Volume 5, Issue 4, April 2015 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

A Review of Computer Aided Diagnostic Approaches for Skin Cancer

Reshu Bansal*, Meenu Saini
ECE, Kurukshetra University Kurukshetra,
Haryana, India

Abstract: ***It is well-known that early finding and treatment of skin cancer can reduce the mortality and morbidity of patients The features should provide distinguishing quantitative measures to automatically diagnose the cancer. The most important challenge is the system evaluation before the task of diagnosis. Because of the limited amount of available data there might be a considerable amount of bias if the system evaluation is not conducted properly. This paper provides a survey on the computational steps required to automatically diagnose skin cancer by using various images such as stain images of biopsy, skin camera images etc. In this paper we address the challenges, and the remedies offered by these techniques to overcome the challenges.***

Keywords: TDV, FBSM, GVF

I. INTRODUCTION

This document is a template. An electronic copy can be downloaded from the conference website. For questions on paper guidelines, please contact the conference publications committee as indicated on the conference website. Information about final paper submission is available from the conference website.

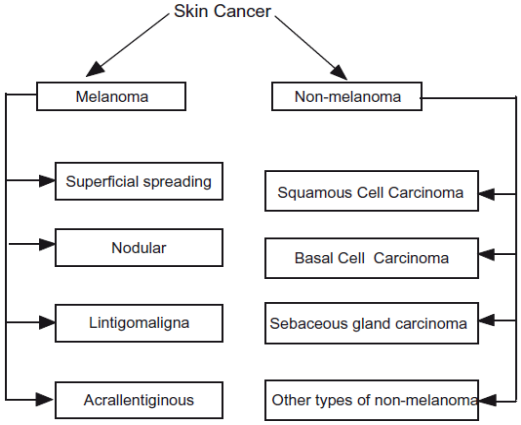
II. IMAGE

An image is an array, or a matrix, of square pixels (picture elements) arranged in columns and rows.
Image processing is any form of signal processing for which the input is an image, such as a photographer video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most techniques of image processing involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it.
Image processing are computer graphics and computer vision. In computer graphics, images are made manually from physical models of objects, environments, and lighting, from natural scenes. Image Processing forms core research area within engineering and computer science disciplines too.
Image processing are computer graphics and computer vision. In computer graphics, images are made manually from physical models of objects, environments, and lighting, from natural scenes. Image Processing forms core research area within engineering and computer science disciplines too.

III. HUMAN CANCER

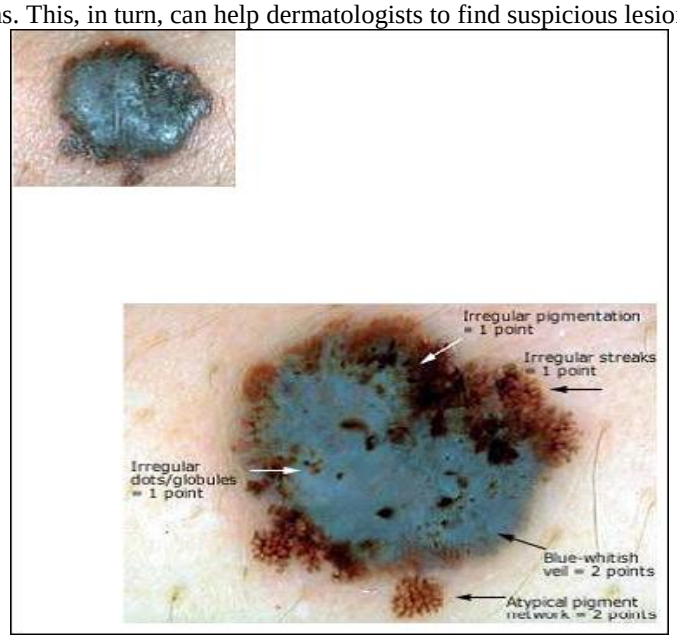
Human Cancer is a complex disease caused primarily by genetic instability and accumulation of multiple molecular alternations. Among many types of cancer, Skin cancers are the most common form of cancers in human. Skin cancer is a major public health problem in the light skinned population.
There are two major types of skin cancer,

a. Alignant melanoma
b. non-melanoma



Melanoma is more dangerous and can be fatal if not treated. If melanoma is detected in its early stages, it is highly curable, yet advanced melanoma is lethal.

