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Automatic Skin wound Examining for the Early Diagnosis of Melanoma Skin Cancer Using Image Processing Technique

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Abstract -Melanoma skin cancer is very dangerous because it spread to other organs more easily if it is not detected at the beginning stage. The hurtful melanomas are spreading worldwide speedily when compared to any other malignant cancer. Statistical testimony states that this malignant melanoma causes a high mortality rate. Several studies say, that there is a more chance of getting a cure if it is detected and controlled at the earliest level. But the clinical detection and prediction of melanoma are difficult, due to the misdiagnosis and incorrect result. Melanoma is more harmful with uneven borders, irregular edges, and varying colors, therefore examining the thickness, color, and figure of the skin lesion is essential for the early elimination and diagnosis of melanoma skin cancer. An automatic skin wound examining for the early diagnosis of melanoma using image processing technique consists of image obtaining, Finding Hair and removing, skin lesion separation, feature extraction, and classification. A Dermoscopy image database is used in this method. The results of this method are very effective and attaining better classification accuracy.

Key Words:melanoma, benign, atypical, image processing

1.INTRODUCTION

Skin cancer occurs due to the unusual growth of cells in the skin. This type of cancer can exist in the region of the skin and it has the capacity to broaden to other body parts. Three different types of skin cancers are BCC (Basal-Cell-Cancer), SCC (Squamous-Cell Cancer) and melanoma skin cancer. Basal Cell Cancer and Squamous Cell Cancer is altogether known as nonmelanoma skin cancer. BCC type cancer will get bigger gradually and can injure the areas all over the place but it will spread to other parts of the body very slowly or it is not harmful. Basically, this basal cell cancer is cancer with little pain. Squamous cell cancer, which is spreading all over the areas and will result in the formation of an ulcer. Nonmelanoma type of skin cancer is able to cure. Melanomas are very malignant in nature which form as a mole on the surface of the skin with uneven borders, irregular edges, varying colors, and then results in itching as well as bleeding.

Higher than 90% of skin cancer comes out by the subjection to UV radiation from the sunlight. These harmful radiations will increase the possibility of skin cancer. Subjects having thin skin are at great risk of getting melanoma skin cancer because of their less immunity. Mostly the malignant melanoma is with brown or black color and very few melanomas are of red or pink color.

2.PRIOR RESEARCH

Examining the structure, figure, and complexion will make the atypical type lesion detection easier and through this one can quickly detect the lesion before it becomes a malignant melanoma (Ref. 1). Doctors get disappointed by seeing the misdiagnosis of malignant melanoma by using the naked eye. Many researchers are showing their interest to find out an effective method for the prevention and diagnosis of melanoma at the earliest (Ref. 2). Dermoscopy Image Analysis is a technique used in the non-invasive method of melanoma diagnosis. Two-level Classification gives a better result when compared with one level classification method(Ref. 3). People at the age of 15 and above are affected by this deadly melanoma skin cancer (Ref. 4). Better performance of malignant melanoma diagnosis is achieved by using the Dermoscopy image analysis technique (Ref. 5).

The Dermoscopic image technique is a recent developing method with an accuracy of 75 to 84 percentage (Ref. 6).Convolutional neural networks and deep learning techniques are producing a reasonable accuracy in the image segmentation (Ref. 7). The images of any digital camera (known as non-Dermoscopic images) are with more unwanted noise and less clarity. So, it is recommended to use Dermoscopy based images (Ref. 8). Mostly Matlab software is used for the development of early detection of malignant melanoma skin cancer (Ref. 9).Various research is going on for the malignant melanoma detection using SVM and neuro-fuzzy technique (Ref. 10).

Imaging Technique for the skin is an encouraging method for the development of a non-invasive melanoma diagnosis system (Ref. 11). Image segmentation is a main step for the Dermoscopic image analysis, this difficult process will separate melanoma from the skin surrounding. Researchers have introduced many computer-based algorithms for doing image segmentation (Ref. 12). The automatic segmentation of melanoma is an important needed step for a computer-based Dermoscopy image analysis. Air bubbles, hair, and some artifacts make this process a very challenging one (Ref. 13). Two major techniques for a computer-based melanoma diagnosis is color constancy method and analysis of skin lesion. The color constancy method gives better accuracy when compared with skin lesion analysis (Ref. 14). Dermoscopy Imaging Analysis is a suitable technique for the development of non-invasive early detection of malignant melanoma (Ref. 15).

