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# Classification and Detection of Melanoma Skin Cancer Using Image Processing

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*In recent days, skin cancer is seen as one of the most hazardous forms of Cancer found in Humans. To perceive pores and skin most cancers at an early stage, we can observe and examine them via numerous strategies named segmentation and characteristic extraction. ABCD rules have been applied for the automatic detection of skin cancer. . The numerous steps of cancer pores and skin lesion characterization in this system (specifically imaging strategies, pre-processing, segmentation, and characteristic dedication for pores and skin characteristic selection)decide how the lesion characterization and type are completed in Feature extractions*
***Keywords:*** *Digital Image Processing, Segmentation, Classification, SVM, MATLAB.*

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## I. INTRODUCTION

Malignant cancer is one of the main reasons for dying because of pores and skin cancers. While prevention of this malignancy is a high-quality approach, the early analysis of modern-day cancers is crucial. Dermatologists determine which moles are of interest-primarily based totally on size, border, shape, and sedation. The maximum essential problem is that most cancers may additionally moreover mimic a benign melanocyte/non-melanocyte lesion and vice versa. It has been stated that the typically anticipated sensitivity (percent of most cancers recognized as most cancers) is around 80%. Several non-invasive strategies had been advanced to enhance dermatologists' discrimination of melanomas from benign nevi. In modern years, multi-spectral and hyper-spectral imaging structures have been introduced as a renewed hobby in the analysis of cancer. Computer-aided prognosis (CAD) structures and photograph processing, used to assist pores and skin most cancers Professionals accumulate better detection of cancer, have been significantly studied inside the ultimate decades. This concept changed in the first proposed round in 1985. For instance, most cancer tendencies together with asymmetrical shape, ordinary border, color, and diameter of extra than 6 millimetres can be extracted through the usage of high-standard overall performance Image processing techniques. Increasing innovation in non-invasive strategies can notably enhance the early detection of malignant cancer as an opportunity to biopsy. Furthermore, because of the speedy increase of embedded device applications, there was an extraordinary possibility to expand transportable imaginative and prescient structures for scientific prognosis and applications, with the desirable decision and overall performance. Portable gadgets permit prognosis in far-flung places for sufferers who do now no longer have to get entry to professional dermatologists at a cheap value.

## II. RELATED WORK

Melanoma skin cancer (MSC) detection using non-invasive methods such as image processing techniques became one of the most attractive and demanding research in recants years. Wiltgen, et al. use a method of tissue counter analysis (TCA), which is based on partitioning the whole image into square elements of equal size, and then features are calculated from these square elements of the image. The features, based on GLCM (Grey level co-occurrence matrix) and gray level histogram, allow the differentiation of homogeneous and high contrast or luminous tissue areas. The highest accuracy of classification obtained by this approach was 68%. Fatima, et al. introduced a Multi-Parameter Extraction and Classification System (MPECS) to aid the early detection of skin cancer melanoma. The system is based on the extraction of 21 features from the detected image using six phase approach. After the extraction of these features, a statistical analysis is performed. Patwardhan et al. provided a method that is

based on the use of wavelet transformation based tree structure model for evaluation and the classification of skin lesion images into melanoma and dysplastic nevus

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. Histogram thresholding includes global thresholding on optimized color channels followed by morphological operations, Hybrid thresholding. The ABCD rule of dermoscopy, suggests that asymmetry gives the most prominent among the fourfeatures of asymmetry, border irregularity, color, and diameter. Several 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 proposed the circularity index, as a measure of irregularity of borders in dermoscopy images.

## III. SYSTEM FLOWCHART

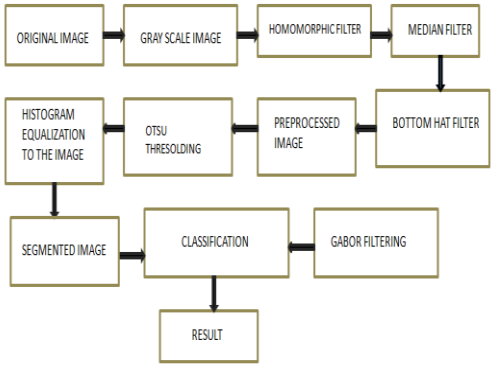


**Fig. 1. System Flowchart Diagram**.

## IV. THE PROPOSED TECHNIQUES

### 4.1.Data collection

A collection of 1000 clinical images was collected from ISIC Website to be used for image analysis and to develop the system. The following image problems were excluded from the collection in order to generate the dataset:

