SKIN CANCER SEGMENTATION FROM SKIN LESION ANALYSIS TOWARDS MELANOMA DETECTION

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ABSTRACT

Melanoma is well-known skin cancer that cause fatal. Therefore, detection of melanoma at early stage are essential to enhance the successful of survival rate. For the detection of melanoma, proper analysis is carried out on the skin lesion according to a set of specific clinical characteristics. This skin lesion clinically diagnosed begin with primary clinical screening and dermoscopic analysis, a biopsy and histopathological examination. Lastly, this skin lesion is classified as either "potential melanoma" or "non-melanoma".However, detection of skin cancer in the early stages is a difficult and expensive process. Typically, the analysis to checks for the various Melanoma are using pre-defined thresh-olds in classification stage such as Asymmetry, Border, Colour, Diameter and Evolution (ABCDE) where color, texture, size and shape are being analysis for image segmentation and feature stages. Accuracy for this method was encourage and reach up to 95.45%.The proposed method shows best accuracy when compared with other methods. To our best knowledges, we are not aware of any previous work proposed for this task. The proposed deep learning frameworks were evaluated on the ISIC 2017 testing set.

KEYWORDS: Melanoma, Segmentation, Pre-Processing.

1. INTRODUCTION

Melanoma is the most deadly form of skin cancer and accounts for about 75% of deaths associated with skin cancer [1]. Accurate recognition of melanoma in early stage can significantly increase the survival rate of patients. However, the manual detection of melanoma produces huge demand of well-trained specialists, and suffers from inter-observer variations. A reliable automatic system for melanoma recognition increasing the accuracy and efficiency of pathologists is worthwhile to develop. Skin lesion segmentation is the essential step for most classification approaches. Recent review of automated skin lesion segmentation algorithms can be found in Accurate segmentation can benefit the accuracy of subsequent lesion classification. Extensive studies have been made to produce decent lesion segmentation results. For example, Gomez et al. proposed an unsupervised algorithm, named Independent Histogram Pursuit (IHP), for the segmentation of skin lesion. The algorithm was tested on five different dermatological datasets and achieved a competitive accuracy close to 97%. Garnavi et al. proposed an automated segmentation approach for skin lesion using optimal color channels and hybrid thresholding technique.

TYPES OF CANCER

Originate	Types of skin cancers
Skin cells - common	Non melanoma - basal cell carcinoma - squamous cell carcinoma
Pigment producing skin cells - dangerous	Melanoma
Tissue in the skin - rare	Cutaneous lymphoma Extra-mammary Paget's disease Merkel cell carcinoma Kaposi sarcoma

Skin cancer is the most common and prevalent type of cancer over the world. Over 3.5 million cases of Melanoma, Basal Cell Carcinoma and Squamous Cell Carcinoma are diagnosed every year. This is more than the combined counts of breast cancer, lung cancer and colon cancers. In fact, a person falls victim to Melanoma every 57 seconds.

One of the challenges of visual screening is the visual similarity between skin diseases. In the last few years, significant advancements have taken place in the domain of computer vision. With the advent of new algorithms, it has become possible to differentiate between clinically similar skin conditions. These algorithms do not require the images to be taken from special purpose devices, such as dermatoscopes, and can be applied on images obtained from general purpose cameras.

2. EXISTING SYSTEM

The scarcity of dermatologists is another challenge towards ensuring better treatment or adequate levels of care for skin cancer patients. Therefore, an automatic skin cancer recognition system has a high demand to ensure accurate, faster and better treatment for skin cancer patients. Varying orientations, illuminations, lighting conditions, and other artifacts make this problem difficult to analyze with automated approaches. Due to several complexities, the automatic detection of melanoma skin cancer is a very challenging task. Firstly, there are large intraclass variances that can be observed in terms of color, textures, shape, size, contrast, and location.

Disadvantages

- The automatic detection of melanoma skin cancer is a very challenging task.
- There is a very high degree of similarity between melanoma and non-melanoma lesions, which makes this problem even harder.
- At the very early stage of this cancer, the automatic skin lesion recognition task becomes more complex due to low contrast and obscuration between the affected areas on the skin and normal skin regions.
- several artifacts, including hairs, veins, ruler marks, and color calibration, may blur and occlude the skin cancer lesions, thus further reducing the recognition performance.

