Chapter 54
Analysis of Valuable Techniques and Algorithms Used in Automated Skin Lesion Recognition Systems

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ABSTRACT

Application of computational intelligence techniques helps physicians as well as dermatologists in faster data process to give better and more reliable diagnoses. The whole system is categorized as: Preprocessing the lesion image to enhance its readability, Segmentation of the Lesion from skin, Feature extraction, selection, and finally the identification of dermoscopic images. Pros and cons of various methods are focused to provide a help for the researchers starting work in automated lesion detection system. Numerous computerized diagnostic systems have been reported in which different border detection, feature extraction, selection, and classification algorithms are used. The aim of this review is to summarize and compare advanced dermoscopic algorithms used for the classification of skin lesions and discuss important issues affecting the success of classification. This paper will be a guide that represents a comprehensive guideline for selecting suitable algorithms needed for different steps of automatic diagnostic procedure for ensuring timely diagnosis of skin cancer.

INTRODUCTION

In skin cancer, the ratio of malignant melanoma and non-melanoma patients is increasing day by day, in particular among people with white skin. There are many different ways of diagnoses for skin cancer which makes it difficult even for expert dermatologists to give accurate diagnosis physically. Automated lesion detection systems is the main idea used in the finding of pigmented skin lesions. By reason of the complication and difficulty of human understanding, automated analysis of dermoscopy images has

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Figure 1. Skin cancer images (Ph2 Data Set, 2013)

turn into an important study and research area. An automated skin cancer detection system follows step by step procedure to detect lesion. Figure 1 is showing different types of malignant skin cancers that can lead to patient death.

To help diagnosing pigmented skin lesions, high performance computer aided investigative systems help the physicians to avoid misdiagnosis. The common approaches to skin lesion early detection include different steps of Preprocessing and Segmentation (Siegel, Naishadham, and Jemal, 2012).

The output of each step is the input of next step. Preprocessing as the first stage of computer aided cancer diagnostics has seriously effects on misleading the results (Society & A.C, 2012). The success of such systems critically depends on pre-processing (C.W.O., 2010). Preprocessing step can be divided into image enhancement, image restoration and artifact removal. Each stage includes different techniques which will be discussed in this paper. In Figure 2, a topology of automated skin lesion detection system is presented that describes the summarized information regarding first stage pre-processing, second stage segmentation, third stage feature extraction and selection and the final and most important stage classification and the details of different researchers worked on it.

This article is ordered in the following pattern. In background, previous information regarding different phases of system is explored to highlight its significance. Next stages of automated system are presented in detail. In last conclusion is described to precisely to comment the entire material.

The main objective of the article is to combine the research being done related to all the steps needed for developing an automatic diagnostic system for skin cancer detection and classification. Second, it presents knowledge that help the researchers judge the importance of high level feature extraction and proper feature selection methods which needs more effort for making correct diagnosis of dangerous cancer. Third, it proposed a topology of the techniques and algorithms that are used by the researchers relevant to entire system phases to help new researchers to start with good details of techniques at one place.

Background

The frequency of skin cancer incidence is growing day by day. Estimated 1,665,540 new cases of malignant melanoma were diagnosed in USA in 2014. About 585,720 Americans are expected to die of