Disease Diagnosis Using Tongue Image Analysis

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ABSTRACT

The tongue is an important part of human body to taste, speak and swallow the food. It reflect the inner working of body. Any kind of unusual behavior of body is reflected through tongue like problem in stomach, pancreas, liver and intestines etc. So in this paper, we are proposing automatic computer based technique to analyze the changes in tongue, which will be latter useful in diabetes diagnosis in patients. The main focus of our paper deals threshold of tongue signs for diagnosis the diseases. The sign classifies the tongue irregular shape, overlapping of colors, saliva on cracks, buds, pimples etc. Each signs have unique character reflections and issues. This sign factor consists of several phases; quantitative features texture measures for tongue image acquisition by using image processing and crack segmentation.

Keyword: Automatic Computer Based, Threshold, Image Acquisition

I. Introduction

The tongue can be used for the diagnosis of disease by using its various features such as color, texture, geometry etc. The tongue is a powerful tool for refining our understanding of the individual and moving us toward an effective remedy. I also appreciate that looking at the tongue lends itself easily to sharing observations and insights with whomever I am working, bringing them into the conversation more fully and helping them make sense of their own bodies. "Tongue analysis" is one of the main identification processes in the patient disease diagnosis. In all traditional structure of diagnosis, tongue is an essential part for best understanding the condition of the patient. Doctors ever ask the patient to open the mouth and show the tongue to extract the visual information. The tongue has a specific connection with the Heart. The normal tongue in old Chinese Medicine has a light red or pinkish body with a thin white coating (Chao liang, 2012).

Quantitative image processing:

In this work, we concentrate on patients with diabetes. Tongue image processing requires some unique attention in the field of image processing and disease study, due to tongues irregular shape, color, texture, etc. The texture and appearance of the tongue says a lot in regards to the condition of our health (Jane Bianch, 2014). The technology recommends that it may soon be workable for trained physicians to conduct digital investigations of individuals' tongues to diagnose ailment. Digital imagery of tongue patterns with soft input analysis to determine whether or not a person is sick. Digitized imagery that maps the size, texture and color of a person's tongue can be utilized, to assess whether or not disease is present and treatment is needed. Tongue images are the basic features for diagnosing different sicknesses. The indications of any issues in the body, for example, Heart related issues, Kidney related issues, Stomach related issues, and will be imitated as abnormalities of the any features of the tongue. Various majority of the ill can be discovered effectively by the thorough examination of the tongue. The Reflex zones of tongue are given in Figure 1.

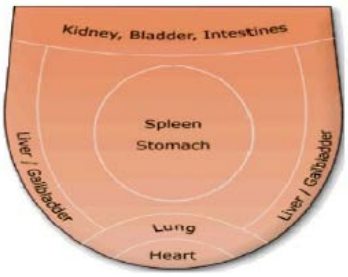

Figure 1 : Structure of Tongue

Tongue image acquisition and Terminology:

Any video and image caught by camera should convert in user managing schemes is called image acquisition. The image acquisition devices consider three factors when it designs. (i) Illumination, (ii) Resolution based on camera lens. (iii) The position we snap the image for process.

The tongue diagnosis treatment the illuminations of tongue research are carried out with sun light with fresh air. Next scheme is digital photography with high resolution or takes the snap using HD camera. Final factor is position of the image takes place from our camera. The above image acquisition and processing techniques are used to find the status of diabetic patients and their any other symptoms. Logical understandings of tongue snap images are monitored in various ways but the basic terminology is view out image in before food and after food.

Symptom find using tongue image:

Several causes exist in the Chinese medical model to justify this belief, including several meridians (channels of energy and blood) that flow directly to the tongue. When we analysis the tongue, there are certain things that you look for including the color, size, shape and texture of the tongue body. We also examine the thickness, texture, and color of the tongue coating. The color of the tongue body tells the state of the blood, yin organs (non-digestive organs) and the lying or nutritive energy. Usually a tongue is pink or light red in color. A pale tongue shows deficiency in either blood or nutritive energy, while a dark or purplish tongue shows that blood or energy are stagnating in the body. Different kind of Changes in color in different regions of the tongue can show imbalances in different organs systems. For instance, a red tongue tip can demonstrate heat in the heart, which can cause insomnia, restlessness, or anxiety.

