



COMPARATIVE STUDY OF MELANOMA DETECTION TECHNIQUES

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Abstract

Melanoma is the most dangerous form of skin cancer that develops from the pigment producing cells known as melanocytes. Melanoma skin cancer has been increasingly identified as the major cause of deaths. Melanoma is a condition or a disorder that develops from the melanocytes, which produce a pigment known as melanin. So melanoma regions appear as black or brown in colour. But some of them doesn't produce melanin, they appear as pink, tan or white colour. So an effective melanoma detection technique is needed. This paper surveys the research work performed regarding the topic. In this paper, a detailed study of melanoma detection is provided. However, this technology is still in its nascent stage and needs considerable improvement to be commercial. Through this, a more user-friendly technique is obtained for the detection of melanoma. Experimental results on a PH2 dermoscopy research database images confirms the efficiency of our system.

Keywords: Skin cancer, Melanoma, SVM Classifier, Thresholding, Segmentation

I. INTRODUCTION

A. Background and Motivation

Skin cancers are cancers that arise from the skin. They are due to the development of abnormal cells that have the ability to invade or spread to other parts of the body. There are three main types of skin cancers: basal-cell skin cancer (BCC), squamous cell skin cancer (SCC) and melanoma. The first two, along with a number of less common skin cancers, are known as non melanoma skin cancer (NMSC). Basal-cell cancer grows slowly and can damage the tissue

around it but is unlikely to spread to distant areas or result in death. It often appears as a painless raised area of skin, that may be shiny with small blood vessel running over it or may present as a raised area with an ulcer. Squamous-cell skin cancer is more likely to spread. It usually presents as a hard lump with a scaly top but may also form an ulcer. Melanomas are the most aggressive. Signs include a mole that has changed in size, shape, color, has irregular edges, has more than one color, is itchy or bleeds.. A skin that has inadequate melanin is exposed to the risk of sunburn as well as harmful ultraviolet rays from the sun[1]. Clinical analysis and biopsy tests are commonly used.

Clinical analysis is done using a dermatoscope by trained dermatologists. A dermatoscope is an optical device used by the dermatologists to get a magnified and enhanced view of skin structure using skin surface reflection. Proper melanoma detection method is needed to detect and diagnose melanoma in the initial stage itself. Concerned scholars have put up into research in order to establish the biology behind early diagnosis melanoma. Research evidences have shown that it is easy to diagnose and control or rather prevent melanoma at its early stages than during its later stages. Researchers have established that there are numerous methods that are used to diagnose melanoma[2]. Some of the remarkable methods include Seven Point Checklist, CASH (color, architecture, symmetry, and homogeneity) and ABCDE (Asymmetry, Border, Color, Diameter, Evolving) etc[6]. Melanoma rates have been increasing steadily for 30 years. For white people it is 20 times more common than in African Americans. Overall, during the lifetime, the risk of getting melanoma is approximately 2% (1 in

50) for whites, 0.1% (1 in 1,000) for blacks, and 0.5% (1 in 200) for Hispanics[8] and [4].

II. RELATED WORK

Malignant Melanoma is one of the deadly skin cancer that is more prevalent to people between the age of 15 years and above [3]. Research shows that failure to detect and diagnose the disease at its initial stages lead to development of lethal advanced melanoma [7]. Upon a careful review of literature, some of the notable clinical algorithms include ,

I. ABCD Rule Based Melanoma Detection

ABCD (asymmetry, border irregularity, colour and dermoscopic structure) rule of dermoscopy is a improving method used by dermatologists to improve dermoscopy findings and effectively separate melanoma from lesions. Detection of melanoma based on ABCD rule enable earlier detection. In this study, Pre-processing enables detection of hair using Gabor filters and contour using geodesic active contours. Feature extraction is based on ABCD parameters. This methods combine existing methods with new way of detecting colour ,border,asymmetry and dermoscopic structures for classifying melanoma or benign nevus and also total dermoscopy score or value is calculated.[10]

II. Real Time Image Analysis System for Early Detection And Detection of Melanoma

It present an image recognition technique, the user can able capture images of different mole types. For data acquisition, this method use PH2 dermoscopy images. Uses k-Nearest Neighbor (kNN) classifier for all classifiers. This method analyze and process the images and alert the user at real-time to seek medical help urgently. Also a more sophisticated pattern recognition methods will be implemented. It provides an automatic method for melanoma prevention and detection.[7]

III. Melanoma Detection Based On Fuzzy C-Means Clustering

Another method for melanoma detection is Fuzzy C-Means (FCM). The method contains data processing architecture, including pre processing (contrast stretching), main processing (FCM) and post-processing (morphological

erosion). Contrast stretching phase is for stretching the range of pixel intensities of the input image to occupy a larger dynamic range in the output image. This is followed by the FCM algorithm for main processing, which automatically divides the data provided by the contrast stretching phase into two clusters ie, lesion and skin. For post processing it uses morphological erosion of the segmented image, where the structuring element is translated over each pixel of the object, so as to overcome typical irregularities between lesion and skin and identify whether it is skin lesion or not. [5]

IV. Based on Geometric Features

Use of geometric features to differentiate between a benign lesion and a malignant one. The k-Nearest Neighbors (kNN) machine learning algorithm is used to classify 15 lesions based on their ABD features. An accuracy of 89% was obtained on the testing set.[11]

V. SVM-based Texture Classification

A three-layer mechanism that inherent to the support vector machine (SVM) methodology is employed to improve the generalization error rate and the computational efficiency. The performance of the algorithm is validated with a series of benchmark texture images and then tested on 22 pairs of real clinical skin lesion images.[4]

3. Limitations of existing method

There are various types of melanoma detection technique. Most of them are SVM-based Texture Classification and Segmentation technique, Non invasive automatic melanoma detection etc.. But these methods has many disadvantages a few of them are complex ,time consuming and Inability to detect structures, Calculation process of these features are complex and also it is less accurate. Also for these method the calculation process is simple but there is no well defined algorithm .According to the comparative study ABCD method based melanoma detection avoid all these problems .It is based on computer aided melanoma detection. It is more simple, cost effective, and less human effort is needed and also calculation process is not complex.[10]

6. Result and Conclusion

Table 1: Comparison of various methods

Method	Accuracy
SVM[4]	70%
Skincure[7]	70%
ABD[11]	89%
ABCD[10]	91.25%

In this paper we presented the comparative study of malignant melanoma prevention and early detection. Table 1. shows the comparative study of various methods. From these comparative study it is identified that ABCD rule based melanoma detection is more accurate as compared to others. It is a visual examination based automatic melanoma detection algorithm for efficient detection of melanoma. But drawbacks of Abcd method is that it is more complex. Future work is focus on more accurate and less complex method for effective detection of melanoma.

7. References

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