3.PROPOSED METHOD

Early diagnosis of malignant melanoma will enlarge the possibility of cure crucially. A Dermoscopy image database is

used in this proposed method. This includes a totally of 160 images (benign, atypical, and melanoma) and these images are with 768x560 pixels of resolution. The proposed framework of examining the skin wound for the early detection of malignant melanoma is shown in the Fig. 1.

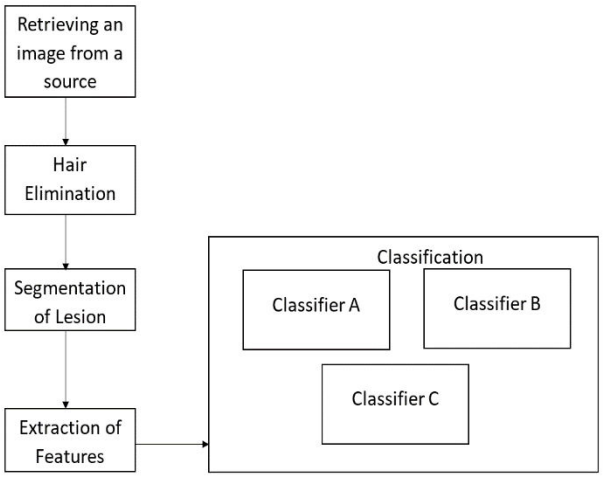

Fig -1: Proposed Framework

Automatic Skin Wound Examining for the Early diagnosis of Melanoma Skin Cancer using Image Processing Technique includes retrieving an image from a source, Hair elimination, Segmentation of Lesion, Extraction of features, and classification. Matlab software is used for the implementation of this analysis. Matlab is a mostly used platform for data analysis and for doing simulation. In this platform, images are stored in the form of arrays. The proposed method for the early diagnosis of melanoma is explained in a detailed manner in the upcoming sections.

3.1. Retrieving an Image from a source

The first step of an image processing is retrieving an image from a source because without this no processing can be done. An image that is retrieved from the source is entirely unprocessed.Real-time image retrieving is one of an important form of this step. But in our proposed method we are using Dermoscopy images from a Dermoscopy image Database and not capturing an image automatically. Hence it is not a real-time image acquisition.

3.2.Hair Elimination

Skin lesions of Dermoscopic images are covered with body hair. This body hair will lead to an inaccurate result. So, it is essential to deal with hair detection and the elimination of hair. A hair mask is used here for the removal of the hair from the image.

3.3.Image Segmentation

Segmentation of an image is the operation of segmenting a Dermoscopic image into a set of pixels. This process changes an image and makes the analysis easier. It will allow a label for each and every pixel of an image. Pixels having identical labels are with certain features (texture, optics, or intensity).

3.4.Extraction of Features

The extraction of features is the process of extracting some required parameters from an image. This is an essential step for the Image classification for the reason that the classification is done based on the extracted features. Some of the features calculated in this method are Two-Dimensional Fourier Transform, Two-Dimensional Discrete Cosine Transform, mean, standard deviation, lesion orientation, etc.

3.5.Classification

Support Vector Classifier (SVM) is a classifier that is used for our system. It is a popular classifier with a good classification algorithm and gives better performance. This classifier is used here to classify the benign, atypical and melanoma images. Benign is a lesion, which has some features of melanoma skin cancer. Atypical type of lesions is also having some characteristics of malignant melanoma. So, it is better to classify the benign, atypical and melanoma skin cancer. Extracted characteristics of an image are given as the input for the classifier. Classifier A is a type of one level classifier and this will classify the benign, atypical, and a melanoma. Classifier B is a two-level type classifier in which the first level will classify the melanoma or other, and the next level of this classifier will classify the benign and atypical. Classifier C is also a two-level type classifier. In this, the first level will classify the images into benign or other, and the next second-level categories, atypical and melanoma.

