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Original Research

Skin Cancer Recognition Using SVM Image Processing Technique

Rahul Chand Thakur[1] **and Vaibhav Panwar**[2]

[1]*M.TECH, Department of Computer Science, IILM Greater Noida*
[2]*Associate Professor, Department of Computer Science, IILM Greater Noida*

Abstract. Skin cancer is considered as commonest cause of death among humans in today's world. This type of cancer shows non uniform or patchy growth of skin cells that most commonly occurs on of the certain parts of body which are more likely exposed to the light, but it can occur anywhere on the body. The majority of skin cancers can be treated if detected early. As a result, finding skin cancer early and easily will save a patient's life. Early detection of skin cancer at an early stage is now possible thanks to modern technologies. Biopsy procedure [1] is a systematic method for diagnosis skin cancer. It is achieved by extracting skin cells, after which the sample is sent to different laboratories for examination. It's a very long (in terms of time) and painful process. For primitive detection of skin cancer disease, we proposed a skin cancer detection system based on svm. It is more helpful to patients. Various methods of image processing and the supervised learning algorithm called Support Vector Machime (SVM) are used in the identification process. Epiluminescence microscopy is taken using an image and particular to several pre processing techniques which are used in the reduction of sound artifacts and improvise quality of images. Segmentation is done by using certain thresholding techniques like OTSU. The GLCM technique must be used to remove certain image features. These characteristics are fed into the classifier as input. The Supervised learning model called (SVM) is used to distinguish data sets. It determines whether a picture is cancerous or not.

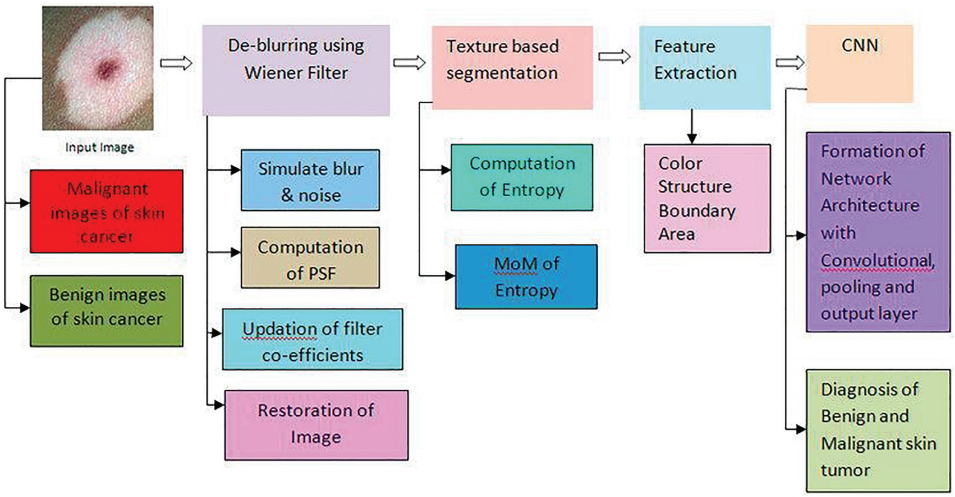
Keywords: Otsu Thresholding, Super Vised Learning Model, GLCM, Skin cancer, Classifier, SVM.

Introduction

Skin cancer is a condition that can be lethal. There are three basic layers to the skin. The outmost cover, which is made up of squamous cells which is the first layer, basal cells that represents the second layer, and melanocytes cells which makes the innermost layer, is where skin cancer starts. Non-melanoma cancers include squamous cell and basal cell carcinomas. Non-melanoma skin cancer is often treatable and seldom spreads to other parts of the body. Melanoma is a form of skin cancer that is more dangerous than the majority of other skin cancers [3]. It easily invades surrounding part or structure and spreads to other parts of the body if it is not detected at an early stage. Biopsy is a formal diagnostic tool for skin cancer detection. A biopsy is a procedure that involves removing a small part of tissue or a cell's sample from a patient's body to be examined in a laboratory. It is an awkward process. Since research takes a long time, the biopsy process is time consuming for both the patient and the doctor. Biopsy is performed by scraping skin(tissues) and subjecting the sample to a series of tests in the laboratory [1]. There is a chance that the disease will spread to other parts of the body. It is more dangerous. In light of the aforementioned scenarios, skin cancer detection via svm is proposed. For classification, this approach employs SVM and digital image processing techniques. This method has led to the primitive detection of skin cancer because it does not involve applying oil to the skin to obtain clear, enhanced images of your moles. It is a simple and safe process this way. Most notably, because of the higher magnification, Skin Cancer Identification is more precise. SVM can help avoid the removal of completely harmless moles and skin lesions that would otherwise be removed.

