Licensing and Technology Transfer Opportunity: Manipal University

Title of Technology Available:
SYSTEM AND METHOD FOR MONITORING DERMAL CONDITION

Brief Description of Invention:

Vitiligo is considered as one of the most common skin depigmentation disorder characterized by loss of melanin. The disease is associated with a dreadful social stigma among the people. Vitiligo mainly affects 1-2% of the world's population with increased rates in Indian and Malaysian population. Although, the research on natural course of vitiligo is still under process, the assessment of vitiligo treatment efficiency is a challenging and daunting task. As per literature, there are no standard objective methods to quantify the efficacy of treatment. Clinically estimated subjective methods involve incorrect evaluation. Additionally, the method also aids the dermatologists in identifying the better treatment among the various vitiligo treatments available. The proposed method uses dermoscopic image captured from a mobile device to determine the rate of improvement in treatment in vitiligo patients. Since, the application has the feature of storing the data, the dermatologist can use it to directly to determine if the treatment is suitable for the patient or not, and accordingly take further actions. The system is automated and requires minimum user intervention with respect to its usage. The proposed system is the first of its kind in literature which can be adopted in a clinical setting for mask screening of vitiligo patients.

Brief Background of Invention:

Three new score systems that were proposed to assess the degree of repigmentation are Vitiligo European Task Force (VETF) [1], Vitiligo Area Scoring Index (VASI) and Vitiligo Extent Tensity Index (VETI) [2-3]. VETF is based on the rule of nine. VASI is adopted from PASI score in Psoriasis, wherein the vitiligo area is calculated in terms of hand units, wherein one hand unit is equivalent to 1% of the total body surface. VETI score gives a cumulative score considering the relative body surface area. The above scorers have some limitations with discrepancy in the results. A region growing and independent component analysis method was used by Nugroho *et al.* [4] for evaluating the vitiligo areas. The same author's further extended the study for 4 patients and

performed a comparison with the physician global assessment method [5]. Nurhudatiana *et al.* [6] proposed a segmentation algorithm using FCM and YCbCr color space. The algorithms reported in literature have considered clinical images with minimum implementation feasibility in a real time environment.

1. Taïeb, A., Picardo, M., & other VETF members. (2007). The definition and assessment of vitiligo: a consensus report of the Vitiligo European Task Force. *Pigment Cell Research*, *20*(1), 27-35.
2. Wong, P. C., Leung, Y. Y., Li, E. K., & Tam, L. S. (2012). Measuring disease activity in psoriatic arthritis. *International journal of rheumatology*, *2012*.
3. Feily, A. (2014). Vitiligo Extent Tensity Index (VETI) score: a new definition, assessment and treatment evaluation criteria in vitiligo. *Dermatology practical & conceptual*, *4*(4), 81.
4. Nugroho, H., Ahmad Fadzil, M. H., Shamsudin, N., & Hussein, S. H. (2013). Computerised image analysis of vitiligo lesion: evaluation using manually defined lesion areas. *Skin Research and Technology*, *19*(1), e72-e77.
5. Nugroho, H., Fadzil, M. A., Yap, V. V., Norashikin, S., & Suraiya, H. H. (2007, August). Determination of skin repigmentation progression. In *2007 29th Annual International Conference of the IEEE Engineering in Medicine and Biology Society* (pp. 3442-3445). IEEE.
6. Nurhudatiana, A. (2015, March). A Computer-Aided Diagnosis System for Vitiligo Assessment: A Segmentation Algorithm. In *International Conference on Soft Computing, Intelligence Systems, and Information Technology* (pp. 323-331). Springer, Berlin, Heidelberg.

Describe the final product:

The invention objectively quantifies the effect of treatment in vitiligo patients by non-invasively assessing the dermoscopic images. This would aid in ease the task of the dermatologists, since, the system would have the capability to store the before treatment images and determine the extent of vitiligo effected areas. The methodology is embedded in a portable application that can be embedded in a portable mobile device with a user friendly interface.

Technological Domain (Keywords):

VITILIGO, DERMOSCOPY, ROI (REGION OF INTEREST), SEGMENTATION, TREATMENT PROGRESSION.