4.EXPERIMENTAL RESULTS

Original Image is an image acquired from a Dermoscopy Image Database. The retrieved image is an RGB image. No processing is possible with this RGB image. Hence it is converted into a grayscale image. Then Hair Detection and its elimination can be done.

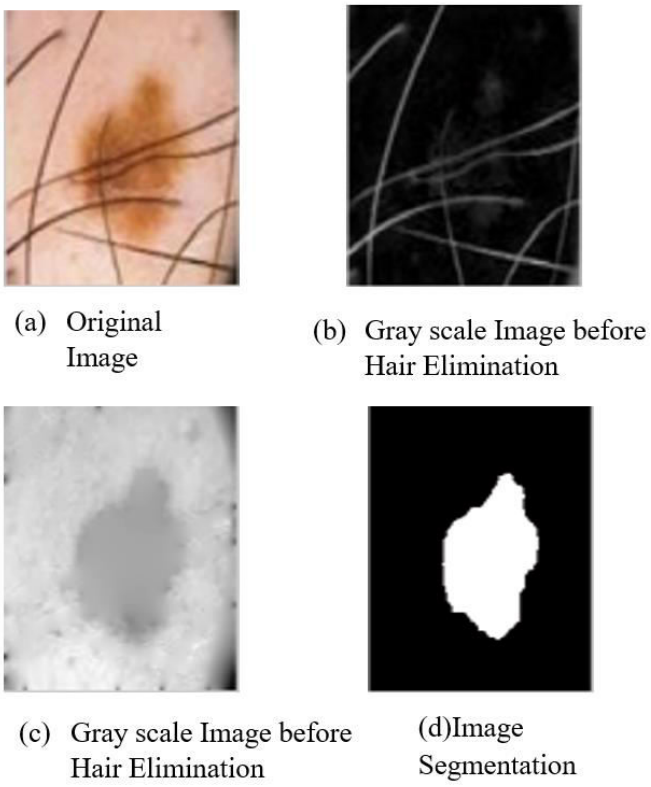

Fig -2: Steps of Early diagnosis of Melanoma

After the morphological operations, the image is taken for a segmentation. The thresholding technique is a popular technique for image segmentation. Segmentation is a process of isolating an image from the background i.e.) Segmenting lesion from the surrounded background. Fig. 2 explains the steps of Dermoscopic Image Analysis.

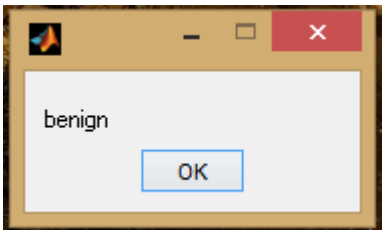

Fig -3: Result of Melanoma detection

After segmentation and feature extraction, the classification of an image will detect the image as benign, atypical, or melanoma.Fig. 3 shows the result of melanoma detection. Here the acquired image is benign and so it is detected as benign.

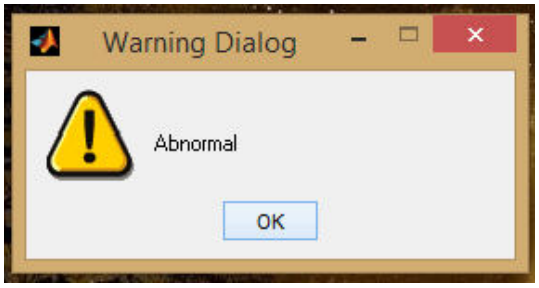

Fig -4: Warning System of early diagnosis of Melanoma

If an image is a normal image, then the warning system will get disable. But if the image gets detected as benign, atypical, or melanoma then the warning system will show a warning by mentioning it as abnormal. In this, the result of an acquired image is benign and hence the Fig. 4 shows the warning system as abnormal.The results of this method are very effective and attaining better classification accuracy with a reasonable error.

5. CONCLUSIONS

Surgical elimination is the only life-giving solution for the melanoma skin cancer and so the early diagnosis of melanoma is very helpful in the medical application. This proposed method introduced a blockage and early diagnosis of malignant melanoma.Dermoscopic Image Analysis is proposed and achieved a better result with a reasonable error by classifying the image into benign, atypical, or melanoma.As future work, a real-time diagnosis of melanoma has to be done with more extracted features.

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