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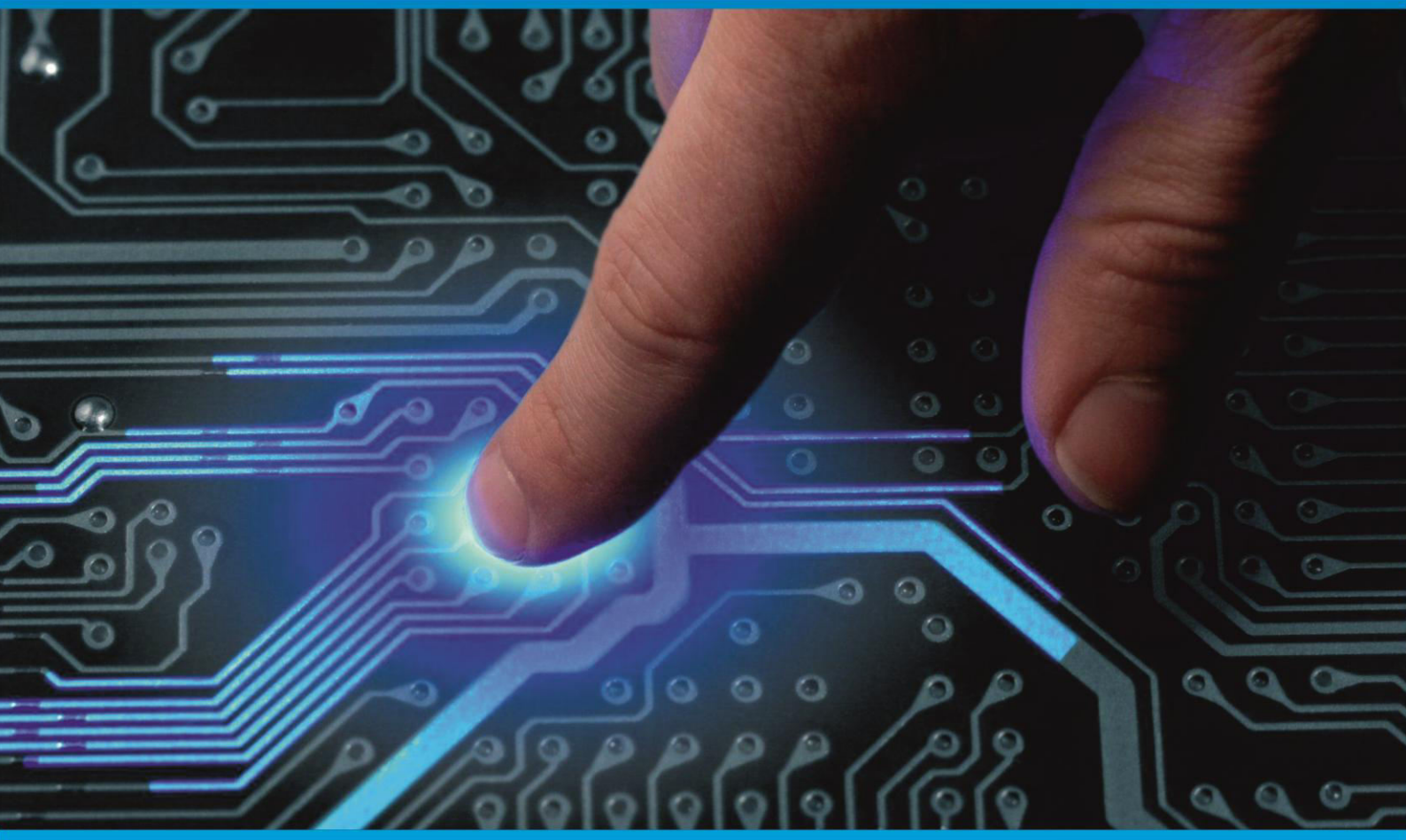

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Skin Cancer Detection Using Image Processing and Artificial Intelligence