Dermatologists can diagnose melanoma in about 80% of cases. Digital dermatoscopy could give dermatologists a closer look at suspicious skin lesions. This, in turn, can help dermatologists to find suspicious lesions in an early step.



To measure and detect sets of features from dermoscopic images, the computerized analysis of these images can be extremely useful and helpful for dermatologists in order to facilitate their diagnosis. Based on images obtained by digital dermoscopy, conclusive aim is to develop an aided-diagnostic system for the identification of early stage melanomas. This would enable supervised classification of melanocytic lesions.

A. Dermoscopy a non-invasive diagnostic technique for the in vivo observation of pigmented skin lesions, which uses optical magnification and liquid immersion or polarized lightning to achieve better visualization of surface and subsurface structures of the skin To increase the clinical applicability of dermoscopy, several diagnostic algorithms have been proposed during the last decades, being the ABCD rule one of the methods which become more widely accepted by clinicians. The ABCD rule is based on the analysis of four different criteria: asymmetry (A), border (B), color (C) and differential structures (D). Each criteria is analyzed semi-quantitatively and multiplied by a given weight factor in order to obtain the Total Dermoscopy Score.

B. Color Enhancement which is based on the color correction with HSV model. In this approach, linear regression models are constructed for each channel, which allows automatic adjustment of the hue and saturation Melanomas are characterized by the presence of six different colors, namely, black, red, light brown, dark brown, blue-gray and white. For each present color, we add 1 to the score.

C. Feature extraction plays an important role which is used as a weapon to analyze an image. In order to achieve an effective way to identify skin cancer at an early stage without performing any unnecessary skin biopsies, digital images of the melanoma skin lesions have been investigated this is achieved by using feature extraction method. Different digital images have been analyzed based on unsupervised or automatic segmentations segmentation techniques. Feature extraction is based on the so-called ABCD-rule of dermatoscopy ABCD represent the asymmetry, border structure, color variation, and dermatoscopical structure so called diameter of the lesion and define the basis for a diagnosis by a dermatologist.

D. Segmentation It refers to the partitioning of an image into disjoint regions that are homogeneous with respect to a chosen property such as luminance, color, texture, etc. The segmentation is the most important stage for analyzing image properly since it affects the accuracy of the subsequent steps.The aim of the image segmentation stage is to extract the lesion area from the healthy skin. Segmentation methods can be roughly classified into the following categories:

i. Histogram thresholding: These methods involve the determination of one or more histogram threshold values that separate the objects from the background.
ii. Clustering: These methods involve the partitioning of a color (feature) space into homogeneous regions using unsupervised clustering algorithms.
iii. Edge-based: These methods involve the detection of edges between the regions using edge operators.
iv. Region-based: These methods involve the grouping of pixels into homogeneous regions using region merging, region splitting, or both.
v. Morphological: These methods involve the detection of object contours from predetermined seeds using the watershed transform.
vi. Model-based: These methods involve the modeling of images as random fields whose parameters are determined using various optimization procedures.
vii. Active contours (snakes and their variants): These methods involve the detection of object contours using curve evolution techniques.
viii. Soft computing: These methods involve the classification of pixels using soft computing techniques including neural networks, fuzzy logic, and evolutionary computation.

IV. RELATED WORK

A number of journals and research papers published during the above span 2014-2013 have been studied. The various aspects of the problem were studied.

