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EARLY DIAGNOSIS AND CLASSIFICATION OF ELANOMA DETECTION USING NEURAL NETWORK

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Abstract

Melanoma is one of the types of skin cancer. It is easily curable when detected at an early stage. Once it spreads into other parts of the body, it can be deadly. It is difficult to find the difference between melanoma and nevus due to the same appearance. In this paper, we have proposed an early diagnosis and classification of melanoma detection using neural networks. It uses image processing methods and algorithms. The mobile image of skin cancer is given as input, and it is converted into a grayscale image to process faster. To enhance the feature of the image it uses contrast enhancement then the median filter is used to remove noise without leaving the edges from the skin surface and the image is undergone to segmentation and features extraction to remove the unwanted features from the lesion. These are given as input to the classifier. Convolutional neural network classifies the given image into melanoma and non-melanoma. DERMIS dataset is a proposed method with a total of 50 skin cancer images: 32 is melanoma and 18 are non-melanoma. It achieves a result of 89% accuracy.

KEY WORDS - Melanoma, nevus, median filter, Convolutional neural network

I.INTRODUCTION

Skin cancer causes most of the deaths around the globe. There are different types of skin cancer in the world. Melanoma is one of the types with more number of death rates [1]. It affects the skin surface cells and it looks brown or black in color but some can appear pink, or tan, or even white. It moreover looks the same as moles on the skin so it is hard to find the difference. When it is detected early it is easily curable. This can spread easily to anywhere of the human body [2].

Fig.1. Four types of melanoma

Melanoma types are shown in Fig.1. The older method for detecting skin cancer is the biopsy method, and it is done by removing a piece of tissue from the patient's body so that it can be analyzed in a laboratory. It is an uncomfortable method and also there is a possibility of spreading disease into other parts of the body. In last year the death is more than nine thousand because there is a difficulty in finding the difference between the melanoma and moles [3]. This paper presents a skin cancer detection using CNN. The mobile image system is used to detect melanoma or non-melanoma by using the input images and the image processing features. The smartphone is used as a base to capture skin cancer images and then it includes various processes such as preprocessing, segmentation, and feature extraction to remove the unwanted features [4]. Finally, the classifier CNN will classify the

images based on the DERMIS dataset and also predict the spreading level of the skin cancer images. CNN will also find which type of melanoma it is with the spreading level of the image. The advantage is the general public can use our system to detect the skin cancer in an early stage and it will be cured easily [5].

II.PROPOSED METHODOLOGY

The skin cancer mobile image is given as input and pre-processing includes grayscale conversion, noise removal, and image enhancement and then the segmentation is used to separate image, then features extraction is to remove the unwanted features finally a classifier is to detect the spreading level and the type of melanoma. The step by step procedures of the process is given in Fig.2.

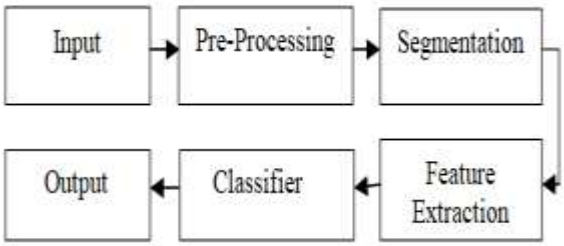


Fig.2. Proposed methodologies for melanoma detection

A.PRE-PROCESSING

It is used to improve the data in the image and to reduce the distortions by improving the images. It has three important things.

1.) Grayscale conversion
2.) Noise removal
3.) Image enhancement.

1.) GRAYSCALE CONVERSION

In this conversion, the input colored image is converted into a grayscale image to process easier and faster. It is done by the weighted sum method.

Grayscale intensity= 0.299R+0.587G+0.114B

2.) NOISEREMOVAL

It is used to detect and remove noise from an input image. It uses a median filter to remove noise without leaving the edges from the skin cancer images. It is calculated by the below formula.

