Melanoma Analysis using Dermoscopy Images

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ABSTRACT--- Melanoma is the most dangerous type of skin cancer. Uncontrolled growth of cancer cells are mostly occurs in melanocytes. In spite of, to prevent its deadly consequences and for treatment to be efficient, to perform the early diagnostic of the melanoma efficient treatment is necessary. The diagnostic of melanoma, without any support is not possible, therefore dermoscopy was created. Dermoscopy is a device used for examination of skin lesions with a dermatoscope. Dermoscopy images are collected from Dermweb. The standard approach in automatic dermoscopic image analysis has three stages: (i) Image segmentation (ii) Feature extraction and feature selections (iii) Lesion classifications. Skin lesions are classified using SVM (Support Vector Machine) classifier. The skin lesions may be Melanoma, BCC, SK and Nevus.

KEYWORDS--- melanoma; dermoscopy; SVM classifier; segmentation.

I.INTRODUCTION

Melanoma is the dangerous skin cancer and accounts for about 75% of deaths associated with skin cancer. To improve the diagnostic performance of melanoma, Dermoscopy technique has been developed. Dermoscopy is a noninvasive skin imaging technique of acquiring a magnified and illuminated image of a region of skin for increased clarity of the spots on the skin. It enhances the visual effect of skin lesion by removing surface reflection of skin.

Skin cancer is defined as the uncontrolled growth of cells in the skin due to the spreading of skin cancer cells rapidly and it forms the malignant tumor. The main causes of skin cancer is the over exposure of ultraviolet radiation from sunshine, genetic defects. Skin cancer can be mainly classified as three types such as Basal cell carcinoma (BCC), Melanoma, and Squamous cell carcinoma (SCC). BCC and SCC are called as non-melanomas. Uncontrolled growth of lesions that rise in basal cells in the skin is called as BCC. Squamous-cell carcinoma (SCC) is a cancer which occurs in squamous cell. It spreads faster to other parts in the body. The virulent form of skin cancer is melanoma which arises in the melanocytes cell.

The paper [1], [2] notifies the segmentation based on thresholding. By using a certain threshold value, the lesion will be segmented i.e., 1's denotes the lesion foreground and 0's denotes the lesion background by comparing each pixel with certain threshold value. Analyzing dermoscopy images have a high differentiation between lesion and skin of the images. Improved internet based melanoma detection cannot be applied for multimodal images.

Several methods are proposed to diagnose the skin lesions for dermoscopy images, like that of the ABCD rule of dermoscopy, 7-point checklist, ELM pattern analysis and CASH algorithm [3]. Previous algorithms are not having the ability to withstand the diagnosis results are difficult. Therefore, an Automatic CAD (Computer Aided Diagnosis) tools are needed, because to achieve the analysis of pigmented skin lesions for dermoscopy images. An automatic method to segment the lesion was proposed by Nikhil Cheerlead al. [4]. Otsu and local binary pattern (LBP) methods are used for segmenting the texture. Neural network classifier was used, which achieves 97% for sensitivity and 93% for specificity. But it doesn't consider as other type of skin lesions such

as NoMSLs.

The challenging task of dermoscopy images is Automated border detection because of several reasons: i) irregular and fuzzy lesion borders ii) low contrast between the lesion and the surrounding skin, iii) variegated coloring inside the lesion and iv) artifacts such as skin texture, air bubbles and hairs. There are two types of dermoscopic features are identifies by Menzies method, i.e., positive (blue-white veil, atypical dots and network), and negative (symmetrical pattern, single color etc.,). The presence of positive features signs a melanoma [5].

The main objective of this paper is to analyze the dermoscopy images which are suitable for both Melanocytic skin lesions (MSLs) and Non-melanocytic skin lesions (NoMSLs) automatically.

II. DESCRIPTION OF DATASET

Dermoscopy images are collected from Dermweb [6], and it contains 320 images (100 NoMSLs and 220 MSLs). The NoMSLs consist of 75 BCC, 25 SK whereas MSLs consist of 100 melanocytic nevi, and 120 melanomas. The dimension of the NoMSLs is 2272 by 1704. The dimension of the MSLs is 500 by 500.

III. METHOD

The flow diagram gives the classification model for skin cancer such as Melanoma, Nevus, Basal cell carcinoma and Seborrhoeic keratosis which can classify both Melanocytic skin lesions (MSLs) and Non-melanocytic skin lesions (NoMSLs) automatically.

Fig: 1 process of analyzing images.

