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A Review: Recognition Methods for Skin Pigmentation

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ABSTRACT

Disorders of skin pigmentation exist across a broad spectrum and include manifestations of hypopigmentation and hyperpigmentation in a variety of benign and malignant contexts. Human skin color is synthesis from many factors. When our skin is damaged, it affects the production of skin pigment. Recognizing skin pigmentation not only affects the appearance, some skin pigmentation diseases will affect everyone's health. Skin pigmentation recognition is very important in diagnosing skin diseases. In this paper, I would like to present a review that is related to skin pigmentation recognition.

Keywords: Skin detection; Skin recognition; Melanin; Hemoglobin; Carotene

Ⅰ. Introduction

From the 80's decade, researchers started to use digital image analysis to recognize skin pigmentation. Image analysis un-directly connect with skin. Using image processing technology could not only segment skin pigmentation from background, but also can calculate some character information of the skin pigmentation. But the image analysis system demand the image is high. Melanin is the mainly determinant of our skin color. It can be found in hair, the iris of the eyes and brain. Hemoglobin is another part of skin color. It can disappear on finger pressure, while purple in the skin and hemoglobin pigmentation do not. Hemoglobin pigmentation can be caused by infection, message, electrical treatment, acne medication, and so on. So some pigmentation is the reflection of disease or itself is the disease. Most of skin pigmentation detection is through the diagnosis of clinician. Nowadays, researchers are developing with the color measurement instrument to recognize skin pigmentation. Researches presented the vision-based recognition of skin lesions in ceroscopy images for the diagnosis of them such as melanoma and other pigmented lesions [1, 2]. These algorithms focus on diagnosing and treating skin lesions from a medical standpoint. But optical instruments are more expensive, and the probe of color measurement instrument has great influence on the effects. Unlike skin lesions, skin pigmentation disorders affect the outward appearance and they are not indicative of some potential health risks in most cases. Many people use the cosmetic to cover them for beauty. Skin pigmentation is necessary to detect and analyze for objectively evaluating the efficacy of cosmetic or skin medical treatment. Like skin lesion detection, the vision-based detection approach can not only precisely segment pigmented area from skin area but also calculate a quantity of pigmentation by any measurements.

II. Skin Recognition

Most of skin recognition methods use a relative mature algorithm that uses the color clustering combined Gaussian mixture model. The differences among these methods are color space and additional algorithm for improving the detect performance. They have shown that their methods are effective way for skin detection under some limitations, which are stable illumination and simple background. Fotouhi et al. [3] show us a way using contourlet-based texture analysis for the skin area detection. A pixel-based boosted skin detection method is used to recognize skin pixels. The skin texture features are used in the contoured texture coefficients for improving the detect performance. For the candidate skin pixels in all sub-images are selected and the feature vector of each patch is extracted. Multilayer perceptron is utilized to learn features and classify the input images. On the other hand, Zhengming et al. [4] proposed a scheme. That uses an image pixel skipping process instead of testing each pixel to label it as skin or non-skin. Moreover, the efficient of Hsu's approach [5], a r-g-b color space based skin detection algorithm is developed. Kherchaoui et al. [6] combine both a statistical model of skin color and geometrical face characteristics for face detection. The presented system contains two parts. One consists in skin color detection by using a statistical method, based on a Gaussian mixture model in the CbCr color space. The other part is about the detected candidate skin regions to select those corresponding to faces.

III. Pigmentation Recognition

In the most of pigmentation detection papers, the main application is for medical diagnosis. In order to get accurate and comparable results. Most of schemes need a stable illumination environment and some professional ceroscopy equipment for acquiring the skin images. The disadvantage is the limitations of application and expensive instruments. As an improvement, we propose an approach which has the illumination robust quality, but not depend on the expensive professional equipment. Let our skin pigmentation scheme has more widespread uses. Nugroho et al. [7] developed image

analysis of skin pigmentation for classification and quantification of eumelanin and pheomelanin types in skin. The proposed model is based on Monte Carlo simulation of light and skin. A model is developed by using collected data from clinical study. That clinical study involving hundreds participants with three different skin images is conducted. In this paper, the inverse type of model is applied to extract the information of melanin and concentration reported. The proposed approach provides an effective characterization of skin layers to determine melanin types. Madasu et al. [8] extended the technique "Fuzzy Co-Clustering Algorithm for images" by inclusion of texture features as a clustering parameter for detecting blotches in skin lesions based on color information. The algorithm is further improvised by adding the texture features computed from the normalized entropy function as an additional parameter for multidimensional clustering. Clawson et al. [9] proposed an algorithm for the detection of color asymmetry, the scheme is proposed for visual display and quantification color asymmetry. Automatic induction and neural network are brought in to evaluate the features diagnostic capability and identify those maximum correlation value. The results show that the features quantifying possible regression region are most indicative of color asymmetry.

IV. Conclusion

In this paper, I present a review of skin pigmentation methods. I hope that this review will help researchers have overview about skin pigmentation recognition.

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