Literature Review

Skin cancer recognition based on static filters known as maximum entropy, Otsu thresholding, feature extraction by gray level co-occurrence matrix (GLCM) and classification by artificial nerve Networks were proposed by J Abdul Jaleel [2013] (ANN). A Back Propagation Neural Network (BPN) is used for classification [1].



M. Chaithanya Krishna [2014]: The ABCD (Asymmetry Index Boundary Color Index Diameter) method is used as a clustering technique to extract features from the segmentation.

A.A.L.C. Amarathunga [2015]: Rule and Chain based strategy is used in this article to identify and detect the skin diseases. The proposed machine allows users to recognise children's and adults skin related diseases and provide helpful medical advice through the internet.

To predict and diagnose the skin disease, researchers used various data mining classification algorithms like MLP, Naïve Bayes and AdaBoost. Just three skin diseases (Eczema, Impetigo, and Melanoma) respond to this treatment [8].

In this article, Kawsar Ahmed [2013] used a variety of data preprocessing techniques, disease diagnosis, a maximum frequent item algorithm for planning, segmentation is done using K Means Clustering algorithm, and important consistent patterns for classification.

Amr Sharawy, Mai S. Mabrouk, Mariam A. Sheha, this paper describes a melanoma diagnosis approach based on a series of digital images. To distinguish between cancerous and noncancerous the figure, (GLCM) alos known as gray level co-occurrence matrix and the classifier (ML) also kmown as multilayer perception were extracted using the characteristics [9].

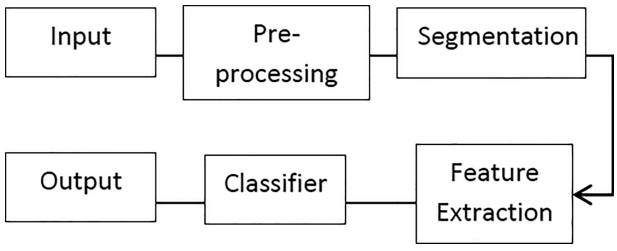


Figure 1. Block diagram.

Proposed System

The use of SVM to identify the appearance of cancer cells in an image is essentially known as skin cancer detection. The GLCM and Support Vector Machine are used to detect skin cancer (SVM). (GLCM) is used to extract second order statistical features as well as extracting image features that can be used for classification. SVM is a type of machine learning technique that is widely used for regression analysis and classification.

Implementation Details

Input image

Dermoscopic images, which are images taken with a dermatoscope, are used as input to the proposed system. It's a magnifier that's used to photograph lesions on the skin (body part). It's a portable device that makes diagnosing skin diseases a lot easier.

Pre processing

The aim of pre-processing is to improve image data by reducing unnecessary distortions and enhancing some essential image features for subsequent image processing. There are three major aspects of image preprocessing. (1) Conversion to grayscale (2) Noise reduction (3) Enhancement of the image.

Grayscale conversion

The only detail in a grayscale picture is brightness. In a grayscale image, each pixel represents an amount or quantity of light. In a grayscale image, the brightness gradient can be distinguished. Only the light intensity is measured in a grayscale picture. RGB colours are coded on 256 levels

starts from 0 to 255. The Grayscale conversion is process of converting a colour image into a grayscale image, as shown in Figure 3. Gray Scale images are processed easily and take less time as compared to the colour images. On a grayscale image, all image processing techniques are used [4].

Our proposed method uses the following equations to convert a (Red Blue Green) RBG image into a grayscale image using the weighted sum technique.

$$\text{Grayscale intensity} = 0.299\ \text{R} + 0.587\ \text{G} + 0.114\ \text{B} \quad (1)$$

Noise Reduction

The process of detecting and deleting unwanted noise from a digital photo is known as noise reduction. The problem is to differentiate between the correct aspects which is required for further bifurcation and which has to be treated as noise. The term "noise" refers to the unpredictability of pixel values.

As shown in Figure 1, we use a median filter in our proposed method to eliminate unnecessary noise [4]. A non linear filter like median filter having invariant sharp edges. A sliding window of odd length is used to enforce a median filter. The median of the sample within the window is the centermost value, and each sample value is sorted by magnitude, which produces filtered output.

Image Intensification

Image intensification aims to make a photograph's main feature more visible. To obtain a higher quality result in this case, contrast enhancement is used as shown in Figure 5.