A. PRE-PROCESSING

First of all, the Dermoscopy skin cancer image was given as input. The skin cancer image contains several artifacts such as the hair to be eliminated in the Preprocessing. The challenging task for dermatologist is the hair removal in skin cancer. So, dermatologists are handling several methods such as Dull Razor software. It does not remove on the thick hair but removes on a thin hair. So the median filter was used for removing thick hair and it also used after that smoothing is done by using circular averaging filter of size r.

a) Black Frame Removal

During the digitization process, the dermoscopy image introduces the black frame. These need to be removed black frames and because they might interfere with the subsequent border detection steps. To find the darkness of a pixel has a coordinates (R, G, B), HSL color space lightness components are [21] utilized.

$$L = \frac{max(R; G; B) + min(R; G; B)}{2}$$

(a) Dermoscopy image with a black frame   (b) after frame removal of image (a)

Fig: 2 Frame Removals

b)   **Image Smoothing**

Skin lines, air bubbles and hairs around the lesion are the extraneous artifacts in dermoscopy images. It may be reduce the border detection accuracy and increase the execution time. In favor of moderate the injurious effects of these artifacts, the images must be preprocessed with a smoothing filter.

(a) Dermoscopy image with bubbles and hair   (b) Image (a) after median filtering

Fig: 3 Median Filtering

B.   BORDER DETECTION METHOD

After the Preprocessing process has been completed, the RGB image is converted to grayscale image, and then the pixels are identified whose intensities are less than 200 of an image. Pixel images are identified based on the dilation process. The dilated image has a disk size 3r and the microscope border areas are not selected. K-means clustering [9] is used for segment the tumor areas. By using Contrast Limited Adaptive Histogram Equalization (CLAHE) the non-uniform illumination present in the images are eliminated. After completing CLAHE [20], the noises are reduced by using morphological operation. To remove the thin objects of the microscopic border perform closing operation with disk of size 2r. For continuity, finally fill the holes in the image.

C.   CLASSIFICATION

Final step of the analyzing dermoscopy image is classification. After completing segmentation process skin lesion images are classified into four regions. Whole tumor is the pixels which are in extracted in the border. The first 30% of the whole tumor area was the peripheral region. Skin lesion features have to be extracted such as color, sub-region and texture related features. The color related features were extracted for the tumor regions such as peripheral, central tumor, and whole tumor for all color intensity channel such as R, G, B, S, H and V calculate the min, max, standard deviation and energy.

Color channel are classified based on R, G, B and S for central tumor and peripheral area. For texture related features calculate the energy, correlation, homogeneity, contrast for the quantization levels N=16, 32, 64 and directions   = 0 , 45 , 90   and 135   for the target regions such as central tumor and whole tumor. When the features are extracted the feature selection was done by Wilkis lambda method [8].
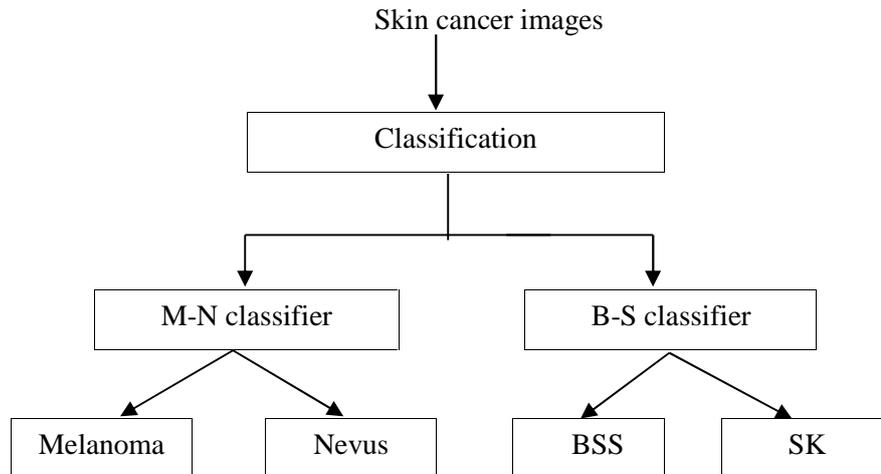
Fig: 4 image classifications

The SVM classifier [10] was used for classification. The Melanocytic skin lesions and Nonmelanocytic skin lesions are classified first and then the melanoma from nevus for MSLs and for basal cell carcinoma from seborrhoeic keratosis are classified in NoMSLs. In brief the first step classifier (MN-BS) is used for distinguish the MSLs from NoMSLs and second step classifier distinguishes melanoma from nevus (M-N) and distinguishes basal cell carcinoma from seborrhoeic keratosis (B-S).

V. CONCLUSION

Dermoscopy images are analyzed using various tools such as Open CV (version 2.4) and Matlab etc., During the analyzing process, a platform of Intel Core i5 and processing power of 2.4 GHz CPU with 2GB RAM are used. For performance measurements, the evaluation metrics are used. Initially the input image are pre-processed and then the segmentation process is executed by using k -means clustering and the lesions are classified by using SVM classifier.

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