3. PROPOSED SYSTEM

The proposed method is far better than methods studied by other researchers in terms of rate of automatic detection, classification accuracy and execution time required for automatic detection and classification of masses. These features are used to classify masses using Fisher's Linear Discriminate Analysis, Support Vector Machine and Multilayer Perceptron with two training algorithms Levenberg-Marquardt (MLP-LM) and Bayesian Regularization (MLP-RBF). Then Preprocessing is applied to remove labels and non-mass regions. After Preprocessing a combined approach is adopted for automatic detection of masses which consists of Otsu's global thresholding technique, morphological operations and watershed transformation.

The objective of the study is to investigate efficient methods for automatic detection and classification of masses in digital mammograms. The process adopted for detection and classification of masses in our work is described.

ADVANTAGES:

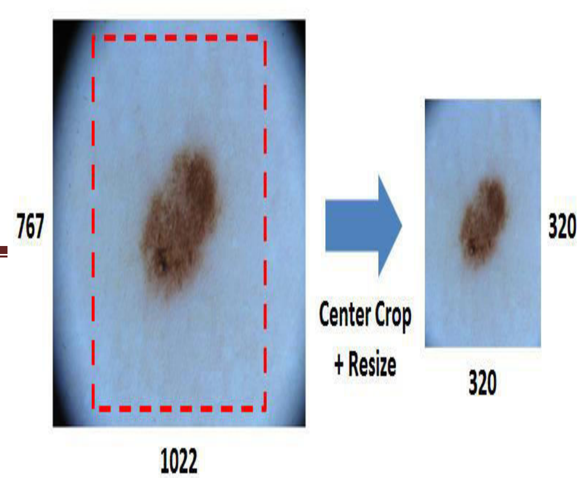
- Required to improve rate of classification for automatic mass detection system.
- Extraction & Selection of most relevant features that will improve classification accuracy.
- Study of classifiers that will minimize the false positive rate
- The overall system should take minimum execution time.

Skin lesion segmentation is the essential step for most classification approaches. Recent review of automated skin lesion segmentation algorithms can be found in Accurate segmentation can benefit the accuracy of subsequent lesion classification. Extensive studies have been made to produce decent lesion segmentation results. For example, Gomez et al. proposed an unsupervised algorithm, named Independent Histogram Pursuit (IHP), for the segmentation of skin lesion.

4. METHODOLOGY

PRE-PROCESSING

The original ISIC skin lesion dataset contains 2000 images of different resolutions. The resolutions of some lesion images are above 1000 x 700, which require high cost of computation. It is necessary to rescale the lesion images for deep learning network. As directly resizing image may distort the shape of skin lesion, we first cropped the center area of lesion image and then proportionally resize the area to a lower



resolution. As illustrated in Fig. 1, this approach not only enlarges the lesion area for feature detection, but also maintains the shape of skin lesion.

Fig No 1: Pre-Processing

SEGMENTATION

The most important stage when analyzing the lesion properly is the segmentation since the accuracy of all the subsequent steps depend on its. However, perfect segmentation is difficult due to the great verities of the lesion shapes, sizes, and colors along with different skin types and textures. We proposed segmentation process based on the following steps:

