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# Automatic Diagnosis System for Detecting Melanoma Using Local Binary Patterns

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***Abstract***
*In this paper, a classification method for melanoma and non-melanoma has been presented using the local binary patterns (LBP). The LBP computes the local texture information from the dermoscopic images, which is later used to compute some statistical features that have capability to discriminate the melanoma and non-melanoma skin tissue. Support vector machine (SVM) is applied on the feature matrix for classification into two skin image classes (melanoma and non-melanoma). The method achieves good classification accuracy of 95.83% with sensitivity of 96.67% and specificity of 95.0%.*

***Keywords:*** *Local Binary Pattern, Support Vector Machine ,Gray Level Co-occurrence Matrix,*

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## I. INTRODUCTION

Skin cancer is one of the most dangerous cancers. The early recognition of skin cancer is one of the prometheus solutions. However, the practical parameters for an automated dermoscopic image classification is still unclear. The computerization of this objective needs all the knowledge of image processing and statistical methods of classification, starting by image preprocessing, segmentation, features extraction, classification. The entire process is composed of three main blocks, Pre-processing, Feature extraction and Disease detection. For feature extraction gray level co-occurence matrices(GLCM) and Local Binary Pattern(LBP) is implemented. The current work aims to classify skin cancer images to melanoma and non melanoma cases using LBP texture features and SVM classifier.

### 1.1 Local Binary Pattern

Local binary pattern (LBP) is one of the useful method for features extraction, this method is used in many topics of image processing, in face detection, breast cancer, X-ray images. LBP is comparison in gray level between one pixel called central pixel with its pixels neighborhood .LBP is a type of visual descriptor used for classification in computer vision. It has been found to be a powerful feature for texture classification; it has further been determined that when LBP is combined with the Histogram of Oriented Gradients(HOG) descriptor, it improves the detection performance considerably on some datasets**.**

The LBP code for each pixel is calculated and the histogram of LBP codes is constructed as the LBP feature. To calculate the LBP code, for each pixel p, the 8 neighbours of the centre pixel are compared with the pixel p and the neighbours x are assigned a value 1 if x>=p and assigned 0 if x<p.

### 1.2 Support Vector Machine

Support Vector Machine (SVM) was introduced by Vapnik and Lerner. It is a classifier that partitions a vector space into two separate zone. An algorithm that intuitively works on creating linear decision boundaries to classify multiple classes. Support vector machines are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis.

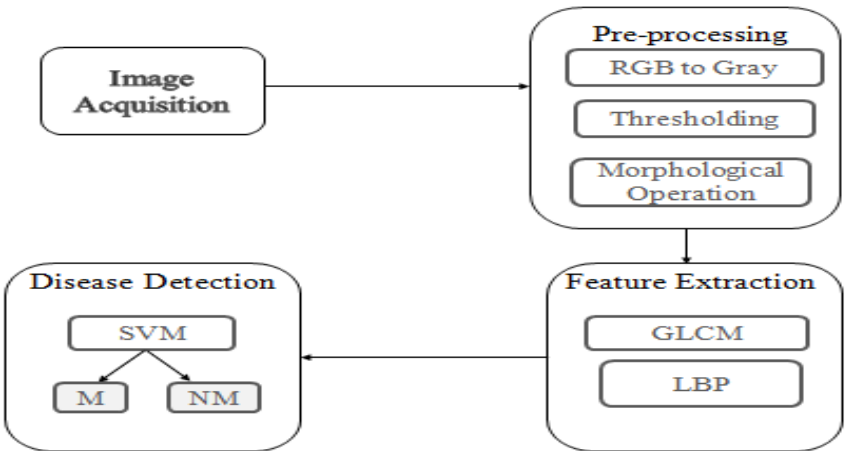
## II. EXPERIMENTAL WORK

In this study the texture features from the skin are computed by the LBP operator. The skin cancer images are obtained from PH^2 dataset. The dataset under study comprises of 120 images with 70 melanoma images and 50 of non-melanoma images. The dataset is divided into training and testing sets . The training set includes 90 images (45 melanoma and 45 non melanoma) and the testing set includes 30 images (15 melanoma and 15 non melanoma) The texture information from these images are computed by using the LBP operator with varying radius and neighborhood pixel values.

