

Detection and Classification of Melanoma Skin Cancer Analysis

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ABSTRACT

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Nowadays, skin cancer becomes a very dangerous disease for human. Skin cancer is classified into many types such as Melanoma, Basal and squamous cell carcinoma. In all cancers, melanoma is the most dangerous and unpredictable disease. The detection of melanoma cancer in an early stage is beneficial for effective treatment. The detection of skin cancer contains four significant stages which are Pre-processing, Segmentation, Feature Extraction and Classification. The proposed study involves the collection of image database, preprocessing methods, segmentation using thresholding and classification using statistical features. The K-Nearest Neighbor (KNN) classifier is used for classification. The accuracy of KNN classifier for proposed research work is 93.4%.

Keywords : Melanoma Cancer, K-Nearest Neighbor, Segmentation, Features, Malignant

I. INTRODUCTION

Melanoma is the most dangerous form of skin cancer. The melanoma cancer found in only 4% of all cancers. But it is responsible for 75% of all skin cancer deaths. Melanoma required early treatment it will be recovered easily [1, 2, 4]. But if not diagnosed in the early stage it will grow deeper into the skin. And it also spared over all other parts of the body [3]. Melanoma is also called malignant melanoma. It produces colours like pink, red, black or white, blue, etc. The mostly black or brown melanoma can found anywhere on the body. Mostly it found on head, neck, soles of the feet, and near nails. It grows faster than any other cancer. This paper intended to implementation of detection and classification of Melanoma Skin Cancer Analysis. This disease is

caused mainly by genetic instability and accumulation of the various alternatives molecules [4, 5]. The current diagnostic classification does not decline the heterogeneity of tumours. These are not enough to predict for successful treatment [6]. To classify the lesion as a malignant feature of the lesion are extracted. This is achieved using segmentation. Fig 1 shows the general stages to detect and classify skin cancer.

Most of the people in the world are suffering from cancer. The cancer treatment is very painful. Every cancer has some stages. In each stage, cancer will change.

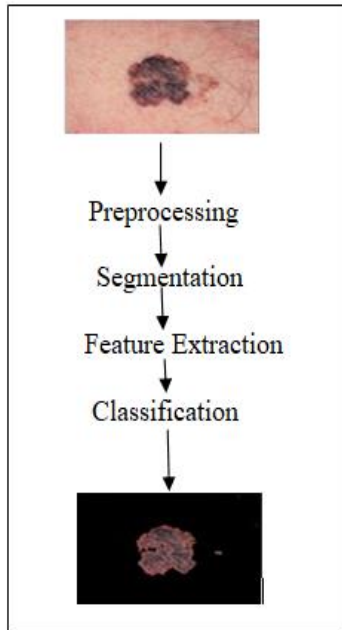


Fig. 1 General stages for detection and classification of skin cancer

1.1 Sign and symptoms of melanoma skin cancer:

This type of skin cancer changes their shape texture and colour. If the cancer patient is careless then risk will be high. Cancer is the only disease that spread on every part of the body. Many symptoms can detect cancer in the early stage. Some symptoms are listed below.

- Pale patch to the skin
- Brownish scar
- Bleeding
- Changing the shape and size of Existing moles

It is always better to check the skin every day.

II. Methodology

The proposed methodology discusses on input malignant image in 2 different classes and then applied to preprocess using different filters and histogram equalization for further enhancement. After that Thresholding is applied to it. Opening operation is applied with Thresholding. Then noise removal is done using a noise model. Finally, the tumour is detected and checked accuracy using KNN

classifier with different statistical filters. The methodology includes the following Stages

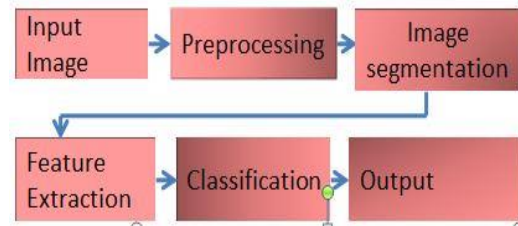


Fig. 2 Stages of Proposed methodology

2.1. Image Acquisition:

The initial stage of any image processing system is the image acquisition stage. After image acquisition a variety of methods of processing can be applied to the image. It is also called as digital imaging. Digital image acquisition is the creation of photographic images, such as a physical picture or of the core of an object. The image acquisition includes the processing, compression, storage printing and a display of such images.

2.2. Pre-Processing:

The digital image may contain noise accordingly resolution of the image. The preprocessing is deals with the removal of noise. The preprocessing is smoothers digital image. Image contains different features. The noise in an image affects the features. Therefore there is a need to remove noise from the image for better feature selection.

2.3. RGB to Grayscale Conversion:

Image enhancement includes image scaling, colour normalization and contrast enhancement. In this method, the normal image is initially converted to RGB [7]. Then it converted into grayscale. It makes an image appropriate for a unique application. Contrast enhancement is a useful step to get better the perception for further processing such as to sharpen the image border, improve brightness. In this pre-processing technique noise, removal functions are used.

2.4. Segmentation:

Image segmentation is the process of dividing a digital image into multiple segments. That may beset of pixels. Segmentation aims to produce various segments of the image. That is more significant and easier to analyze the image. These regions should powerfully relate to show objects or feature of interest. The success of image analysis depends on the consistency of segmentation [8]. Segmentation is hard when there is a smooth transition from lesion to skin. Region-based thresholding and edge-based algorithms can be used in segmentation.