A. Different types of images

Mahmoud Elgamal(2010),This paper presents two hybrid techniques for the classification of the skin images to predict it if exists. The proposed hybrid techniques consists of three stages, namely, feature extraction, dimensionality reduction, and classification. In the first stage, we have obtained the features related with images using discrete wavelet transformation. In the second stage, the features of skin images have been reduced using principle component analysis to the more essential features. In the classification stage, two classifiers based on supervised machine learning have been developed. The first classifier based on feed forward back-propagation artificial neural network and the second classifier based on k-nearest neighbor. The classifiers have been used to classify subjects as normal or abnormal skin cancer images. A classification with a success of 95% and 97.5% has been obtained by the two proposed classifiers and respectively. This result shows that the proposed hybrid techniques are robust and effective.

B. Diagnosis of Melanoma

i. Nadia Smaoui, Souhir Bessassi, In this paper, the proposed work is based on a combination of a segmentation method and an analytical method and aims to improve these two methods in order to develop an interface that can assist dermatologists in the diagnostic phase. As a first step, a sequence of preprocessing is implemented to remove noise and unwanted structures from the image. Then, an automatic segmentation approach locates the skin lesion. The next step is feature extraction followed by the ABCD rule to make the diagnosis through the calculation of the TDV score. In this research, three diagnosis are used which are melanoma, suspicious, and benign skin lesion. The experiment uses 40 images containing suspicious melanoma skin cancer. Based on the experiment, the accuracy of the system is 92% which reflects its viability.

ii. Apoorva Raikar,In tis paper.An image based system implementing diagnostic method is discussed for the automatic detection of melanomas as support to clinicians. Early detection of melanoma is one of the greatest challenges of dermatologic practice today. A new diagnostic method, the "ELM 7 point checklist", defines a set of seven features, based on color and texture parameters, which describe the malignancy of a lesion. As Dermoscopy is an in vivo method for the early diagnosis of malignant melanoma and the differential diagnosis of pigmented lesions of the skin, it has been shown to increase diagnostic accuracy over clinical visual inspection in the hands of experienced physicians.

C. Diagnosis of skin lesions

i. Luís Filipe Caeiro Margalho Guerra Rosado, This paper aims to develop a prototype capable of segmenting skin lesions in dermoscopy images and classify them based on visual characteristics, particularly in detecting melanomas and separate them from other lesions. This work took as starting point the ABCD rule, which is based on visual features, and for which was developed algorithms to measure and quantify them. The proposed model is divided into three distinct stages: 1) Segmentation: implementation of a segmentation algorithm of dermoscopy images in order to determine the border of the lesion, based on the analysis of peaks and valleys of the histogram. 2)Feature extraction: definition of the features to use (asymmetry, color, border and differential structures) and development of routines for their automatic detection. 3) Classification: development of methods for automatic classification of dermoscopic images. The images were classified through a supervised method (classification is made taking into account the image analysis by a specialist), using a thresholding method, a k-nearest neighbors classifier and a Support Vector Machines classification.

ii. Rajvi Parikh, Dr Hitesh shah, In this paper, computer diagnostic tools enable objective judgments by making use of quantitative measures. The basic three steps are there to achieve the results i.e. 1) image processing 2) Feature extraction 3) Classification. Step 1 deal with noise reduction artifacts removing, step 2 deals with extracting variety of information fro the processes image for accurate detection and step 3 deals with results that say various types of skin lesions. In this paper we are showing the process of it and also discussed some clinical diagnosis methods which is being incorporated with the tool for detecting the type of lesion.

iii. Paul Wighton, Tim K. Lee, Harvey Lui, David I. McLean, and M. Stella Atkins, In this paper a general model using supervised learning and MAP estimation that is capable of performing many common tasks in automated skin lesion diagnosis.We apply our model to segment skin lesions, detect occluding hair, and identify the dermoscopic structure *pigment network*. Quantitative results are presented for segmentation and hair detection and are competitive when compared to other specialized methods. Additionally, we leverage the probabilistic nature of the model to produce receiver operating characteristic curves, show compelling visualizations of *pigment networks*, and provide confidence intervals on segmentations.