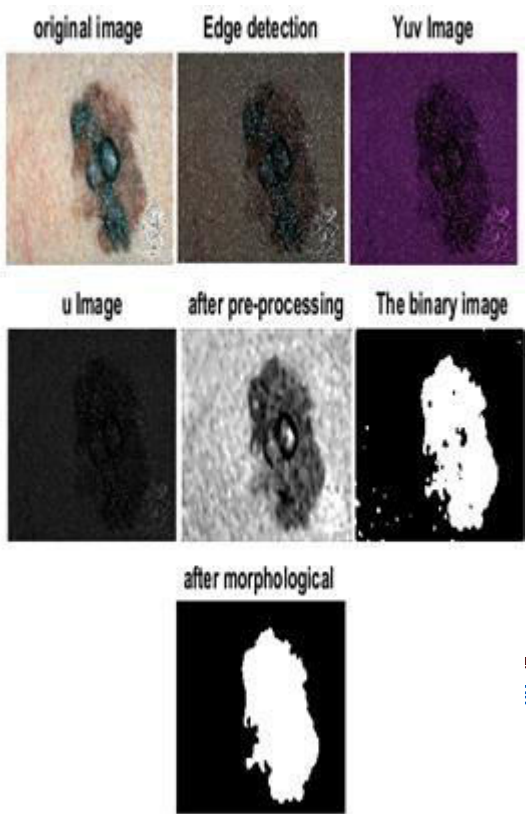


Fig No 2: Segmentation

CLASSIFICATION

THE ABCD RULE

The ABCD rule was introduced by Stolz et al. and used by dermatologists in detection of skin lesions to assess the risk of malignity of a pigmented lesion. This way is able to provide a more objective and reproducible diagnostic of skin cancers in addition to its speed of calculation. It is based on four parameters

A stands for ASYMMETRY:

One half of a mole or birthmark doesn't match the other. two orthogonal axes bisect the lesion. For both axes, asymmetry is assessed regarding shape, colors and/or dermoscopic structures. A score of two is given if there is asymmetry along both axis, it is scored one if there is asymmetry along one axis, and zero otherwise.

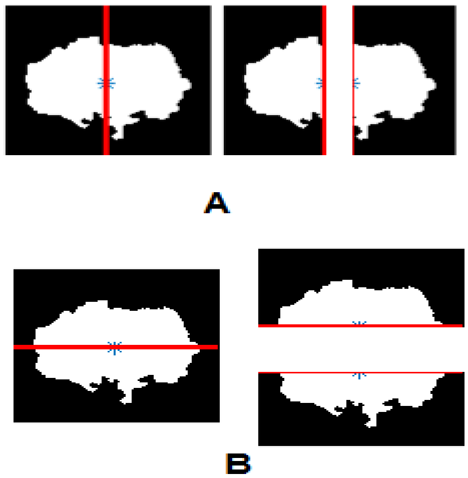


Fig No 3: Classification

B stands for BORDER:

The edges are irregular, ragged, notched or blurred.

C stands for COLOR:

The color is not the same all over, but may have different shades of brown or black, sometimes with patches of red, white or blue. We look for the occurrence of the six colors (white, red, light brown, dark brown, blue-grey and black). The score is incremented by one for each existing color.

D stands for DIAMETER:

To find the diameter of the lesion, only the points along the edge of the lesion are to be considered. For this purpose, the perimeter of the lesion is found. After the points along the perimeter have been determined, the distances between all these points is computed. The maximum distance between any two points is the diameter of the lesion .

PREDICT THE IMAGE:

The prediction is a statement of the expected results of the experiment based on the hypothesis. If predictions are confirmed, the scientist has supported the hypothesis.

5. CONCLUSION

We have discussed a computer-aided diagnosis system for melanoma skin cancer. It can be concluded from the results that the proposed system can be effectively used by patients and physicians to diagnose the skin cancer more accurately. This tool is more useful for the rural areas where the experts in the medical field may not be available. Since the tool is made more user friendly and robust for images acquired in any conditions, it can serve the purpose of automatic diagnostics of the Skin Cancer.

Classification is a very crucial and important step which is based on feature extraction it should clearly classify if the result is a melanoma or not. So the methodology uses the K-Nearest Neighbourhood (KNN) classification. The KNN classification is considered to be a non parameterized classification algorithm we use the Euclidean distance to calculate the KNN algorithm for classification. SVM classifier uses a hyperplane to classify the pixels. The decision tree decides with the classification in a tree shape. The boosted tree is something which uses functions in each and every stage.

6. FUTURE ENHANCEMENT

For future study, researcher can perform additional contrast or correlation in various techniques in detecting skin cancer. Consequently, evaluation of the efficiency can be used for further levels of detection system. We can conclude automated diagnosis of skin cancer its efficient methods, in which it caters all essential steps generally use in computational system for diagnosing skin lesions. Therefore, this paper is beneficial to new researcher working further on detection of skin cancer.

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