color image into grey scale. Segmentation of image is done in this stage then all processing is done on the resulting image using the algorithms we decided as for ringworm local binary pattern for psoriasis color segmentation.

Pre-processing is an important stage as all the images need to be converted into standard size so that further processes can be easily done.

STAGE 3

The next stage is decision making stage in which the image is compared with the database. The database includes standard and multiple images of the diseases. Decision making is a crucial part because any error in selecting the processes for decision making errors shall be present at the output reducing the efficiency. Decision making involves different methods for different diseases as parameters vary from disease to disease. Then using probability density function and threshold values we will get result and the disease name is identified. Factors in different diseases are different for eg. Ringworm has circular pattern with red patches thus making LBP an appropriate algorithm while psoriasis involves multiple red patches over the infected area thus making colour segmentation the perfect method to be used. These methods make decision making more efficient.

STAGE 4

Once the name of disease is known it is displayed to the user on displays including mobiles, PC's or laptops. We have developed graphical user interface on MATLAB. The output to be displayed should be in a proper so that the user or the doctor should easily identify the disease and increase the interactive parameters so that it becomes more user friendly.

V. FLOW Chart

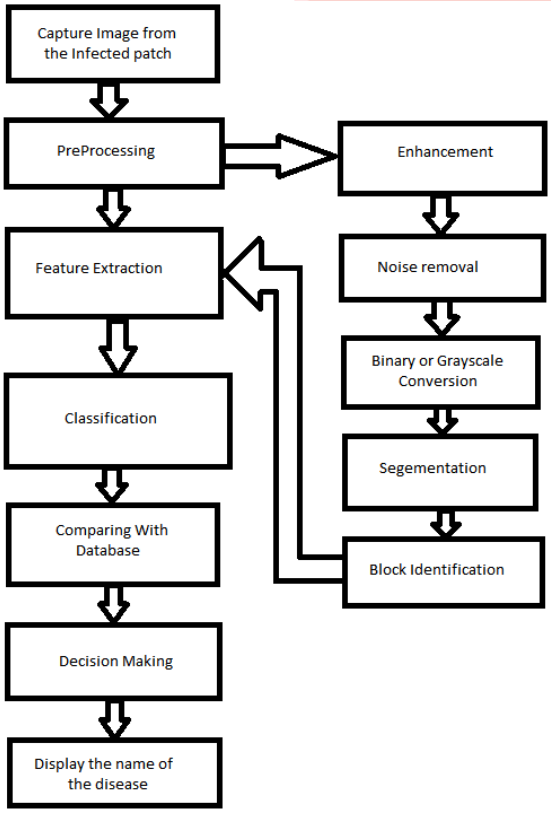


Fig.2 Flowchart illustrates.

First block shows the image acquisition from infected area the image should be clear for further processing. After image acquisition preprocessing on the image is done.it includes the image enhancement, noise removal, binary or grey scale conversion, segmentation of image, block identification. After pre-processing feature extraction is done for the classification. Classification is done using the classifiers as LBP, SVM, and color segmentation. After the classification next process is to compare that result with database which is already present After comparison with database decision is made using PDF and result is displayed on the screen of PC's.

VI. CLASSIFIERS

Local binary pattern (LBP) LBP is a very feature for texture classification. It was first described by T. Ojala. Due to its gray scale and rotation invariance property, this feature has been used successfully in different domains of computer vision like face detection, facial expression recognition, brain MR image analysis etc. This operator is invariant against any monotonic transformation of the gray scale of an image. LBP value of a particular pixel is always calculated by considering the pixel property of its neighborhoods and this is the significance of using the term "Local". It is described later how this feature can be defined using "0" and "1" only and ultimately form a 0-1 pattern, that's why it is called "Binary Pattern".

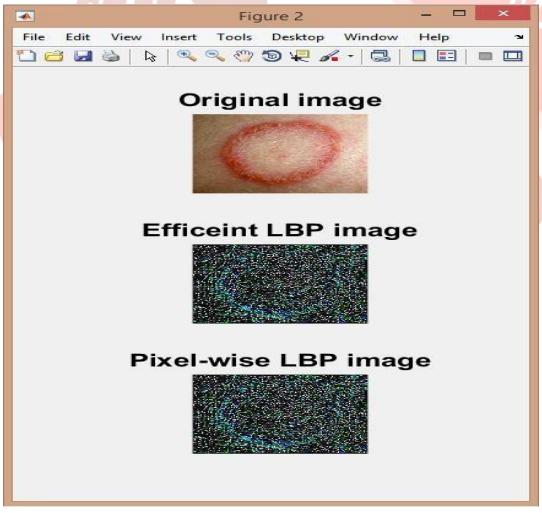
Support vector machine (SVM) Support Vector Machine has been used successfully for pattern recognition and regression tasks. It was mainly designed for binary classification, in order to construct an optimal hyper-plane, to maximize the margin of separation between the negative and positive data set. Although, SVM is used for two class pattern classification problem but multi-class problem can also be solved by extending the binary classification to multi class classification. For the Support Vector Machine classifier, an open source software Lib SVM tool is used. In general, a classification task usually involves with training

and testing data which consist of some data instances. Each instance in the training set contains one "target value" (class labels) and several "attributes" (features). The goal of SVM is to produce a model which predicts target value of data instances in the testing set which are given only the attributes. Before considering the data directly from the linearly scaling each attribute to the range [-1, +1] or [0, 1].

Color segmentation Color is one of the most important features that make possible the recognition of images by human. Color is a property that depends on the reflection of light to the eye and the processing of that information in the brain. Color moment is a compact representation of the color feature to characterize a color image.

VII. RESULTS

The detection of Ringworm showed the following results:-

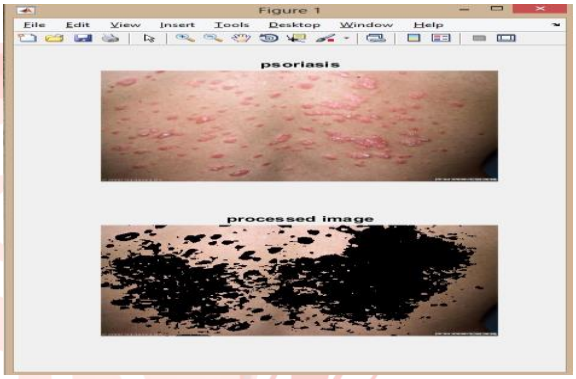


In Fig. 3 the first image as its label states is the image given by the patient. We tried 2 methods of LBP.

1. Efficient LBP: This method was time efficient and skipped redundant data to generate the output as quick as possible.
2. Pixel-wise LBP: This method involved process on every single pixel resulting in a more accurate result but less efficient in time.

These methods generated the above output.

The detection of psoriasis using color segmentation is done Results of color segmentation of image is as shown in Fig. 4.



VIII. CONCLUSION

In this paper, we used local binary pattern SVM, color segmentation for detection of ringworm, and psoriasis respectively. We have obtained low cost technique. This would be useful to dermatologist to reduce errors in diagnosis. It can be serve as initial tests for patients in rural area.

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