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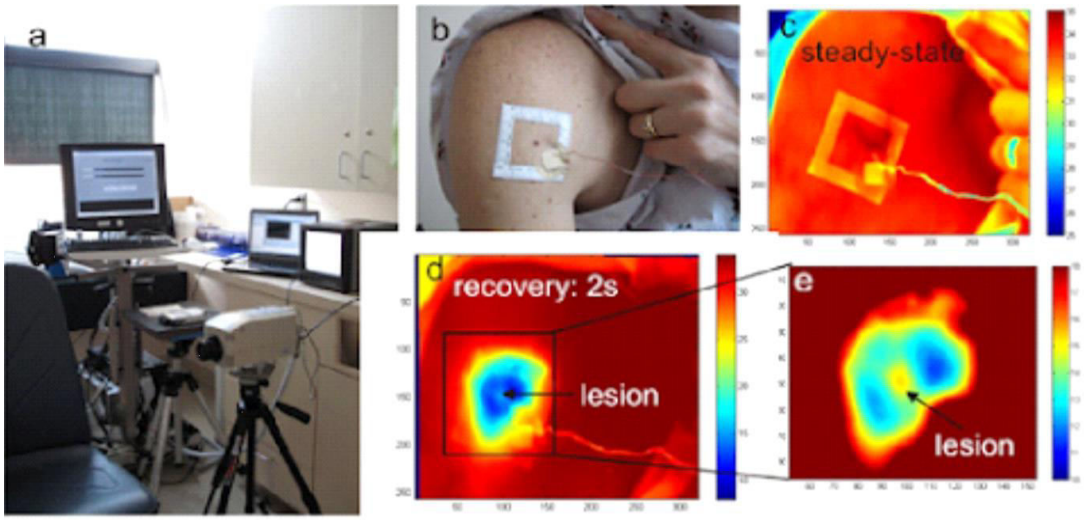
ABSTRACT: In recent days, skin cancer is seen as one of the most hazardous forms of Cancers found in Humans. Skin cancer is found in various types such as Melanoma, Basal, and Squamous cell Carcinoma among which Melanoma is the most unpredictable. The detection of Melanoma cancer in the early stage can be helpful to cure it. Computer vision can play important role in Medical Image Diagnosis and it has been proved by many existing systems. In this article, we present a computer-aided method for the detection of Melanoma Skin Cancer using Image Processing tools. The input to the system is the skin lesion image and then by applying novel image processing techniques, it analyses it to conclude about the presence of skin cancer. The Lesion Image analysis tools checks for the various Melanoma parameters Like Asymmetry, Border, Colour, Diameter,(ABCD), etc. by texture, size and shape analysis for image segmentation and feature stages. The extracted feature parameters are used to classify the image as Normal skin and Melanoma cancer lesion.

KEYEORDS: image processing, AI, computer vision, medical image diagnosis, Artificial Neural Network (ANN),Image Segmentation, Skin cancer



I. INTRODUCTION

Melanoma is a particularly deadly form of skin cancer and although it accounts for only 4% of all skin cancers it is responsible for 75% of all skin cancer deaths. If melanoma is diagnosed and treated in its early stages, it can be cured but if the diagnosis becomes late, melanoma can grow deeper into the skin and spread to other parts of the body. Its spread in other parts beyond the skin can be hazardous as it is difficult to treat. The presence of Melanocytes in any body part cause Melanoma. Intensive Exposure of skin to ultraviolet radiation is the main cause of melanoma. Dermoscopy is a non-invasive examination technique based on the use of incident light and oil immersion to make possible the visual examination of sub-surface structures of the skin. Though the detection of melanoma using dermoscopy is higher than unaided observation-based detection, its diagnostic accuracy depends on the training of the dermatologist. The diagnosis of melanoma from melanocytic nevi is not straightforward, especially in the early stage. Thus, an automatic diagnosis tool is essential for physicians. Even when expert dermatologists uses dermoscopy for diagnosis, the accuracy of melanoma diagnosis is estimated to be about 75-84%.4 The computer-aided diagnostics is helpful to increase the diagnostic accuracy as well as the speed. The computer is not more intelligent than a human but