D. Segmentation methods

Margarida Silveira, In this paper, we propose and evaluate six methods for the segmentation of skin lesions in dermoscopic images. This set includes some state of the art techniques which have been successfully used in many medical imaging problems (gradient vector flow (GVF) and the level set method of Chan *et al.* [(C-LS)]. It also includes a set of methods developed by the authors which were tailored to this particular application (adaptive thresholding (AT), adaptive snake (AS), EMlevel set [(EM-LS), and fuzzy-based splitand- merge algorithm (FBSM)]. The segmentation methods were applied to 100 dermoscopic images and evaluated with four different metrics, using the segmentation result obtained by an experienced dermatologist as the ground truth. The best results were obtained by the AS and EM-LS methods, which are semi-supervised methods. The best fully automatic method was FBSM, with results only slightly worse than AS and EM-LS.

E. Feature extraction

Md.Amran Hossen Bhuiyan, Ibrahim Azad, Md.Kamal Uddin, In this paper, different digital images have been analyzed based on unsupervised segmentation techniques. Feature extraction techniques are then applied on these segmented images. After this, a comprehensive discussion has been explored based on the obtained results. To achieve this goal, feature extraction is considered as an essential-weapon to analyze an image appropriately. In this paper, different digital images have been analyzed based on unsupervised segmentation techniques.

Table 1. Some of the recent proposed automatic methods for analyzing dermoscopy images.

YEAR	SEGMENTATION METHOD	CLASSIFIER	CONCLUSION
2001	Thresholding+ Color Clustering	K-Nearest Neighbour	Feature selection based on ABCD rule.
2002	Thresholding	Artificial Neural Network	Features grouped into 4 categories (geometry,color,texture and islands of color).
2008	Clustering+Region Growing	Artificial Neural Network	Feature selection based On ABCD rule.
2007	Thresholding+ Color clustering	K-Nearest Neighbour	Feature selection based on ABCD rule.
2013	k-mean Clustering segmentation method	K-Mean Clustering Algorithm	Three unsupervised segmentation method for skin lesions have been discussed.

V. CONCLUSION

Many experimental researches attempt to build automatic skin cancer detection and improve the accuracy of diagnosis. The literatures on these attempts are reviewed. The conducted survey indicates feature selection methods can improve the classification complexity through minimizing the utilized number of features. However, a classification method affects the performance gain in terms of accuracy.

REFERENCES

[1] .Mahmoud Elgamal,"Automatic *Detection of skin Cancer(IJACSA)* International Journal of Advanced Computer Science and Applications,Vol. 4, No. 3,.

[2] Nadia Smaoui," *A developed system for melanoma diagnosis*" International Journal of Computer Vision and Signal Processing, 3(1), 10-17(2013).

[3] Apoorva Raikar**,"** *Diagnosis of Melanomas by Check-list Method*" 4th ICCCNT – 2013 July 4 - 6, 2013, Tiruchengode, India.

[4] Luís Filipe Caeiro Margalho Guerra Rosado**,**" *Automatic System for Diagnosis of Skin Lesions Based on Dermoscopic Image***s"**.

[5] Rajiv Parikh, ,**"** *A Survey on Computer Vision Based Diagnosis for Rkin Lesion Detection*" International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 2, March 2013

[6] Paul Wighton**,**" Generalizing Common Tasks in Automated Skin Lesion Diagnosis" IEEE, VOL. 15, NO. 4, JULY 2011..

[7] Margarida Silveira,*"Comparison of segmentation Methods for Melanomas Diagnosis in Dermoscopy Images*" IEEE, Vol.3,No. 1, February 2009

[8] Md.Amran Hossen Bhuiyan,**"** *Image Processing for Skin Cancer Features Extraction*" International Journal of Scientific & Engineering Research Volume 4, Issue 2, February-2013