Median=(n+1)/2

3.) IMAGEENHANCEMENT

To increase the contrast the range of value of an image can be changed. It will improve the process by using the colors on the display. To enhance the feature of the image it uses contrast enhancement.

B. SEGMENTATION

It is the process of separation of the large image into several parts and makes the process simpler. It uses two types of segmentation. The two types of segmentation used in these are.

1.) Edge Based segmentation.
2.) Region-Based segmentation.

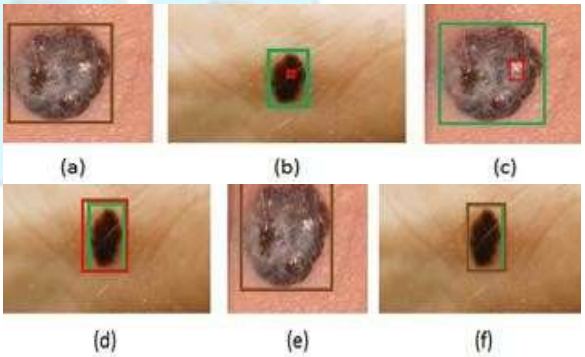
1.) EDGE BASED SEGMENTATION

Edge detection works by detecting discontinuities in brightness. It can detect edges with noise suppressed at the same time. It will smoothen the image and remove unwanted details and textures. The segmented image is shown in Fig.3.

Fig.3. the Input image and segmented image

2.) REGION-BASED SEGMENTATION

It is carried out based on similarities in the given image. The regions that are formed using this method



have the following properties. The output of segmented images is given in Fig.4.

Fig.4. Segmented images

- The sum of all the regions is equal to the whole image.

- Each region is contiguous and connected
- Each region must satisfy uniformly condition

C. FEATURES EXTRACTION

It aims to remove unwanted features from the image without deleting the original features. Feature extraction has multiple hidden layers. It will remove the unwanted texture, and color. It is an important process in the system to detect melanoma. It is the extraction of the image like removing some pixels and edges from the original image. The extraction of the unwanted features is given in Fig.5.

Fig.5. Features Extraction by CNN

D. CLASSIFICATION

The Classifier is to identify the melanoma and nevus and also to find the type of melanoma or non-melanoma. A different classification algorithm is trained and tested to achieve high accuracy. It consists of various layers at various stages. Every layer is used for extracting the features based on the DERMIS dataset which is already trained with various parameters.

Fig.6. the Output of lentigo malignant melanoma with predicted spreading level

Fig.6. Represents one of the types of melanoma with predicted spreading levels so that we can easily diagnose at an early stage and can be treated with proper medicines. CNN has the advantage of the deep learning algorithm and biomedical and morphological processing. The below figure represents it is a normal skin rashes image. The output of Non-Melanoma is given in Fig.7.

Fig.7. Represents Non-Melanoma

III.DATASET AND EVALUATION METRICS

The DERMIS image database is used in the prediction of melanoma. The database consists of 50 images: 32 is melanoma and 18 are non-melanoma. It is displayed based on the performance of classification. DERMIS dataset gives an accuracy of89%. The performance can be calculated regarding its accuracy and efficiency of the system and its performance of the different types of melanoma images. The results of DERMIS dataset is given in Fig.8.

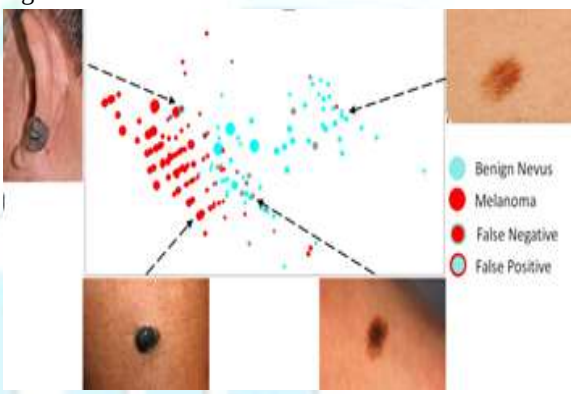


Fig.8. Represents results of DERMIS dataset

IV.RESULTS ANDDISCUSSION

The results based on the input images give the efficient output accurately using the classification of CNN. It is proposed to accurately classify a skin cancer image into melanoma or non-melanoma. The General public can use this by using mobile. It is more advantageous to cancer patients because they can easily find the difference between melanoma and nevus. The technique was tested with CNN. It gives 89% accuracy. This has various issues and problems. For this, we have investigated the HCI design issues

