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SKIN CANCER DETECTION USING LOCAL BINARY PATTERN AND SVM CLASSIFIER

[1] P.Umamaheswari, [2]S.Ajumal Ahamed, [3]R.Harene, [4]S.Haritha, [5]R.Mitra

[1]Assistant Professor/ECE, [2], [3], [4], [5]Final year students

[1]Electronics and Communication Engineering,

[1]SNS College of Technology, Coimbatore, I*ndia*

Abstract*:* Detection of skin cancer in the earlier stage is very Important and critical. In recent days, skin cancer is seen as one of the most Hazardous form of the Cancers found in Humans.. The detection of Melanoma cancer in 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. Skin cancer is found in various types such as Melanoma, Basal, Squamous cell Carcinoma, among which Melanoma is the most unpredictable. In this paper, we present a 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 image processing techniques, it analyses to conclude about the presence of skin cancer. The Lesion Image analysis tools checks for the various Melanoma parameters, Colour, Area perimeter, diameter etc by texture, size and shape analysis for image segmentation and feature stages. The extracted feature parameters are used to classify the image as Non-Melanoma and Melanoma cancer lesion.

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. Skin cancer detection using Local Binary Pattern (LBP) presents an innovative and efficient approach to early diagnosis. By leveraging LBP's ability to capture textural patterns in dermatological images, this method aims to enhance the accuracy of automated systems, aiding healthcare professionals in timely and informed decision-making. The computational efficiency and robustness of LBP make it a promising tool for highlighting irregularities in skin lesions, contributing to the early identification of malignant growths. This approach not only has the potential to simprove accessibility to skin cancer screening but also to reduce false positives and negatives, ultimately advancing the field of dermatological health.

Fig 1.1 MELANOMA

RESEARCH METHODOLOGY

2.1 HARDWARE SPECIFICATION

- PROCESSOR : Intel/Pentium
- OS : Windows 10
- RAM : 4GB
- SYSTEM TYPE : 64-bit

2.2 SOFTWARE SPECIFICATION

- TOOL : MATLAB 2014a
- TOOL BOX : Image Processing Tool Box

2.2 SOFTAWRE REQUIREMENTS

2.2.1 MATLAB

MATLAB is utilized in a project for skin cancer detection employing local binary pattern (LBP) and support vector machine (SVM) classifier. Initially, MATLAB is employed to preprocess the skin images, extracting relevant features using LBP, a texture descriptor known for its effectiveness in characterizing local patterns. These features are then fed into an SVM classifier, which is trained on a dataset containing labeled instances of malignant and benign skin lesions. MATLAB facilitates the training of the SVM model, optimization of its parameters, and evaluation of its performance through techniques like cross-validation. Additionally, MATLAB provides visualization tools to analyze the results, aiding in the assessment of the classifier's accuracy, sensitivity, and specificity in detecting skin cancer. Overall, MATLAB serves as a comprehensive platform for implementing and evaluating the skin cancer detection system, leveraging LBP and SVM techniques for effective classification of skin lesions.

2.2.2 IMAGE PROCESSING TOOL BOX

In a skin cancer detection project employing local binary pattern (LBP) and support vector machine (SVM) classifier, the Image Processing Toolbox in MATLAB plays a pivotal role. Initially, the toolbox facilitates the preprocessing of skin images, including tasks such as noise reduction, contrast enhancement, and segmentation to isolate the lesion regions. LBP feature extraction, a critical step in the process, is efficiently implemented through functions provided by the toolbox, allowing for the characterization of local textures within the lesion areas. Subsequently, the SVM classifier training and evaluation processes are seamlessly integrated into the workflow using functions and algorithms available within the toolbox, enabling the optimization of classifier parameters and the assessment of model performance through metrics like accuracy, sensitivity, and specificity. Moreover, the toolbox's visualization capabilities aid in the qualitative analysis of results, providing insights into the effectiveness of the skin cancer detection system. Overall, the Image Processing Toolbox in MATLAB serves as a comprehensive framework for implementing LBP-based feature extraction and SVM-based classification, facilitating the development of robust and accurate skin cancer detection algorithms.

2.2.3 SVM ALGORITHM

In the skin cancer detection project employing local binary pattern (LBP) and support vector machine (SVM) classifier, the SVM algorithm plays a crucial role in distinguishing between malignant and benign lesions. Initially, features extracted using LBP are fed into the SVM classifier, which learns to discriminate between different texture patterns characteristic of skin cancer. The SVM algorithm, implemented through MATLAB's toolbox, constructs an optimal hyperplane that separates the feature space into distinct regions corresponding to different classes of skin lesions. By iteratively adjusting parameters to maximize the margin between classes while minimizing classification errors, SVM effectively captures the underlying patterns in the data. Furthermore, through techniques like cross-validation, the SVM model's performance is assessed and fine-tuned, ensuring robustness and generalization to unseen data. Overall, SVM serves as a powerful tool in the skin cancer detection pipeline, leveraging LBP-derived features to provide accurate and reliable classification results, crucial for early diagnosis and treatment planning.