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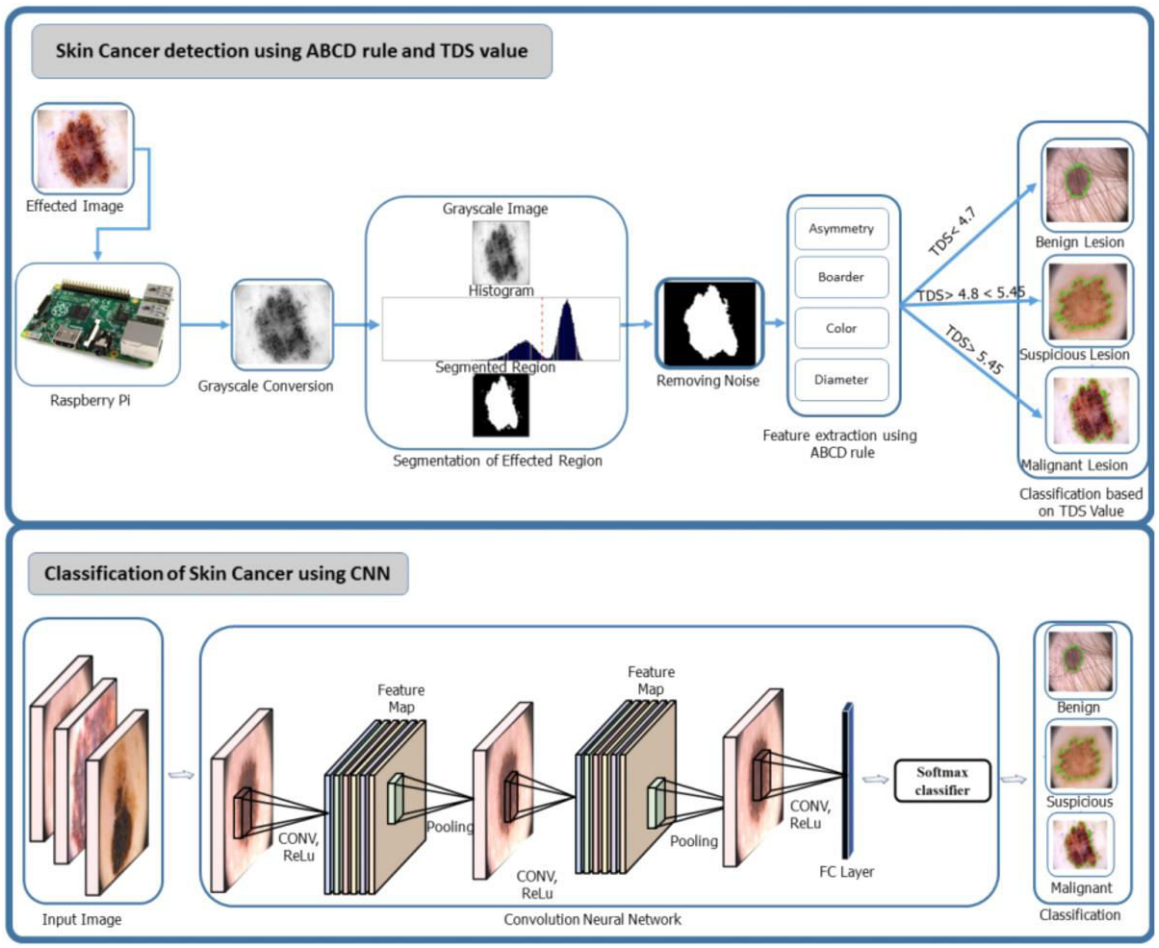
it may be able to extract some information, like color variation, asymmetry, texture features, that may not be readily perceived by human eyes. There have been many proposed systems and algorithms such as the seven-point checklist, ABCD rule, and the Menzies method to improve the diagnostics of melanoma skin cancer. The key steps in a computer-vision based diagnosis of melanoma are image acquisition of skin lesion image, segmentation of the skin lesion from the skin region, extraction of features of the lesion blob, and feature classification. Segmentation or border detection is the process of separating the lesion from the surrounding skin in order to form the region of interest. Feature extraction is used to extract the features; similar to those visually detected by dermatologists, that accurately characterizes a melanoma lesion. The feature extraction methodology of many computerized melanoma detection systems has been largely based on the conventional clinical algorithm of ABCD-rule of dermoscopy due to its effectiveness and simplicity of implementation. Its effectiveness stems from the fact that it incorporates the main features of a melanoma lesion such as asymmetry, border irregularity, color, and diameter (or differential structures), where quantitative measures can be computed.



