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Automatic Tongue Image Based Classification Using Image Processing

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Abstract:

In the medical domain, image processing plays a vital role in identifying human diseases by inspecting the infected parts of the patient. Usually, human diagnosis is carried out through pathological tests. Those diagnostic methods are invasive. Moreover, the human eye suffers from subjectivity in resolving colors, thus a small variability in nail color may lead to the wrong conclusion. However, computer-assisted diagnosis may detect and recognize such a small change in tongue color. Thus this study was to extract color features of tongue images for identification of normal and vitamin deficiency detected image using digital image processing techniques.

Keywords **—Disease identification, Feature analysis, Tongue analysis.**

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I. INTRODUCTION

Vitamin deficiency is a problem that affectsover two billion people around the world. The WHO said that one in three children do not get enough vitamin. Vitamin deficiency is a global problem that affects over two billion people around the world. The WHO said that one in three children do not get vitamin. 33% of children under the age of five have deficiency of vitamin A. This deficiency causes low immunity and night blindness. Vitamin deficiencies affect all ages and frequently co-exist with mineral (zinc, iron, iodine) deficiencies. The groups most susceptible to vitamin deficiencies are pregnant women, children, because of their needs for these compounds and susceptibilities to their absence. Most common deficiencies relate to vitamin A, vitamin B, folate and vitamin D. Supplementation programs have made diseases like scurvy and pellagra rare. Many of deficiencies are preventable through consumption of a healthy diet containing diverse foods, as well as food fortification and supplementation, where needed. Most vitamin and mineral deficiencies can be picked up with a blood test, like a venous blood test and finger-prick blood test. In venous blood test a trained professional will use a needle to puncture a vein, usually in your arm, to collect a blood sample and in finger-prick blood test using lancet, you can prick your own finger and collect blood sample. In hospitals these blood tests can bedone or we can also order home vitamin and mineral test kits online and do it our self. The cost of venous blood test and finger-prick blood in India is on an average of Rs.1000 and Rs.800 respectively. Home vitamin and mineral test kits costs around Rs.8000. Digital image processing (DIP) is dealing with the manipulation of digital images using a computer. In the medical domain, image processing plays a vital role in identifying human diseases by inspecting the infected parts of the patient. It helps to analyze the internal and external structures of the human organs for easy diagnosis of the diseases. Usually, human diagnosis is carried out through pathological tests. Those diagnostic methods are invasive. Image processing makes the effort of disease diagnosis simple and efficient by investigating the affected part of the body (Sharma and Ramaiya, 2015) Disease

diagnosis can also be made indirectly by inspecting the parts of the human body. In this regard, skin, nail, eye, and teeth may help show the symptoms of the disease.

II. REVIEW OF LITRATURE

Recently, developing approaches for segmenting thetongue images have received a great deal of attention among researchers. A brief review of some recent researches ispresented here.Wangmeng Zuo et al. [1] have presented a technique for automated tongue segmentation by merging polar edgedetector and active contour model. First a polar edge detector is proposed to efficiently excerpt the edge of the tongue body.They announced a technique to filter out the edge that is of no use for tongue segmentation. A local adaptiveedgebi-threshold technique is also projected. Finally an initialization and active contour model are suggested to segment the tongue body from the image. Experimental results revealed that the tongue segmentation can segment the tongue precisely. A measurable assessment on 50 images shows that the mean DCP (the distance to the closest point) of the proposed technique is 5.86 pixels, and the average true positive (TP) percent is 97.2%. Bo Pang et al. [2] have presented a tongue-computing model (TCoM) for the diagnosis of appendicitis based onquantitative measurements that comprise chromatic and textural metrics. These metrics were calculated from true color tongue images by means of suitable procedures of image processing. They suggested the technique to address the problems such as, the clinical applications of tongue diagnosis have been restricted due to two factors: (1) tonguediagnosis is typically centered on the capacity of theeye for detailed discrimination; (2) the accuracy of tongue diagnosis is governed by the experience of physicians; and (3) customary tongue diagnosis is always dedicated to the identification of syndromes other than ailments. Applying their method to clinical tongue images, the tentative results are promising. Yue Jiao et al. [10] proposed a tongue classification method centered on SVM. The classifiers typically have poor performance. In contrast, Universum SVM is a favourable technique which includes a priori information into the learning process with labeled data and irrelevant data (also called Universum data). In tongue image classification, the number of immaterial occurrences could be very large as there are many unrelated categories for a particular tongue's type. But not all the irrelevant occurrences combined in training can enhance the classifier's performance. So an algorithm of choosing the Universum samples is also presented in this paper. Experimental results revealed that the Universum SVM classifier is better and the algorithm of choosing Universum samples is effective.Yang Ben Sheng et al. [11] proposed an image segmentation algorithm centered on the shortestpath. Thealgorithm is superior to the conventional region growing algorithm (RGA), it lacking of certain disadvantagesexperienced by old-fashioned region growing built on competing seeds. This technique was enlightened by the water free movement in surface of terrain. In their method, each pixel node will be allocated to an optimal path, in order to ensure integrity and continuity of segmentation objects, they added leaking detection into the algorithm. The results of running both the proposed and the traditional algorithm on medical tongue images and other images demonstrate the dominance of the proposed algorithm based on the shortest path. The proposed algorithm depicts the contours of the object area precisely, particularly when it is used to segment the local object of the image, the segmentation outcomes is useful to sequence image analysis and patter recognition.