2.5. Feature Extraction:

The ordinary goal of feature extraction is to convert the segmented object into representations that better describe their main features and attributes. The type of difficulty of the resulting demonstration depends on many factors, such as the type of image like binary, grayscale, or colour. The feature extraction is the process by which certain features of interest within an image are detected and represented for further processing. The main features for the detection and classification of melanoma cancer are geometric.

The feature extraction is an important step in delectation. In our work mean and standard deviation features are selected. The mean and standard deviation are calculated using standard formulas. These features are playing a very important role in classification. There are many feature extraction methods are available such as GLCM and Gabor etc. we will later try to improve accuracy using more statistical features. The below table 1 are shows the extracted feature and feed to the classifier

Table 1. Feature extraction parameters with classes

Image No.	Mean	SD	Class
1	5.7749	0.8226	2
2	0	0.7321	1
3	5.0608	0.6777	2

4	0	0.7695	1
5	0	0.8369	1
6	0	0.6937	1
7	1.8604	0.7492	2
8	0	0.6413	1
9	0	0.7315	1
10	0.0022	0.7734	2
11	0	0.8523	1
12	0	0.3625	1
13	0	0.6932	1
14	0.0034	0.9684	2
15	0	0.635	1
16	0	0.9854	1
17	0	0.7841	1

2.6. Classification:

Classification techniques are generally applied to the image data. The classification includes a broad range of decision-theoretic approaches. That is used for the identification of images. Image classification analyzes the numerical properties of various image features. It organizes data into different categories. Classification approaches can be implemented to classify the total scene content into a limited number of major classes [7, 8]. Classification is a very important step to detect image having melanoma or not. The KNN classifier is considered as non parameterized classifier.

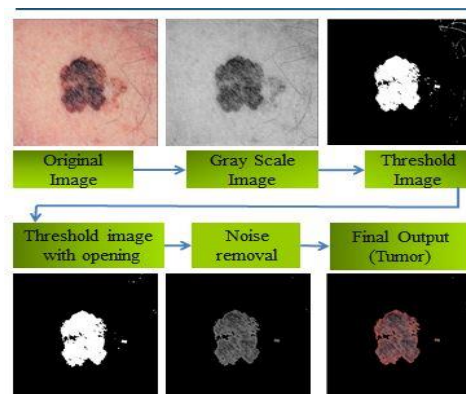


Fig. 3 Result of Proposed Method

III. EXPERIMENT AND RESULTS

The presented method, using KNN classifier based on statistical features was successful in classifying the

selected lesion area. The result of KNN classifier shows the accuracy of 93.4% with two statistical features (Mean and Standard deviation). The result shows the performance of the presented model for the detection and classification of melanoma skin cancer.

3.1 Algorithm for detection and classification

- Step 1: Start
- Step 2: Input the colour training/ testing image
- Step 3: Converted this image into a grayscale image
- Step 4: Thresholding applied to it
- Step 5: Opening is performed with Thresholding
- Step 6: Noise removal is applied to it
- Step 7: Final tumour is detected
- Step 8: Mean and Standard deviation is calculated for the region
- Step 9: Feed this feature to classifier and accuracy is tested
- Step 10: Stop

Following Fig. 3 shows a scatter plot of selected two statistical features and Fig. 4 shows test confusion matrix of KNN classifier. For experimentation, more than 400 images are used. And these images are tested using KNN classifiers. These images are collected from the internet. The accuracy is tested using other different classifier. But KNN classifier gives more accurate result.

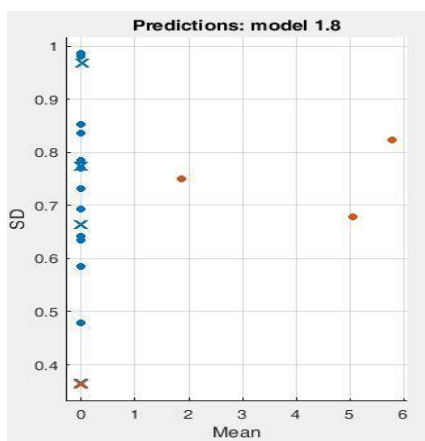


Fig. 4 Scatter plot of selected statistical features

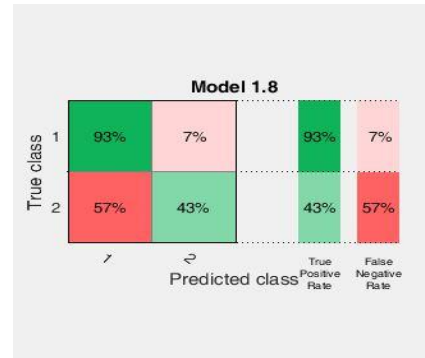


Fig.5 Test Confusion Matrix of KNN with selected statistical features

IV. Conclusion

In the proposed system, we presented a strong method for detection and classification of melanoma skin cancer using KNN based classifier. Experimental accuracy for the proposed method is 93.4%. This method was tested using other classifiers and using the same statistical features. We achieved near about the same accuracy with different computational complexity.

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