Acquisition and Image Processing System for Digital Dermatoscopy

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Abstract

Skin, hair and scalp analysis is an important task for dermatologic clinics. The dermatoscope is a large used device applied to analyze skin, hair or scalp problems The LaPSI Digital Dermatoscope is a low cost solution to any surface inspection, providing the user the possibility of acquiring images during the treatment in order to present to the patients the evolution, generating a database for treatment and progress analysis.

1. Introduction

The diagnosis of skin and scalp lesions is based mainly on visual features. The typical skin, hair and scalp exam is made usually using a magnifying glass or a dermatoscope. Several times along the treatment, the patient is examinated by the dermatologist in order to evaluate the evolution of the lesion. For this reason, storing the tissue lesion pictures is helpful in order to improve the diagnosis and prescriptions.

Computer aided examination is an early research in dermatology [1]. Several companies around the world developed the video dermatoscope system, which is a normal dermatoscope with a camera connected to a computer.

We propose a software and hardware low cost system specific to acquiring and treating dermatologic images, the LaPSI Digital Dermatoscope (LDD) [2]. The LDD allows the dermatologist to keep records of the patient's treatment and present the evolution of the skin or hair conditions. Furthermore, the skin, scalp or hair images may be sent by internet in order to provide diagnostic from doctors in different cities or countries.

2. Hardware

The hardware is based on a webcam as presented on diagram of figure 1. The prototype is shown in figure 2.

The image acquisition sensor and USB interface was based on a webcam device.

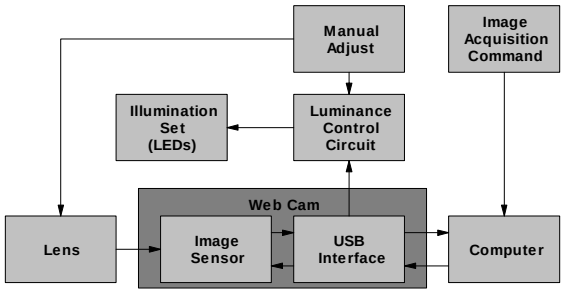

Figure 1. The LDD hardware system diagram.

The proposed hardware is connected to any computer with a USB connection.

The original sensor lens set has been replaced by another, which characteristics are more appropriated to the system. Also, the user may adjust the focus of the lens.

The illumination is a difficult task in skin image acquisition. Non uniform illumination may lead to totally different diagnosis [1]. In order to uniform the acquisition, the system has an illumination set (eight high brightness white LEDs) in order to provide constant illumination to the surface under analysis. The user may control the illumination by a manual adjust. The luminance control circuit provides the energy to the illuminations set only while the software request information from the sensor in order to save battery charge.

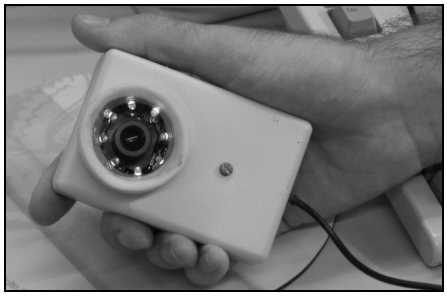

Figure 2. The LDD. The system is connected to the USB interface of the computer.

The image acquisition commands are five. Acquire image, show first, last, next or previous images.

The size of the tissue region that the sensor may capture is around 0.88 cm^2, in a field of 1.1 cm to 0.8 cm, as shown in figure 4.

3. Software

The software was developed for Windows® and runs the image acquisition and processing operations for dermatoscopy analysis [1,3]. The software performs some image processing functions such as filtering, color equalization and grid. These functions, as the main software, were developed using the LaPSI Image Processing Library (*lili*) [4]. A set of images may be captured in the computer memory and then the most significant ones can be select to be saved in files. Figure 3 shows the graphic interface of the LDD during an examination.

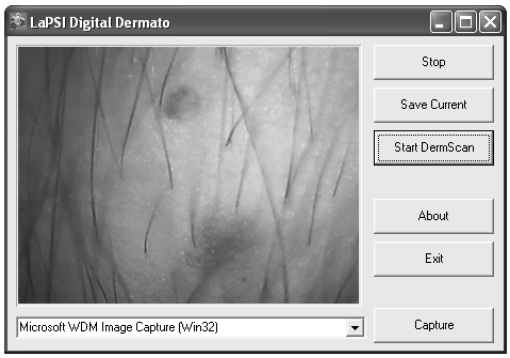

Figure 3. The LDD graphic interface.

4. Results

The use of a webcam to acquire skin, hair and scalp images was validated by means of the image acquisition of different types of samples, considering both skin and hair colors. Some acquired images are shown in figures 4 and 5.

Figure 4. Skin image acquired using the LDD.

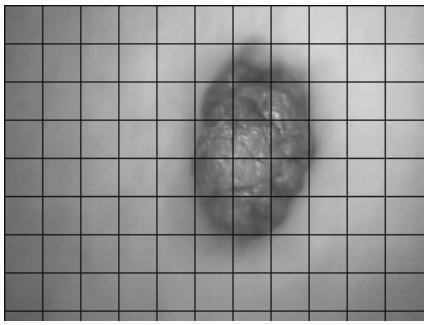

Figure 5. Skin image acquired using the LDD.

5. Conclusion

The LDD was developed using a webcam, and the system total cost is about 20% of similar systems available in the US and Europe markets. The system resolution is compatible with the commercial systems.

The use of the *lili* library helped the implementation of several system functionalities and algorithms, as controlling several acquisitions parameters and filtering.

Also, the LDD allows the development of computer aided diagnosis, using image processing functions to segmentation and analysis.

6. Future Works

We intend to include several automatic analysis in the system, such as color, symmetry and edge in order to help the diagnostic [1,4]. In order to aid the management of the generated image files, is proposed storing all images in the same file, including data from the exams and the patient [3].

7. References

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