Proof of Concept:

To assess the degree of repigmentation in order to quantify the success in Vitiligo treatment. A computer aided image analysis tool is developed. The Fig. 1 depicts the block diagram of the proposed system

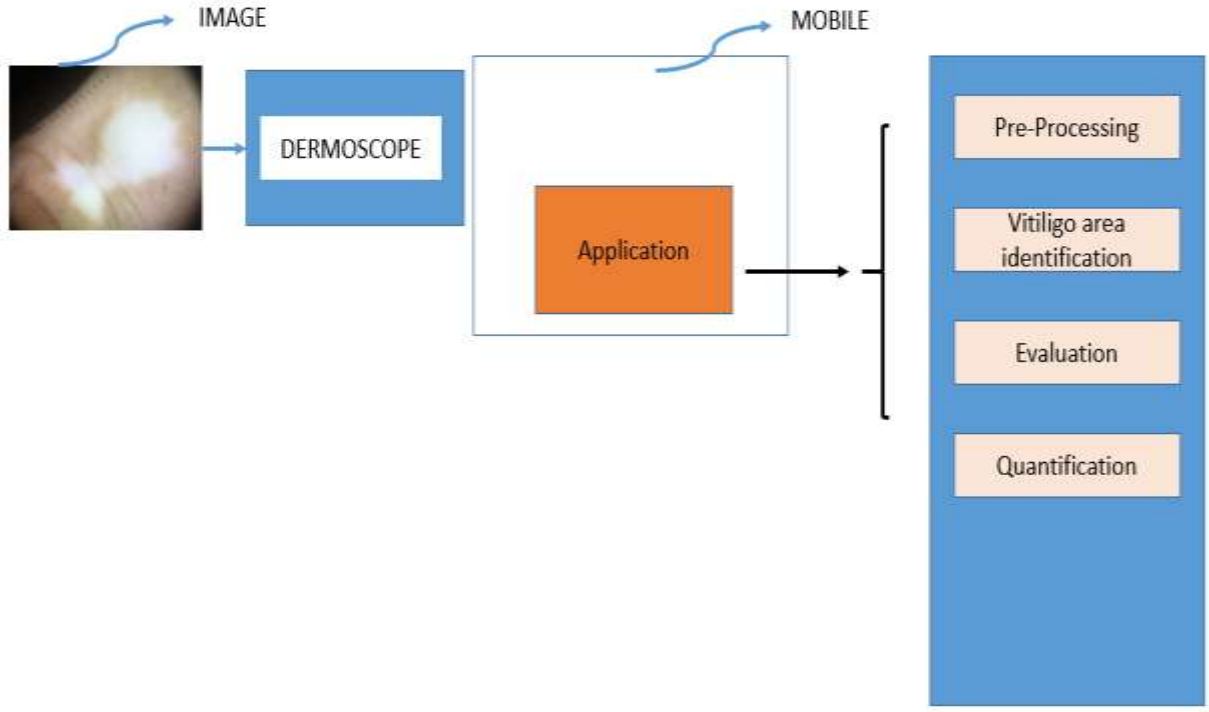

Fig. 1. Overview of the proposed system

Initially the dermoscopic image $I(x, y)$ is pre-processed by considering the contrast enhanced CIEXYZ tristimulus color space. The second stage of pre-processing involves creation of an intensity image and coarse identification of pigmented vitiligo areas. The contrast enhanced XYZ color space is converted to HSV color space. Further, the V channel is used for processing. The ROI pixels are highlighted by considering the difference between the average of the pixels and the image pixels. The aforementioned step results in significant intensity difference between the ROI and NROI areas. Further, a coarsely identified ROI is obtained by considering the intensity values greater than zero. A new channel $Y(x, y)$ is formed by concatenating the previously obtained intermediate channels. The intensity image that will be subjected to the thresholding is computed by taking the Euclidean distance of each pixel to the maximum value of the corresponding channel. The resultant intensity image is created to highlight the vitiligo skin areas. The intensity image is now subjected to thresholding.

Stage of Development:
Ideation/Prototype/Advanced Prototype/Ready to Market technology: Prototype

Provide Information on Competitors who manufacture and/or sell similar products: NA

What are the unique advantages your innovation has compared to the competition:
A mobile application to assess the degree of repigmentation that defines success in Vitiligo treatment.

The system would ease the task of the dermatologist and can be adopted in a clinical setting, for mask screening of vitiligo patients.

A few potential companies who might be interested in this technology: HEALTHCARE COMPANIES

Intellectual Property Status: Indian Patent application with number **202041003116** filed in (mention year)