II. RELATED WORK

Many researchers have been working on the Computer vision approach for skin cancer detection. For segmentation of skin lesions in the input image, existing systems either use manual, semi-automatic, or fully automatic border detection methods. The features to perform skin lesion segmentation used in various papers are: shape, color, texture, and luminance. Many border detection methods are reported in the literature, Some of the methods include histogram thresholding, global thresholding on optimized color channels followed by morphological operations, Hybrid thresholding. In this study, we have applied the Automatic thresholding and border detection method. Different image processing techniques have been used to extract such features, the author has introduced an automated Global border-detection method in dermoscopy images based on color-space analysis and global histogram thresholding which exhibits high performance in detecting the borders of melanoma lesions. In. the authors have used the technique of

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dividing the input image into various clinically significant regions using the Euclidean distance transform for the extraction of color and texture features. The ABCD rule of dermoscopy, suggests that asymmetry is given the most prominent among the four features of asymmetry, border irregularity, color, and diameter. A number of studies have been carried out on quantifying asymmetry in skin lesions. In Some techniques, the symmetry feature is calculated based on geometrical measurements on the whole lesion, e.g. symmetric distance and circularity Other studies, propose the circularity index, as a measure of irregularity of borders in dermoscopy images, The paper gives an overview of the most important implementations in the literature and compares the performance of several classifiers on the specific skin lesion diagnostic problem.

III. METHODOLOGY

The proposed methodology for Melanoma Skin Cancer Detection using Image Processing is as shown in Fig. 1. The input for the system is the image of the skin lesion which is suspected to be a melanoma lesion. This image is then pre-processed to enhance the image quality. The automatic thresholding process and edge detection are used for image segmentation. The segmented image is given to the feature extraction block which consists of lesion region analysis for its geometrical features and ABCD features. The geometrical features are proposed since they are the most prominent features of the skin cancer lesion. The extracted feature is further given to the feature classification stage which classifies the skin lesion as cancerous or normal by comparing its feature parameters with the predefined thresholds.

IV. SYSTEM FLOW DIAGRAM

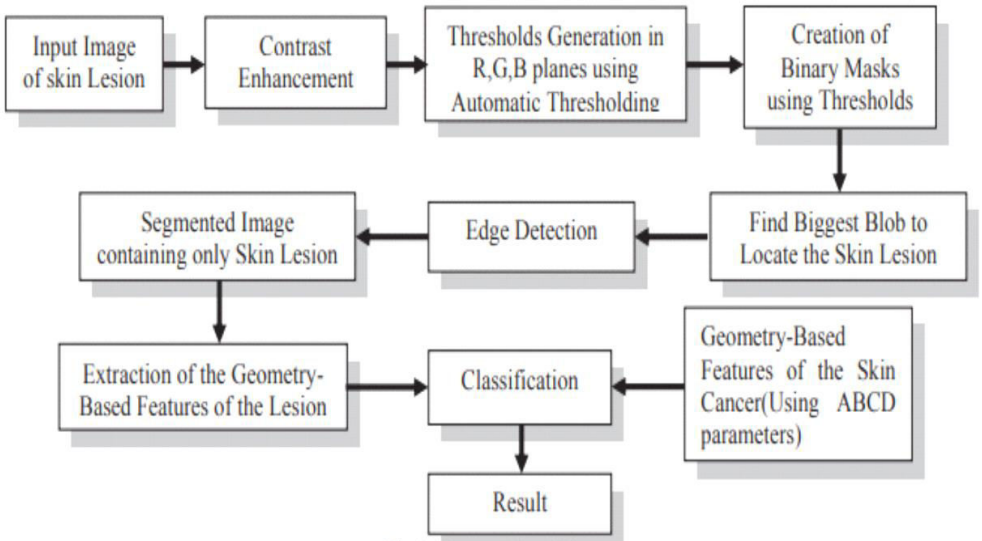

Fig.1. System Flow Diagram

THE PROPOSED TECHNIQUE

1.IMAGE PRE-PROCESSING

The input image given to the system can be obtained in any lighting condition or by using any camera such as a mobile camera. Hence it needs to be pre-processed. Here, the pre-processing includes the image resizing and contrast and brightness adjustment. This is done in order to compensate for the non-uniform illumination in the image. These processes are done by using image processing techniques like gamma correction.