- Poor-quality images.
- Images with uncertain class labels.
- Images wherein the ratio of the scale of lesions turned into very low in comparison with different images.
- Images wherein massive numbers of hairs covered the surface of the lesion

.Each image was cropped so that the lesion was located in the center of the image and then each sample was resized to 450X600 pixels. The generated dataset contained 5000 images and was divided into two groups: melanoma and non-melanoma. There were 560 images of melanoma and 560 images of benign nevi. And remaining images are used for CNN Classification.

### 4.2. Pre-processing

This step includes Converting the RGB acquired skin image to a gray image, Contrast enhancement, Histogram modification and, Noise Filtering. Contrast enhancement and histogram change are proposed due to the fact that a number of the obtained images aren't homogenous because of the wrong illumination at some point of the image acquisition. While the histogram alternate strategies which consist of histogram equalization are used to increase the contrast of the image and, therefore, make the segmentation more accurate. Noise filtering using a median filter is implemented to reduce the impact of hair cover on the skin in the final image used for classification

### 4.3.Segmentation

The subsequent level after preprocessing is detecting and segmenting the region of interest (ROI) which represents the lesion region. One of the main contributions of this study was to develop a fast and efficient algorithm to enable border detection to be implemented on a portable system. We proposed the following techniques as follows:

Several edge detection techniques have been investigated after the usage of morphological operations because of the pre-processing step for border detection of melanoma images. We considered this method due to its speed and computational simplicity

**Based on Color features**: A semi-automatic method for lesion segmentation of clinical images based On lesions, color functions become evolved so that it will enhance the accuracy of border detection.

**Otsu thresholding:**

- Since the ROI is homogenous and, therefore, the thresholding becomes dynamic depending on the histogram of the enhanced image. After that,
- Image filling is applied to remove background pixels from inside the detected object and, therefore, make the ROI clear.
- Image opening is used to take away the extra background pixels which represent part of non-ROI and, also, to smooth the contour of the object's boundary and break narrow isthmuses, and eliminate thin protrusions.
- Finally, the extracted region is cropped and then converted to a gray level image and the histogram image is calculated.

**4.4 Feature extraction**

**Color Features**: Color analysis is one of the most important methods for analyzing medical images. Color moments can be used as color features in image processing. Color moments estimate the representation of color distribution in an image and specify a measurement for the color similarity between images. They are scaling and rotation invariant and encode both shape and color information for feature extraction.

**Shape features:** The shape traits are the Border irregularity index, Abnormality index, Circularity, and diameter that compare to the lesion.

**Texture features:** Texture analysis is a technique for extraction and analysis of the shape and spatial structure of images such as smoothness, coarseness, roughness, and regular patterns. In this study, texture features were extracted from The Grey level co-occurrence matrix (GLCM).and Texture Feature extraction using Gabor filter

**4.5 classification**

classification is the final step of this project, on this step we use the SVM set of rules which classifies into benign cancer or malignant cancer. Unlike maximum algorithms, SVM makes use of a hyper plane that acts as a choice boundary between the numerous classes. SVM may be used to generate multiple keeping apart hyper planes such that the information is split into segments and every section carries the handiest sort of information. Features of SVM are as follows:

1. SVM is a supervised learning set of rules. This method that SVM trains on a set of classified information. SVM research the classified training records after which classifies any new input records depending on what is discovered with inside the training phase.
2. A essential benefit of SVM is that it could be used for both classification and regression problems. Though SVM is in particular regarded for classification, the SVR (Support Vector Regression) is used for regression problems.
3. SVM may be used for classifying non-linear information via way of means of using the kernel trick. The kernel trick method transforms information into some other size that has a clear dividing margin among instructions of records. After that, you can without problems draw a hyper plane between the numerous lessons of information