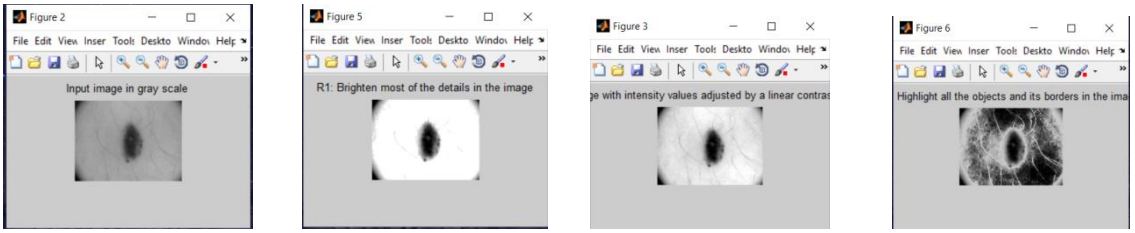
For feature extraction, different preprocessing algorithms are used. The RGB values of the images are extracted before converting it into a gray scale image. Sharpening filter is applied to the gray scale image in order to sharpen the details of the infected region. The number of components of the skin affliction was extracted from the image using the Euler value. A threshold limit was imposed on the Euler value exceeding which was an indicator of presence of a large number of inflictions.

The GLCM functions characterize the texture of an image by calculating how often pairs of pixel with specific values and in a specified spatial relationship occur in an image, creating a GLCM, and then extracting statistical measures from this matrix. A GLCM is a matrix where the number of rows and columns is equal to the number of gray levels, G, in the image.

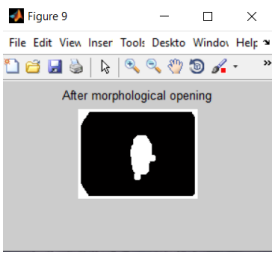
Using GLCM ,statistical features such as Contrast, Homogeneity, Energy, Correlation are computed to obtain a statistical feature matrix. These statistical features have the capability to discriminate the melanoma and non-melanoma tissues The classification task is achieved using the support vector machine (SVM) classifier which is applied on the extracted statistical features.. The entire steps of the proposed method are presented by the block diagram.



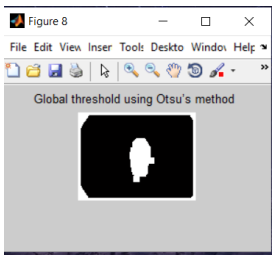

The results of the input image at each stage of preprocessing technique is shown in the following figure.



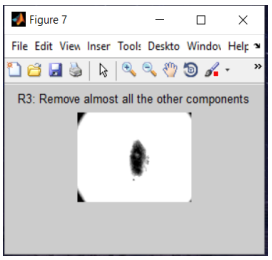

a) Grayscale Image b)Brightening the details c)Intensity adjusted d)Border highlighted



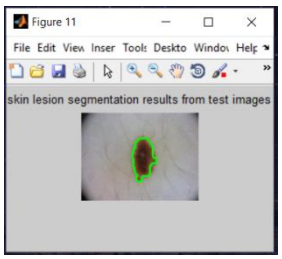

e)Morphological Operation




h) Thresholding




i) Removing outer components

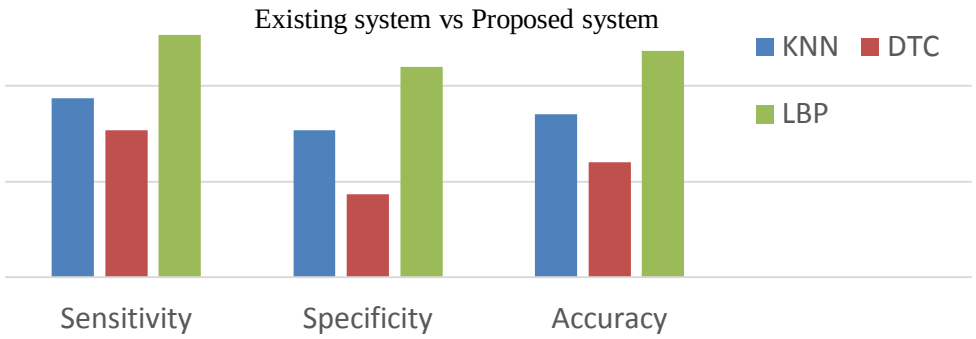



j) Segmenting

## III. RESULTS

Using the LBP operator with different radius R and numbers of neighbors P, feature matrices were obtained separately. Using GLCM, statistical features were obtained and classified using SVM classifier. The comparison of the classifications are presented in the table

| | **Sensitivity** | **Specificity** | **Accuracy** |
|---|---|---|---|
| **KNN** | **93.33** | **91.67** | **92.50** |
| **DTC** | **91.67** | **88.33** | **90.00** |
| **LBP+SVM** | **96.67** | **95.00** | **95.83** |




## IV. CONCLUSION

In this paper, an application of local binary pattern combined with SVM classifier is presented to discriminate the melanoma and non-melanoma skin cancer tissues. The texture descriptors at different radii R and neighborhood P of the LBP operator are computed from the extracted images in the skin cancer dataset. The results present a good performance for LBP with a sensitivity of 96.67% and accuracy of 95.85%.

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