

Chapter 56

A Study on Automatic Segmentation and Classification of Skin Lesions in Dermoscopic Images

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ABSTRACT

Malignant Melanoma is one of the rare and the deadliest form of skin cancer if left untreated. Death rate due to this cancer is three times more than all other skin-related malignancies combined. Incidence rates of melanoma have been increasing, especially among young adults, but survival rates are high if detected early. There is a need for an automated system to assess a patient's risk of melanoma using digital dermoscopy, that is, a skin imaging technique widely used for pigmented skin lesion inspection. Although many automated and semi-automated methods are available to diagnose skin cancer but each has its own limitations and there is no final, state-of-the art technique to date which is able to be implemented in real scenario. This survey paper is based on techniques used to segment the skin cancer, analysis of their merits and demerits and their applications on advanced imaging techniques.

INTRODUCTION

Melanoma is a type of skin cancer which consists of melanocytes (pigment-containing cells in the skin). In recent statistical, the most fatal type of skin cancer caused by Melanoma. The reason is melanoma caused for around 75% of Mortality related with skin cancer. As statistical studies in the United States, It shows that 76,690 patient with melanoma and 9,480 of them will pass away of melanoma in 2013 (Public Health Agency of Canada, 2013) . In addition, in Canada, 1 in 74 male and 1 in 90 female will be infected of melanoma in their life. After applying some of studies of the melanoma trends from 1992-2006, the researchers found that for non-Hispanic white males and females, incidence rates were increasing at

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an annual rate of approximately 3%. For adults; ages 15-30, melanoma is the most common diagnose types of cancer (Public Health Agency of Canada, 2013; Diepgen and Mahler, 2002). If melanoma is discovered in early stage, Stage I (less than 0.76mm thick), the rate of remaining alive for 5-years is 96%. However, if the melanoma is in Stage IV, it decreases to 5%. More and more, the treatment cost of melanoma in Stage IV is 30 times the treatment cost of melanoma in Stage I. So, early melanoma examination is helpful (Jerant, Anthony, Jennifer, Sheridan, and Timothy, 2000). Dermatoscope is a helpful tool to assist dermatologist consultants for diagnosis. It is a small device that illuminates, magnifies and enhances skin lesions, helping dermatologist to view the lesion features greatly. Comparing to the naked eye, using the dermatoscope has been improved the diagnosis. With following the ABCD scale and using a dermatoscope, diagnosis of skin lesions as malignant melanoma has a reported sensitivity of 76.0-87.7% and specificity of 61.0- 77.8%. However, in the United States, the dermatologists reported only 48% using a dermatoscope. The against using of dermatoscope causes of a lack of training or interest (Howlader et al, 2013).

The proposed research work comes under the domain of information systems for decision making activities. These systems are popularly known as Decision Support System. Decision support systems have been deployed in many areas like corporate sector, education institutions, government sector, defense organizations and medical domain etc. Decision support systems for medical applications are gaining much popularity these days among researchers and encouraging them to propose effective and efficient novel solutions to many real life problems in medical domain (Jemal et al, 2011) . Medical Decision Support System have been in practice since last few decades and performing a commendable job by assisting medical and clinical experts to make successful decisions to diagnose various types of diseases. Malignant Melanoma is one of the rare and the deadliest form of skin cancer if left untreated. Death rate due to this cancer is three times more than all other skin-related malignancies combined. Incidence rates of melanoma have been increasing, especially among young adults, but survival rates are high if detected early. Unfortunately, the time and costs required for dermatologists to screen all patients for melanoma are prohibitively expensive. There is a need for an automated system to assess a patient's risk of melanoma using digital dermoscopy, that is, a skin imaging technique widely used for pigmented skin lesion inspection. One challenge in implementing such a system is locating the skin lesion in the digital image. Most existing skin lesion segmentation algorithms are affected due to the presence of noise such as illumination variation like shadows, hairs, low contrast and specular reflections in digital images. It complicates the task of finding skin lesion in the presence of these abnormalities. Existing systems on skin cancer detection are also quite costly and computationally extensive (Bleyer, O'Leary, Barr and Ries, 2006). This paper will address these problems by reviewing existing researches in order to detect skin cancer.

LITERATURE REVIEW

Segmentation of Skin Cancer

For the special problem of skin lesion segmentation, mainly region-based segmentation methods are applied, and within this category the thresholding operation is most often used. Despite of existing research in decision support systems design there exists plenty of room for researchers to explore this research area and propose effective and efficient decision support systems for recognition. In medical

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