Diagnosis of Diabetes Using Tongue Color Analysis

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Abstract – The human tongue plays an important role in detecting various diseases. A feature of the tongue is extracted based on its color, texture and geometry help in knowing the disease. Color feature extraction is one of the most important parameter useful in diagnosing diseases. The proposed method extracts the color features of the tongue using the color gamut in which 12 colors represent features of the tongue.

Index Terms – Tongue, Diseases, Diagnosing, Color Analysis.

1. INTRODUCTION

The tongue is considered to be the mirror of viscera. It can be used for the diagnosis of disease with its color feature to be of utmost importance. In accordance with ayurveda the front the tip one-third of the tongue relates to lungs, heart, chest and neck. The central area relates to liver, spleen, stomach and pancreas. The rear one-third of the tongue the base relates to the lower abdominal organs – small intestine and the colon. Any disorder in the organs corresponding to that area is reflected by discoloration or sensitivity in the area.

In the proposed system the tongue color gamut is first explained and further every foreground pixel of the tongue is compared with the 12 colors in the gamut. The color closest to the pixel of the tongue is assigned with the color. This make up for the color features of the tongue.

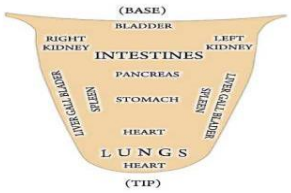

Fig 1: Reflex zones of the tongue

2. MODULES DETAILS

The system after careful analysis has been identified to be presented with the following modules:

- Tongue Image Acquisition
- Image Segmentation
- Color Analysis
- Texture Analysis
- Diagnosis Results

a) Tongue Image Acquisition

Prior to initiate any video or image processing, an image must be caught by a camera and changed over into a manageable entity. This practice is known as image acquisition.

Two important factors to be considered when designing a image acquisition device are:

(i)Illumination, including the illuminant and the environment, and

(ii)Imaging camera, including the imaging macro mode lens with added lighting of UV rays.

As per tongue diagnostic practices, the best illumination for tongue examination is sun light in open air. The most typical strategy is by digital photography with an advanced digital camera however here to capture a digital photography, phone is utilized.

This project considered two different case of a tongue as in figure before taking food and after taking .Such different is chosen to show this proposed technique performs for different cases.

b) Image segmentation

In this module it will segregate the captured image, and it will consist of three approaches like region-based segmentation, data clustering segmentation and edge-based segmentation. Region-based segmentation includes the Seeded Region Growing (SRG) and unseeded region growing algorithms. The algorithm of POS is applied along with SRG method for refining the position and similarity difference value of each seed point.

c) Texture analysis

Texture analysis describes the symptoms of diseases and so it is considered to be an important criterion in disease diagnosis. The roughness or bumpiness refer to difference in the intensity value, gray levels. Inflammation lesions or ulceration and deterioration of the associated body part are pointed out by dark red in tongue. White designates stagnation of blood; fat and mucus deposits or feebleness in the blood leading to such

disordered as anemia. A disorder of the liver and gallbladder is specified by yellow. This results in a surplus secretion of bile, particularly in the middle organs of the body, and likely inflammation. Blue or purple shows the stagnation of blood circulations and a grave fading of the part of the digestive system that is connected to the zone of the tongue. Surplus of blue or green shows maladies in the blood vessels and in blood quality and circulations. Surplus purple color mirrors ailments of the lymphatic and circulatory system. It designates a fading of the immune capacity of the blood vessels.

d) Color analysis

The tongue color gamut is a set of all colors which appear on the human tongue. 1 RGB points are plotted and connected using lines which forms a triangle. On the RG line there is a point Y (Yellow) marked. The RB line consists the point P (Purple) and similarly C (Cyan) is marked on line GB. For the RGB color space the center is denoted by W (White), P (Purple), C (Cyan) a straight line is drawn to W (White).The points at which these lines intersect the tongue color gamut form a new color to be added to denote the 12 colors. This results in the addition of LR (Light Blue) which is the midpoints between the lines from the black boundary to the center W (White). DR (Dark Red) is chosen as no other point occupies that region. The colors GY(Gray) and BK (Black) belongs to grayscale.

e) Diagnosis results

In this module it is used all the above method it compare the tongue image and display the result of diabetic patient (Normal, Diabetic).

3. ARCHITECTURE DIAGRAM

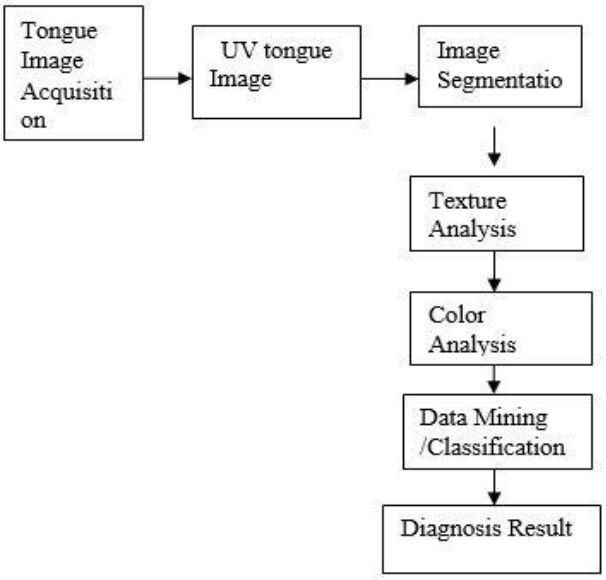

Fig 2: System Flow Diagram

4. RESULT

Table 1: Color Analysis

Color	[R G B]	[L A B]
C(Cyan)	[188 188 185]	[76.07-0.55 1.36]
R(Red)	[189 99 91]	[52.25 34.84 21.30]
B(Blue)	[183 165 180]	[69.46 9.54-5.49]
P(Purple)	[226 142 214]	[69.46 42.47-23.88]
DR(Dark red)	[136 72 49]	[37.84 24.55 25.93]
LR(Light red)	[227 150 147]	[69.46 28.49 13.39]
LP(Light purple)	[225 173 207]	[79.06 24.32-9.77]
LB(Light blue)	[204 183 186]	[76.06 7.89 0.98]
BK(Black)	[107 86 56]	[37.84 3.96 20.58]
GY(Gray)	[163 146 143]	[61.65 5.71 3.73]
W(White)	[200 167 160]	[70.97 10.98 8.29]
Y(Yellow)	[166 129 93]	[56.31 9.55 24.45]

Fig.3. Twelve colors representing the tongue color gamut

In this project the existing system to prick your finger drops of blood to put test strip into a meter that shows your blood sugar level. Get results in less than 15 seconds and can store this information for future use. You can get blood sugar meters and strips at your local pharmacy. These devices, also called interstitial glucose measuring devices, are combined with insulin pumps. They are similar to finger-stick glucose results and can show patterns and trends in your results over tongue. In the proposed system the tongue color gamut is first

explained and further every foreground pixel of the tongue is compared with the 12 colors in the gamut. The color closest to the pixel of the tongue is assigned with the color. This make up for the color features of the tongue.

5. CONCLUSION

The proposed method extracts the color features of tongue can be used for analysis of diabetes. It is easy to understand and efficient method with significantly lesser computation. All the 12 colors in the color gamut are successfully extracted.

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Authors

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