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A Non-Invasive Approach to detect Diabetic Mellitus (DM) and Diabetic Retinopathy (DR) using Tongue color, texture and Geometry features

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ABSTRACT:

Diabetes Mellitus is a major health issue in worldwide. To detect Diabetic Mellitus (DM) and Non-Proliferative Diabetic Retinopathy (NPDR) in its early stages, a non-invasive approach is proposed which uses color texture & geometry features for diagnosis. A tongue color gamut is established with 12color representing the tongue features. The texture values of blocks strategically located on the tongue surface, with the additional mean of all eight blocks, are used to distinguish the nine tongue texture features. Finally, 113 features extracted from tongue images based on measurement, distance, areas, and their rations represent the geometry features. With the combination of these features was can distinguish DM, NPDR & healthy person from their tongue images.

Keywords:

Diabetes mellitus, Non-proliferative, Retinopathy, Color gamut.

INTRODUCTION

Diabetes Mellitus (DM) and its hurdles leading to Diabetic Retinopathy (DR) are soon to become one of the 21st century's main health affecting troubles. This represents a huge financial trouble to healthcare bureaucrats and governments. A Fasting Plasma Glucose (FPG) test is the regular method which is in practice by many medical professionals to diagnose Diabetes Mellitus.

This FPG test is performed after the patient has gone at least 12hr without food and requires taking a sample of the patient blood in order to analyze its blood glucose levels. Even though this method is exact, it can be considered invasive and slightly painful therefore, there is a need to expand a detection method. To do this we have extracted 3 major attributes of tongue color, texture & geometry. We have used the color gamut to showcase the probable colors observed on a tongue image. Gabor filter of second order is used to choose the textures of tongue geometric features.

A grouping of all these features is used to classify a tongue images into normal, diabetic and NPDR category. Also separate analysis done over color, texture and geometry features. But when these three features are shared, it gives better results.

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METHODOLOGY

Experiments were performed using a clinical image dataset given by the laboratory of Traditional Medical Syndromes, Shanghai University of TCM. First, a tongue image was developed by a saliency window. Second, we initialized the tongue area as the upper part and inferior stage set matrix. Third, a double geo-vector flow (DGF) was planned to detect the tongue region in the image such that the geodesic flow was assessed in the lower part, and the geo-gradient vector flow was assessed in the upper part.

The flow of proposed algorithm is as follows,

1. Input image is selected from tongue image database.
2. Pre-process the image to remove noise.
3. For color features,
   - 12 colors are extracted & converted to corresponding LAB values
   - 12 Euclidian distances is calculated
   - Mean average & standard deviation is calculated.

4. For texture features,

The tongue image is divided in 8 blocks strategically located on tongue. Gabor filter is used for texture feature extraction of each block

5. For geometry features, extra various shape features and their rations using mathematical formulae.

6. For matching,
   - Divide the database into training and testing test
   - SVM is used for training & classification
   - Determine whether the input image is DM/NPDR/Healthy.
7. Use sequential feature selection (SFS), to select best features for matching.

8. Result.

Problem Identified:

- There are various problems with current practices for treating DM.

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- Patients should go to their wound clinic on a regular basis and their wounds to be checked by their clinicians. This repeated clinical estimate is not only inconvenient and more time consuming for patients and clinicians, but also represents a major health care cost because patients may need special transportation. e.g., ambulances

- Patient has to travel with Diabetics to their clinics to report about the problem. This may increase the seriousness of the DM instead of curing it.

- Patient travel exposure may cause a very serious problem for them.

- The BEDT does not stop properly on the actual tongue boundary because for each image, initial curve defined manually, so fake edges mayinterfere with the evolution.

Fig a. Input image

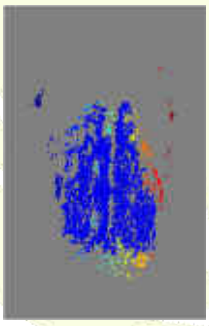

Fig b. Labeled region

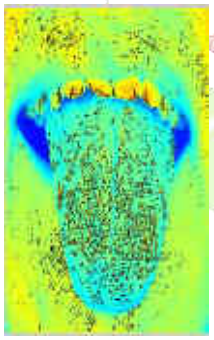

Fig c. detected objects

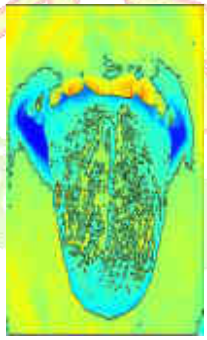

Fig d. final detected Grains

The main purpose is given by

- Patient's travel exposure is significantly reduced. Also it will reduce the patients stress.

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- Doctor can easily assess the problem through images and its segmentation. So the proper report can be given to the patient on time.
- A non-invasive way to identify Diabetic Mellitus(DM) &Non-proliferative Diabetic Retinopathy(NPDR)
- Based on three collection of classification namely Colour, Texture and Geometry.
- Classifies Healthy & DM/NPDR samples using three groups of features haul out from tongue images.

We have implemented a non-invasive system to use tongue images and perceive diabetes mellitus & non proliferative diabetic retinopathy using color, texture & geometry features together. This technique requires minimum human intervention & can be used at the diabetes screening laboratories.