Segmentation

Segmentation is the method of eliminating an image's region of interest. Each pixel has similar attributes in a region of interest. For segmentation, we use maximum entropy thresholding [5]. To begin, we must first determine the original image's grey level, then calculate the grayscale image's histogram, and finally, using maximum entropy, separate the foreground and context. After obtaining the static filters like maximum entropy, a binary image is obtained, which is white and black image as shown in Figure 6.

Feature extraction

In order to extract information from a given image, feature extraction is crucial. For texture image analysis, we're using GLCM. This perceptual relationship between the image pixels identified by GLCM method. The grey level image matrix is used by GLCM to capture the most common features like contrast, mean, energy, and homogeneity [2].

Contrast:

$$\Sigma_i \Sigma_j\ (i-j)^2 C(i,j) \quad (2)$$

Energy:

$$\Sigma_i \Sigma_j\ C(i,j)^2 \quad (3)$$

Equation of Homogeneity

$$\Sigma_i \Sigma_j\ \frac{C(i,j)}{1+|i-j|} \quad (4)$$

Mean (μ)

$$\frac{\Sigma_i^m \Sigma_j^n\ C(i,j)}{m*n} \quad (5)$$

An Image data set helps in image recognition by measuring specific attributes or values using a suitable technique called Feature Extraction. To differentiate between cancerous and non-cancerous images, a classifier is used. For the sake of consistency, we used supervised learning model called support vector machine. This model analyses a set of different images and checks which of the two cancerous and non-cancerous groups each image belongs to. The purpose of SVM is to build a hyperplane that separates the two groups with the least difference [2]. Feature extraction (glcm) is a technique for reducing the size of an image data set by measuring certain values or attributes that aid in image identification [5].

Results

On the internet, I discovered photographs of skin cancer. They were preprocessed using techniques including conversion into grayscale, static filters (median) like maximum entropy, and the gray level coocuurence matrix system, and all the various features were fed into Support Vector Machine to separate malicious cancer and non melanocytes non-cancerous images, yielding the image. cancer (as shown in the figure).

Figure 2. Input image.

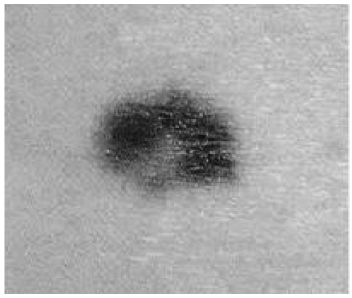


Figure 3. Gray scale image.

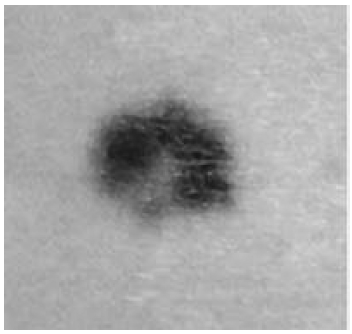


Figure 4. Image without noise.

Figure 5. Enhanced image.

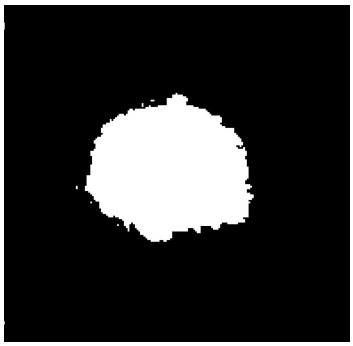


Figure 6. Segmented image.

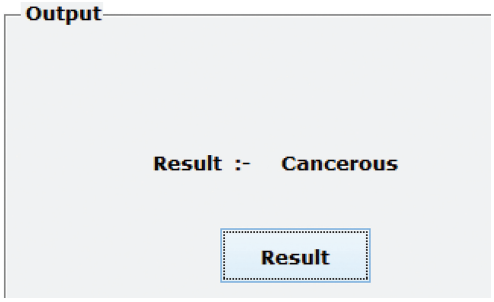


Figure 7. Snapshot of output.

$$\text{Accuracy Rate} = \frac{\text{True Positive Value} + \text{True Negative Data Value}}{\text{True Positive Value} + \text{False Positive Value} + \text{False Negative Value} + \text{True Negative Value}} \quad (6)$$

Table 1. Support Vector Machine (SVM) performance.

Parameters	Support Vector Machine Classifiers
True Positive Value	17
True Negative Value	04
False Positive Value	1
False Negative Value	2
Accuracy Rate	

Accuracy Rate using above formula = 95%

Conclusion

The proposed skin cancer recognition method can easily be determined by using a (GLCM) and a statistical model learning called support vector machine to detect if the image is non cancerous or not. The accurate rate obtained for the developed machine is 95%. In contrast to biopsy, it is a painless and long-lasting treatment. It's more useful to the patients.

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