Texture Analysis:

Texture analysis (Ethan Huff , 2014) describes the symptoms of diseases and so it is considered to be an important criterion in disease diagnosis. The roughness or bumpiness refers to difference in the intensity values, or gray levels. Inflammation lesions or ulceration and deterioration associated to body part pointed out by dark red in tongue. White designates stagnation of blood; fat and mucus deposits or feebleness in the blood leading to such disorders as anemia. A disorder of the liver and gallbladder specified by yellow.

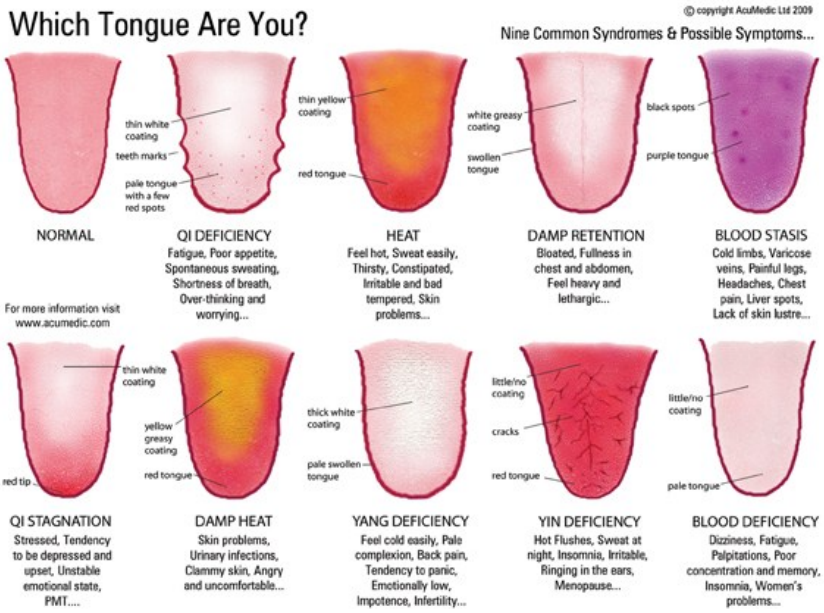

Figure 2. Various Tongue Texture Image for Examine Disease symptom.

The figure.2 gives the results in a surplus secretion of bile, particularly in the center organs of the human body, and likely inflammation. Blue or

purple shows the stagnation of blood circulation and a grave fading of the part of the digestive system that is connected to the zone of the tongue. Implicit conditions could be understood by analyzing the color on the underneath of the tongue. Surplus of blue or Green shows maladies in the blood vessels and in blood quality and circulation. Surplus purple color mirrors ailments of the lymphatic and circulatory system. It designates a fading of the immune capacity of the blood vessels. The textural measures are extracted from tongue images by using popular digital image processing techniques that models the relationship between these quantitative features and diseases. The effectiveness of the method is tested on a group of 100 local patients affected by 13 common diseases as well as other 40 healthy volunteers, and the diagnostic results predicted by the previously trained Bayesian network classifiers.

Qualitative tongue image detection and analysis:

An analysis of tongue is mainly focused on the shape, fur, and body of the tongue. The shape of the tongue can be medium, fat, thin, and tilted. A normal tongue should be one with a medium shape. A fat tongue indicates water toxin, while a thin tongue represents yin vacuity or qi and blood vacuity. Observation at the back of the tongue is focused on the sublingual collateral vessels, including the length, width, number of branches, solidness, and colour. By inspecting these features, a doctor can have an understanding of the patient's qi and blood circulation for identify whether the organs are functioning normally. Observation of the tongue status starts with the visible abnormality that becomes the basis for pattern identification/syndrome differentiation (Maciocia, 2004).