S.no	Title	Algorithm	Classifier	Disadvantages
1.	An advance for Tongue Diagnosing with Sequential Image Processing Method	Edge Detector, Region Growing	Universe SVM classifier	1. Further enhancement to the system can be done by civilizing the localized intensity methods and edge detection algorithms. 2. Region growing algorithm (RGA), it lacking of certain disadvantages experienced by old-fashioned region increasing built on competing seeds.
2.	An Optimized Tongue Image Color Correction Scheme	Color correction, RGB color space	Polynomial-regression-based algorithm and	1. One problem is that the color images produced by digital

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			Support-vector regression (SVR)-based algorithm	cameras are usually device-dependent(for specific camera) 2. The other problem is, in the specific device-dependent color space, it is tricky to compute the color distinction that can be useful for the tongue segmentation and diagnosis.
3.	Statistical Analysis of Tongue Images for Feature Extraction and Diagnostics	The JSEG segmentation method is utilized here	one-class SVM algorithm	1. Tongue images were usually collected by various digital cameras without strict control of the luminance and environmental Conditions, and a color correction procedure was not involved in the post-processing stage Hence, most of these images are of poor quality and not applicable. 2. need to tongue image acquisition device or tongue image analyzing

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				algorithms, can further be studied to promote the development of computerized tongue image analysis.
4.	Unsupervised Segmentation of Color-Texture Regions in Images and Video	Spatial segmentation. JSEG segmentation, SPATIOTEMPORALSEGMENTATION AND TRACKING, video segmentation		1.There is no clear boundary. However, it is often over segmented into several regions 2. pixel based analysis ,so this technique is much accurate.
5.	A novel approach based on computerized image analysis for traditional Chinese medical diagnosis of the tongue	1.computerized tongue examination system(CTES) 2.chromatic algorithm and textural algorithm	spatial gray-tone dependency matrices (SGTDM)	Analyze only texture and also classifier is not well utilized in this method.
6.	Micro aneurysms Detection in Color Fundus Images	region growing, block based segmentation	Linear discriminated analysis (LDA) was chosen as the simplest effective classification technique.	A micro aneurysms Detection sensitivity of 56% at 5.7 false positive per image was achieved.

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CONCLUSION

In this paper we proposed a non invasive method to detect diabetes mellitus. The 12 color representing the tongue color gamut is detected. Normally the human tongue contains numerous features to identify disease is the most prominent method. There is only few published work to detect diabetes mellitus using tongue image features.

A noninvasive approach to classify Healthy/DM and NPDR/DM-sans NPDR samples using three groups of features extracted from tongue images was proposed. These three groups include color, texture, and geometry. This project will helpful for the DM Patients and Doctors. Patient's travel exposure is considerably abridged. Also it will decrease the patients stress. Doctor can easily evaluate the trouble through images and its segmentation. So, the correct statement can be given to the patient on occasion.

REFERENCE

[1].Bob Zhang, B. V. K. Vijay Kumar, "Detecting Diabetes Mellitus and Non proliferative Diabetic Retinopathy Using Tongue Color, Texture, and Geometry Features" IEEE 2014

[2].Bob Zhang, Xing , Wang, Jane You" Tongue Color Analysis for Medical Application" IEEE2013.

[3].Ratchadaporn Kanawong, Ajayi "Automated Tongue Feature Extraction for ZHENG Classification in Traditional Chinese Medicine" IEEE2012.

[4]. J. Benadict, C.G. Ravichandran "Blood Vessel Segmentation For High Resolution Retinal Images" IEEE 2011.

[5]. Bunyarit Uyyanonvara, Sarah Barman and Tom Williamson "Automatic Microaneurysm Detection from Non-dilated Diabetic Retinopathy Retinal Images" IEEE2011.

[6].Luca Giancardo, Fabrice Meriaudeau "Microaneurysms Detection with the Radon Cliff Operator in Retinal Fundus Images" IEEE2010.

[7].Bo Pang, David Zhang "The Bi-Elliptical Deformable Contour and Its Application to Automated Tongue Segmentation in Chinese Medicine" IEEE2005.

[8].Pavle Prenta, Unska 3, Zagreb, Croatia "Detection of Diabetic Retinopathy in Fundus Photographs"IEEE 2006.

[9] S. Wild, G. Roglic, A. Green, R. Sicree, and King, "Global prevalence of diabetes estimates for the year 2000 and projections for 2030," Diabetes Care, IEEE 2004.

[10] S. J. Lee, C. A. McCarty, H. R. Taylor, and J. E. Keeffe, "Costs of mobile screening for diabetic retinopathy: a practical framework for rural populations," Aust J Rural Health, 2001.

[11] C. A. McCarty, C. W. Lloyd-Smith, S. E. Lee, P. M. Livingston, Y. L. Stanislavsky, and H. R. Taylor, "Use of eye care services by people with diabetes: the Melbourne Visual Impairment Project," Br J Ophthalmol,1998.

[12] D. A. Askew, L. Crossland, R. S. Ware, S. Begg, P. Cranstoun, P. Mitchell, and C. L. Jackson, "Diabetic retinopathy screening and monitoring of early stage disease in general practice: design and methods," Contemp Clin Trials,
2012.

[13] H. C. Looker, S. O. Nyangoma, D. Cromie, J. A. Olson, G. P.Leese, M. Black, J. Doig, N. Lee, R. S. Lindsay, J. A. McKnight, A. D. Morris, S. Philip, N. Sattar, S. H. Wild, and H. M. Colhoun, "Diabetic retinopathy at diagnosis of type 2 diabetes in Scotland," Diabetologia, 2012