## V. RESULTS

***A. Image Acquisition***

**Fig.1.input image**

***B. Pre-processing***

**Fig.2.preprocessed image**

Fig 1 is the original image which we take as input the image on the left is the cancer image and on the right is the output image of pre-processing

***C. Segmentation***

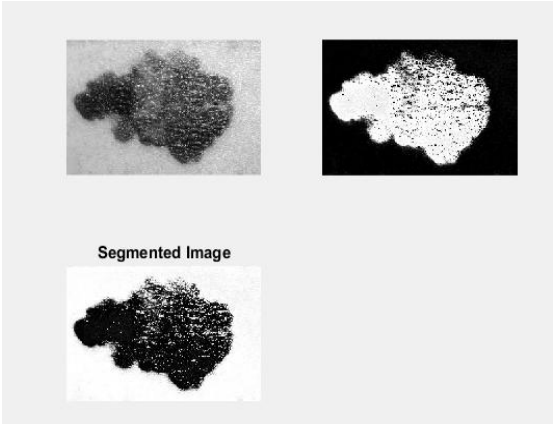


**Fig.3. segmented image**

***D. Feature Extraction***

Texture Feature extraction using Gabor filter
Analysis results: [by Gabor filtering]

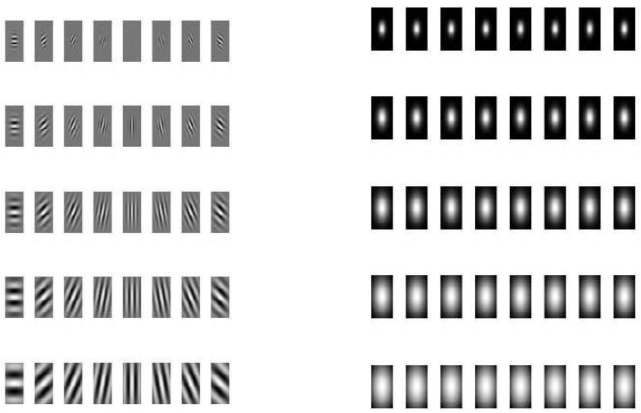

**Fig.4.1. A real part of the Gabor filter**

**fig.4.2. The magnitude of the Gabor filter**

***E. Classification***

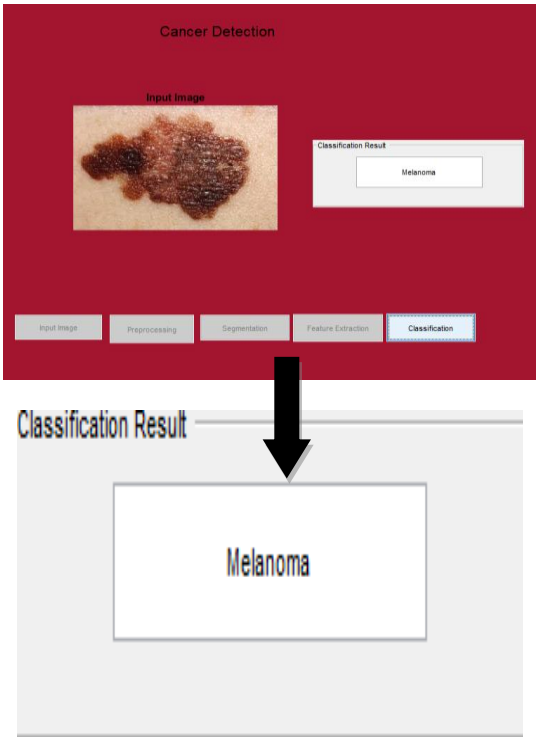


**Fig.5. The final step is classification of image, which classifies into benign-melanoma or malignant-melanoma. Melanoma images are classified from other non-melanoma images using the classifier.**

## VI. CONCLUSION

In this project, we use the dataset of 4000 images from well-known ISIC for checking out and training. We have examined different strategies for melanoma detection and classification. The cancer detection approach is completed in precise levels like pre-processing, segmentation, feature extraction, and classification. Based on the all features like color, texture, and shape features along with trained data, texture features are done by the Gabor filter.SVM will predict skin cancer whether it is malignant or benign. In order to detect and classify skin cancer for a single image, we use a Support Vector Machine (SVM) for the detection and classification of images.

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