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Diagnosing Human Diseases using Toe Nail

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Abstract: **- Digital Image Processing deals with the manipulation of digital images through a digital computer. Digital Image Processing plays a vital role in the medical field. Medical Imaging helps to reveal and analyze the internal structure and external structure of the human parts for easy diagnosis of the diseases. A human Toenail is one of the parts for finding the diseases. The diseases can be detected by extracting its assorted features from the nail. The features such as color, texture, and shape are the basic component to ascertain the affected areas in the nail. In this paper, the proposed system is developed to identify the diseases using toenail color. In this system, the nail images are acquired by the image acquisition and the segmentation technique is applied for feature extraction to extract the affected portion of the toenail. The Hue value is used for identifying the color of the nail. Finally, the result is evaluated and the nail disease is diagnosed based on the nail color.**

***Keywords*: Hue value, Color, Medical Image, Toe nail.**

I. INTRODUCTION

In medical domain, Image Processing plays a vital role for finding human diseases by inspecting the infected parts of an image. Usually the human diseases are diagnosed through pathological test. It makes irritation for human since the blood samples are taken from the human body for finding the diseases. Image Processing makes this diagnosing test as a simple and efficient one by taking the images of the affected part of the human. This diagnosis is made by inspecting the parts of human body. The parts such as skin, nail, eye, teeth show the symptoms of the human diseases [1]. In this paper, the human toe nail is analysed for identifying the human diseases. The toe nail's features such as shape, texture, color and edges show the symptoms of diseases in human body. The proposed system extracts the color of the human's toe nail image for disease anticipation. This investigates toe nail's color since tiny color changes in toe nail is not perceivable by human's eye. Hence, the proposed system will extract the color feature of human's toe nail image for disease anticipation. In this system, the human's toe nail image is snatched using camera. The snatched image is uploaded into the proposed system and based on the color, region of interest from nail area is selected. The selected area is then processed for extracting the feature such as color of the toe nail. The paper is organized as follows: Section II deals with the background of the research. Section III describes the proposed system. Section IV discusses the result and diseases prediction. Finally section V concludes the paper.

II. BACKGROUND

There are assorted ways are available in medical domain to diagnose the diseases in human body. The scrutiny of human's toe nail is one of the ways to anticipate or assure the existence of disease. Human nails provide useful information about disorders or any nutritional imbalances in human body depending upon their shape, texture and color.The specific color changes in toe nails reveals convicted diseases. The color changes in toe nail such as yellow color reveals the symptoms of Thyroid, Diabetes, Lung Disease and black color identifies Skin Cancer, Diabetes, Kidney disease, Heart Disease and so on[2].

A. Parts of Toe Nail

The Figure-1 shows the anatomy of toe nail and its parts.
Nail Plate: It is smooth curved and light pink in color.
Lunula: The moon shape observed at the base of the nail plate but not permanently.
Cuticle: It is a flat thin tissue which is occurs over the base of the nail plate.
Nail Matrix: It is a hidden part of the nail unit under the cuticle, the toe nail grows from this matrix and it contains blood vessels and nerves.
Proximal Nail Fold: It is a required guardian seal that prevents germs and bacteria from getting into the nail matrix, where new cells are created.
Nail Bed: The soft, pink tissue that sits underneath and supports the nail plate while it grows.
Distal Nail Fold: It is a fold of hard skin overlapping the base and sites of the toe nail.

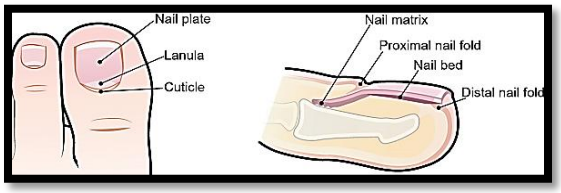

Figure 1. Parts of Toe Nail

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B. Nail Color Connotations [2]

Pink Nails: Pink color toe nails specify a healthy nail.
Yellow Nails: Yellow color toe nails identifies Thyroid, Psoriasis or Diabetes, Lung Disease, Onychomycosis.
Black Nails: Black color toe nails point outs Skin Cancer, Diabetes, Kidney disease, Heart Disease.
White Nails: White color toe nails denotes Leukonychia, Jaundice liver trouble, Anemia.
Purple Nails: Purple color toe nails specifies bruised nail.
Green Nails: Green color toe nails indentifies Chloronychia.
The Figure 2 shows the human diseases based on nail colors.

III. PROPOSED SYSTEM

In the proposed system, the human diseases are identified with the help of toe nail's color. In habitual method, doctors can forecast the diseases by scrutinizing human nails since nail colors are varying for human. These variations are correlated to physical circumstance changes caused by disease but they require more time for predicting the diseases and also produce less efficient outcome. Thus the proposed system easily scrutinizing human toe nails though they have smaller color changes since significant changes in the toe nail show diverse diseases. This proposed work is done using MATLAB.

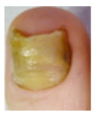
Toe Nail Type	Image	Possible Disorders	Causes
Yellow Nail		Thyroid Psoriasis Diabetes Lung Disease Onychomycosis	Fungal Infections
White Nail		Leukonychia Jaundice liver trouble Anemia.	Allergic Reaction Fungal Infection Nail Injury Mineral Deficiency
Black Nail		Skin Cancer Diabetes Kidney disease Heart Disease	Fungal Infection Repetitive trauma Blunt force
Purple Nail		Bruised	Taking Anticoagulant medication Internal body infections Foot sprain
Green Nail		Chloronychia	Bacteria

Figure 2. Human Diseases based on Nail Color

Block Diagram of the Proposed System:

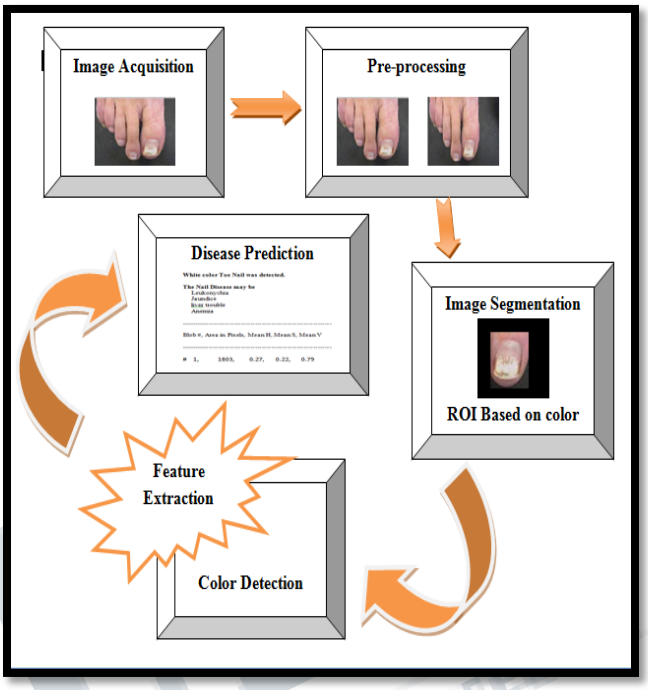


Figure 3. Block Diagram of the Proposed System

The proposed system involves with the following steps for finding the human diseases by examining the toe nail.

- Read a toe nail image which is flipside of feet.

Figure 4.1 Input Image

- Applying median filter to the above input image to remove unwanted noise in that image.

Figure 4.2 Median Filtered Image

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- In the segmentation process, the region of interest is extracted based on the color.

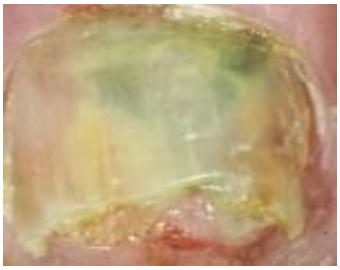

Figure 4.3ROI Segmented image

- The extracted nail image is now being processed based on the origin of color.
- The extracted image is converted into HSV color space.

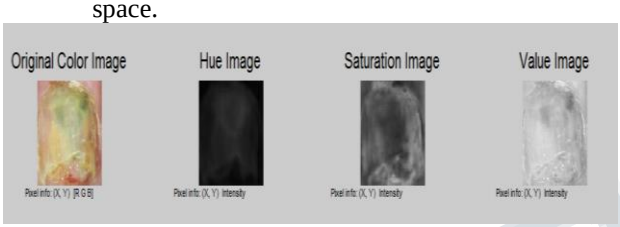

Figure 4.4HSV Colored Image

- Compute image histogram for each color bands.

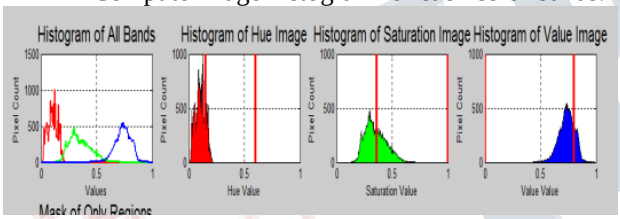

Figure 4.5Image Histogram

- The Color threshold ranges are applied to calculate Hue, Saturation and value

Figure 4.6 Applying Threshold Ranges

- The calculated Hue, Saturation and Value in the previous step is used to find the color of the nail.

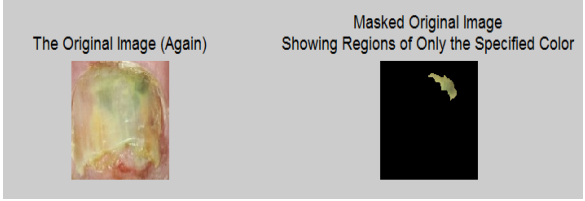

Figure 4.7 Color Detection

- Finally the disease is obtained by analyzing the color of the toe nail.

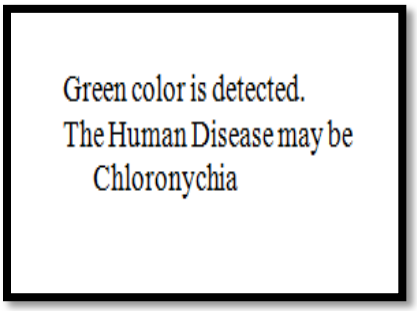

Figure 4.9 Final Result

IV RESULT AND DISEASE PREDICTION

The proposed system is experimented with various toe nail images. The Table 2 shows the input images tested, ROI segmented image, the extracted color regions and the diseases revealed by the proposed system.

Table 2. Proposed System Results

S. No	Original Image	ROI Segmented Image	Extracted Color Region	Possible Diseases
1				Healthy Nail
2				Bruised
3				Chloronychia
4				Leukonychia Jaundice liver trouble Anemia
5				Thyroid, Psoriasis , Lung Disease, Onychomycosis

V.CONCLUSION

Human diseases are rapidly increased at a rate which has not been seen before due to the change of food habit, more pollution and addiction etc. This reason urges the medical field to treat the diseases as early as possible. The human body parts play a major role in determining the diseases by internally as well as externally. Hence, in this paper, the human toe nail is analyzed for identifying the diseases as it aids to decrease the outlay of the diagnosis of disease. The infected toe nail color is extracted using Hue value to detect the diseases since color variation depicts different diseases. This model provides more accurate results than human vision and also it provides correct view of the diseases for the doctors to give treatment to the patients. In future, this proposed work is enhanced to identify the diseases by combining the features such as color, shape and texture.

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