Colour image segmentation:

Image segmentation is valuable in numerous applications. It can recognize the regions of interest in a scene or interpret the data. We categorize the existing segmentation algorithm into region-based segmentation, data clustering Segmentation, and edge-based segmentation. Region-based segmentation includes the Seeded Region Growing (SRG) and unseeded region growing algorithms. All of these techniques expand each region pixel by pixel taking into account their pixel value or quantized value so that each cluster has high positional connections. The standard methodology is to discover a point close to the center of the target image, which is utilized as the center of image, and afterward to give an initial two-dimensional curve and make it astringe to the edge of the target as per dynamics mechanism (Fu, 2006). This methodology is proper when the general form of the target is fixed. However human tongue is not generally flat when extended out of the mouth.

Image Segmentation:

The usual approach is to find a point near the center of the target image, which is used as the center of image, and then to give an initial two-dimensional curve and make it astringe to the edge of the target according to dynamics mechanism. This approach is appropriate when the general form of the target is fixed. But human tongue is not always flat when extended out of the mouth. Some forms will be changed and therefore it is not suitable for this algorithm. We adopt the component H (Hue) and V (Value) of HSV space to decide the initial position of tongue. Then level set algorithm is used to obtain the better segmentation (Liu, 2007).

2. Research Method

Tongue images can be captured by using a specific set of image acquisition devices, including an advanced kernel camera and its corresponding lighting system. Segmentation methods such as "Thresholding" achieve this goal by looking for the boundaries between regions based on discontinuities in gray levels or color properties. The proposed model is based on building a group of natural features are derived from NSS and fitting them to Multivariate Gaussian Model (MVG) model. Assessing the quality of a distorted image is then expressed as the distance between MVG fit of the features extracted from the distorted image and the MVG model of the natural features extracted from natural images. Figure 5 block diagram of the proposed algorithm for feature extraction. Threshold techniques can be categorized into two classes global threshold and local (adaptive)

threshold. In global threshold a single threshold value is used in the whole image in the local threshold a threshold value is assigned to each pixel to determine whether it belongs to the foreground or background pixel using local information on around the pixel.

Segmentation algorithms are based on two basic properties of intensity values discontinuity and similarity. Histogram threshold approach falls under into regions that are similar according to predefined criterion. Many methods exist to select threshold value for a segmentation task. The most common methods is to set the threshold value interactively the user manipulating the value and reviewing the thersholding result until a satisfying segmentation has been obtained. The histogram is often a valuable tool in establishing A suitable threshold value. Histogram thresholding results using different threshold values obtained from the histogram Thresholding is the simplest segmentation method. The pixels are partitioned depending on their intensity value. Global thresholding, using an appropriate threshold T:
g (x,y) =1, if f(x,y) > T;
0,if f(x,y) < T.

Variable threshold if T can changes over the image. Local or regional thresholding if T depends on a neighbor hood of (x,y). Adaptive thresholding if T is a function of(x,y) multiple thresholding.
g (x,y) = a, if f (x,y) > T2;
if T1 < f (x,y)<T1;
if f(x,y) < T1;

Threshold is one of the widely methods used for image segmentation. It is useful in discriminating foreground from the background. By selecting an adequate threshold value T, the gray level image can be converted to binary image.

Figure. 3: Disease affected Tongue

The most common way to convert a gray-level image to a binary image is to select a single threshold value (T). Then all the gray level values below this T will be classified as black (0), and those above T will be white (1). .The binary image should contain all of the essential information about the position and shape of the objects of interest (foreground). Figure -4 - The segmentation problem becomes one of selecting the proper value for the threshold T.
The advantage of obtaining first a binary image is that it reduces the complexity of the data and simplifies the process of recognition and classification. Histogram Dependent Technique (HDT) The histogram based techniques is dependent on the success of the estimating the threshold value that separates the two homogenous region of the object and background of an image. The figure – 5 (HDT) is suitable for image with large homogenous and will separate regions where all area of the objects and background are homogenous and except the area between the objects and back- ground.

Figure 4. Segmented Tongue Image