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2.IMAGE SEGMENTATION

Image segmentation is performed by using our proposed automatic thresholding and masking operation in R, G, and B planes. First, automatic thresholding proposed by Otsu12 is applied in each plane. Binary masks for each plane are obtained and then combined to produce a final lesion mask. We use a 3-plane masking procedure to increase segmentation accuracy. Then edge detection is applied to further segmentation. The main prerequisite for extracting the features is that the lesion must be separated from the surrounding normal skin. But the segmented image may contain other smaller blobs which are not the skin lesion. To overcome this, we find the biggest blob in the segmented image. The segmented image obtained contains only the skin lesion.

3.CLASSIFICATION

Using the ABCD rules for melanoma skin cancer, we use some pre-defined thresholds in the classification stage. The Feature Values Extracted in the Feature Extraction stage are compared and the skin lesion is classified as Melanoma Skin Cancer or normal skin or Mole. This classification method proves to be efficient for most skin images.

V. RESULTS AND DISCUSSION

First, the Skin Lesion Mask is formed, and then it is applied to the input image to obtain the segmented image. As shown in Fig 6 and Fig7. input image of the skin lesion is efficiently segmented for both mole as well as Melanoma Cancer Image using the proposed segmentation method.

Fig2.These are the original images which we take as input the image on the left is cancer image and on the right is mole

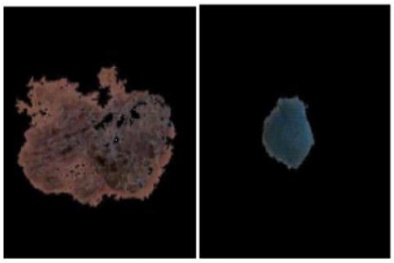

Fig3. Mask Is created

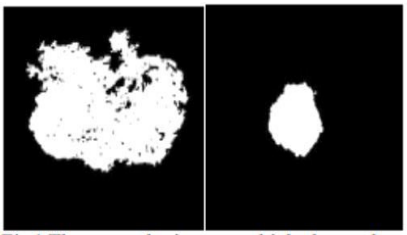

Fig4.These are the images which shows the biggest blob detected in the input image.

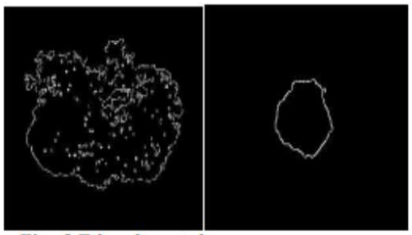

Fig. 5 Edge detected

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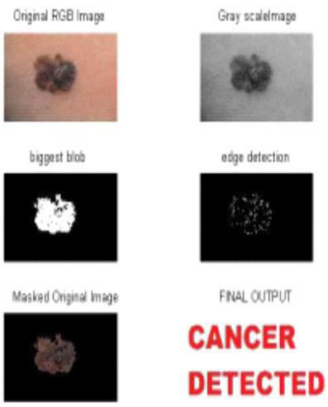

Fig.6 Cancer detected

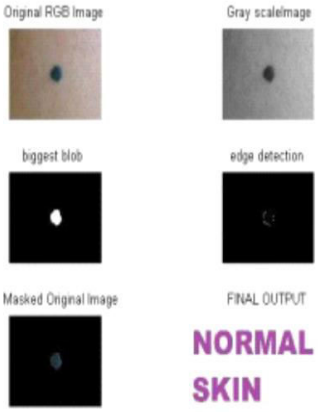

Fig.7. Cancer not detected

VI. CONCLUSION

It can be concluded from the results that the proposed system can be effectively used by patients and physicians to diagnose skin cancer more accurately. This tool is more useful for the rural areas where 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 Skin Cancer.

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