Wang X and Zhang D [12] proposed an optimized correction scheme that amends the tongue images capturedinvarious device-dependent color spaces to the target device-independent color space. The correctionalgorithm inthis system is produced by comparing numerous widely held correction algorithms, i.e., polynomial-based regression, ridge regression, support vector regression, and neural network mapping algorithms. They check the performance of the suggested scheme by calculating the CIE L(*)a(*)b(*) color difference (ΔE(ab)(*)) between estimated values and the target

reference values. The tentative results on the color checker revealed that the color difference is less than 5 (ΔE(ab)(*) < 5), while the tentative results on real tongue images illustrate that the distorted tongue images (taken in different device-dependent color spaces) become more steady with each other. In actual fact, the average color difference amid them is significantly abridged by more than95%. Xiu-Qin Zhong et al. [13] established a technique to segment the tongue image spontaneously with the mouthlocation method and active appearance model (AAM). With the help of a specific feature of the mouth, they could locate the darkhole's site effortlessly and quickly. For the close relationship concerning the mouth and tongue, they predicted the approximate area of the tongue. Then they used the AAM to segment the tongue from the image completely, which uses texture and shape of an object.Wenshu Li et al. [14] have suggested a method for tongue contour extraction based on improved level setcurveevolution. They offered an automatic initialization of contour by the feature of tongue in the HSV color space. Improved level set method takes tongue contour shape constraint characterized by energy function among the evolving curve and parametric shape model. In addition to this, the orderliness of the level set function is innately conserved by the level set regularization term to ensure accurate computation. Tentative results for the large database of tongue images reflected desirable performances of the technique.The segmentation of the body of tongue plays a significant part in automatic tongue diagnosis in Traditional Chinese Medicine. If there are comparable grayscales near the boundaries of the body of tongue, it is tough to excerpt the body of tongue suitably with some standard methods directly.In order to overcome this effort, Wenshu Li et al. [15] have offered a technique that joins prior knowledge with improved level set method. First, the contour of tongue is initialized inthe HSV color space and a technique which improves the contrast between tongue and other parts of the tongue imageis presented. Then, a region-based signed pressure force function is suggested, which can proficiently stop the contourat weak edges. To finish with, a Gaussian filtering process was used to further regularize the level set function as an alternative of reinitializing signed distance function. Experiments by abundant real tongue images showed desirable performances of our method

III. METHODOLOGY

Tongue images are the elementary features for diagnosis various diseases. For the ease of the diagnosis, the tongue images should be processed clearly and properly. As we discussed earlier, tongue image processing is quite a tough task due to the tongues particular features like, its irregular shape, interference with the lip etc. So it's difficult to get an effective diagnosis of diseases without an effective tongue image processing methods. The main features that are used for diagnosing the tongue include shape, color, pimples, cracks and texture of the tongue.

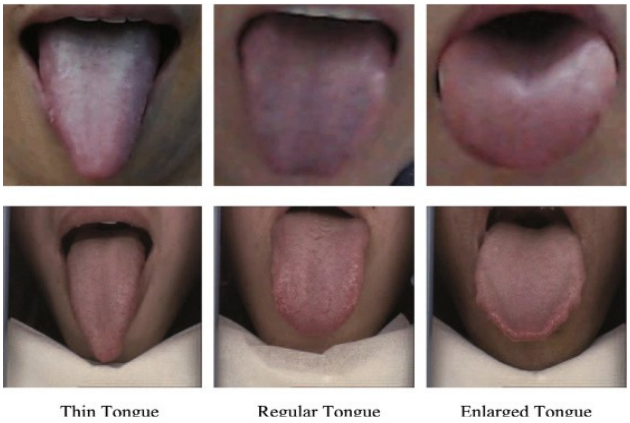

Fig. 1. Tongue images with different characteristics.

Fig. 1 shows images of the tongues that shows different shapes and characteristics. When we consider a tongue, we should be aware about the diagnosing factors of the tongue. The shape, size, color, etc. every feature describes special features of the tongue. Normal healthy tongue image is represented in the Fig. 2.

Fig.2 Healthy Image

Symptoms of anybody disease, such as heart problems, kidney problems, and so on, will manifest as irregularities in any of the traits. So, for the most part, the disorders are easily recognised by examining the tongue. We employ tongue images for extensive tongue study; with the help of clear tongue images, a detailed tongue diagnosis of the tongue; with the help of clear tongue images, a detailed diagnosis of the tongue is achievable. Let us now look at several tongue photos and the disease analysis. Shape, colour, and tongue body cracks and pimples are the most important factors in tongue diagnosis.

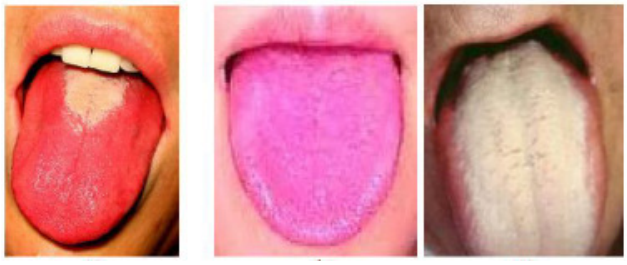

Fig.3 Various color based tounge Image

IV RESULT

The input image is process and the 1ts step is to resize the image. The input image is resizing then it is given to the filter for enhancing the quality of image. The filter used here is the median filter. As the tongue image provides different example for the disease identification based on colour shape, size, spots, etc. The various images are taken based on healthy tongue and unhealthy tongue. Also some of the images which are unhealthy are categories as vitamin deficiency images. The image classification and recognition is based on their different features. The below result shows the images are identified as healthy tongue and unhealthy tounge with vitamin deficiency image.

IV. CONCLUSIONS

Image segmentation is an important research in tongue image processing, So different methods are introduced to process tongue images effectively. However, a new process is needed due to one or more deficiencies in the process. So, in our approach, we share a structured approach where each transaction takes place step by step. The vitamin deficiency is recognizing and classified based on colour based classification technique.

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