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and semi-structured interviews and these issues should be addressed in future work.

Fig.9. Input image

Fig.9. represents the input image. The colored mobile image is given as an input in the JPEG format to convert into a grayscale image. In the colored image, it is very slow to process than the grayscale image.

Fig.10. Grayscale image

The colored mobile image is converted into a grayscale by using the weighted sum method. The result of Grayscale image is given in Fig.10.

Fig.11. Segmented output image

The result of segmented image is shown in Fig.11. Segmentation is the process of separating the large image into different parts and makes the process simpler.

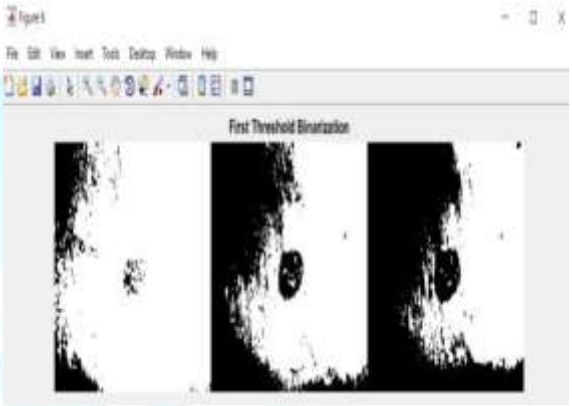

Fig.12. Feature Extraction

After segmenting out the skin from the lesion it will remove the unwanted features without discarding the original features. It will remove the unwanted texture, color, and edges. It is the extraction of the image like removing some textures and pixels from the original image. Fig.12. represents the output of features extraction.

Fig.13. Cancer detection using CNN

CNN will detect the type of melanoma and the spreading level of the cancer. Fig.13. represents the output of cancer detection using CNN.

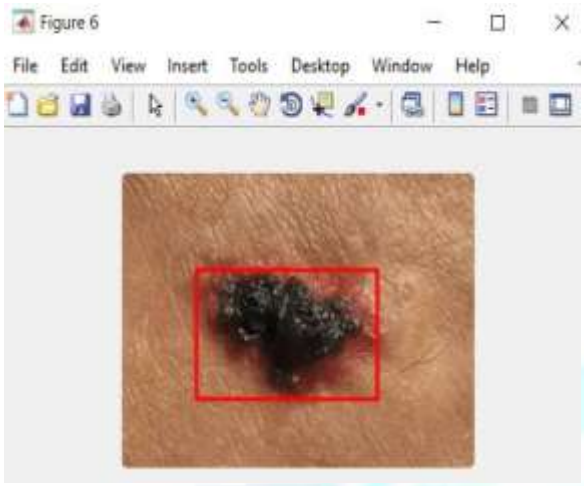

Fig.14. Output image

Fig.14. represents the output image and the spreading level of the image. The above figures show that which type of melanoma and spreading level of the acc melanoma skin cancer image using the Convolutional neural network.

V.CONCLUSION

This paper presents an advanced system for melanoma detection using neural networks. CNN technique is used to detect the spreading level from the cancer image and to find which types of melanoma more accurately and efficiently. The total accuracy of the CNN algorithm is 89% in comparison with the older classification method. The problems and issues in this work will be discussed in future work. The idea of implementing a CNN classifier in MATLAB to use the features to train a CNN classifier and use the trained dermis dataset to detect melanoma cancer.

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