2.2.4 LOCAL BINARY PATTERN

Local binary pattern (LBP) is integral to the skin cancer detection project, serving as a feature extraction technique that captures the texture characteristics of skin lesions. Initially, LBP is applied to input images to encode local texture information by comparing the intensity of each pixel with its surrounding neighbors. This generates a histogram of texture patterns, effectively representing the texture properties of different regions within the skin lesion. These LBP histograms serve as feature vectors that are subsequently fed into the SVM classifier. By leveraging LBP, the system can effectively capture the subtle variations in texture associated with malignant and benign lesions, facilitating accurate classification. The discriminative power of LBP features enables the SVM classifier to learn and distinguish between different classes of skin lesions with high precision. Overall, LBP plays a crucial role in the skin cancer detection pipeline by providing discriminative texture features that enhance the performance of the SVM classifier, ultimately contributing to the system's ability to accurately diagnose cancer.

II. PROJECT DESCRIPTION

3.1 EXISTING METHOD

Skin is a sense of touch in humans' body which one of its functions is to feel the touch. This part of the human body is very sensitive, easy to get hurt, and feels a sense of sensitivity. Human skin consists of epidermis and dermis. Skin diseases can be caused by a decrease in the immune system, allergies, viruses, or other causes. Skin disease is generally caused by a less guarded hygiene, bacteria, viral, allergic reactions, and low body resistance. If the cause of skin disease is only due to a lack of maintaining cleanliness, it can be prevented by changing lifestyles to be cleaner and healthier. In another situation, not all people understand skin diseases for treatment or prevention. By the reason, The Forward Chaining Method is made to provide information about diagnoses of several skin diseases and produces conclusions. The existence of this expert system application makes it easy for people to get any information about skin diseases.

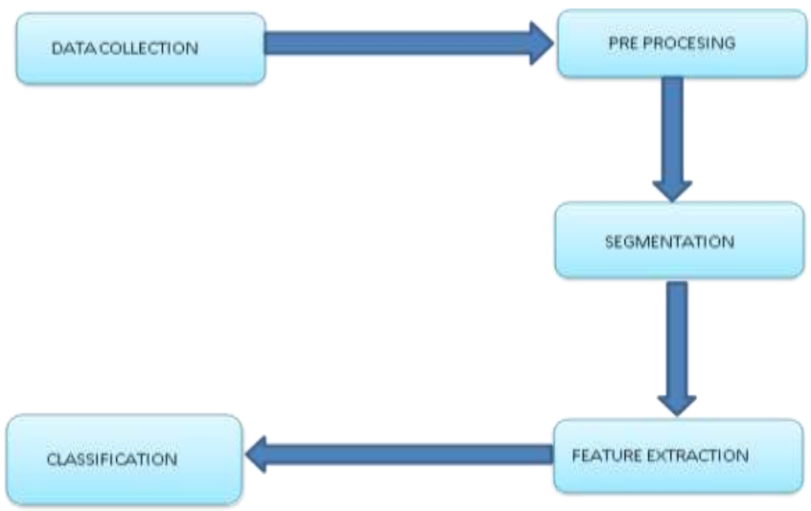

Fig. 3.1 EXISTING METHOD

3.2 WORKING OF PROPOSED SYSTEM

The proposed system for skin cancer detection using local binary pattern (LBP) and support vector machine (SVM) classifier operates as follows:

Preprocessing: Initially, the input skin images undergo preprocessing steps such as noise reduction, contrast enhancement, and segmentation to isolate the lesion regions, preparing them for feature extraction.

Feature Extraction with LBP: Local binary pattern is applied to the preprocessed images to extract texture features that describe the local patterns within the skin lesions. LBP encodes the texture information of each pixel by comparing its intensity with neighboring pixels, generating histograms of texture patterns for each region of interest.

Feature Vector Formation: The histograms of LBP patterns serve as feature vectors, representing the texture characteristics of the skin lesions. These feature vectors are constructed for each image and serve as input data for the subsequent classification step.

SVM Classification: The feature vectors extracted using LBP are then fed into an SVM classifier. The SVM algorithm learns to distinguish between malignant and benign skin lesions by finding an optimal hyperplane that separates the feature space into different classes. Through iterative optimization of parameters and margin maximization, SVM effectively learns the underlying patterns in the data.

Model Evaluation and Validation: The performance of the SVM classifier is evaluated using techniques such as cross-validation, where the classifier's accuracy, sensitivity, specificity, and other metrics are assessed. This ensures that the model generalizes well to unseen data and provides reliable predictions.

Skin Cancer Detection: Finally, the trained SVM classifier is utilized to predict the likelihood of malignancy for new, unseen skin lesion images. Based on the classification results, dermatologists or healthcare professionals can make informed decisions regarding diagnosis and treatment planning.

Overall, the proposed system combines the descriptive power of LBP texture features with the discriminative capabilities of SVM classification to accurately detect skin cancer, providing a valuable tool for early diagnosis and intervention.

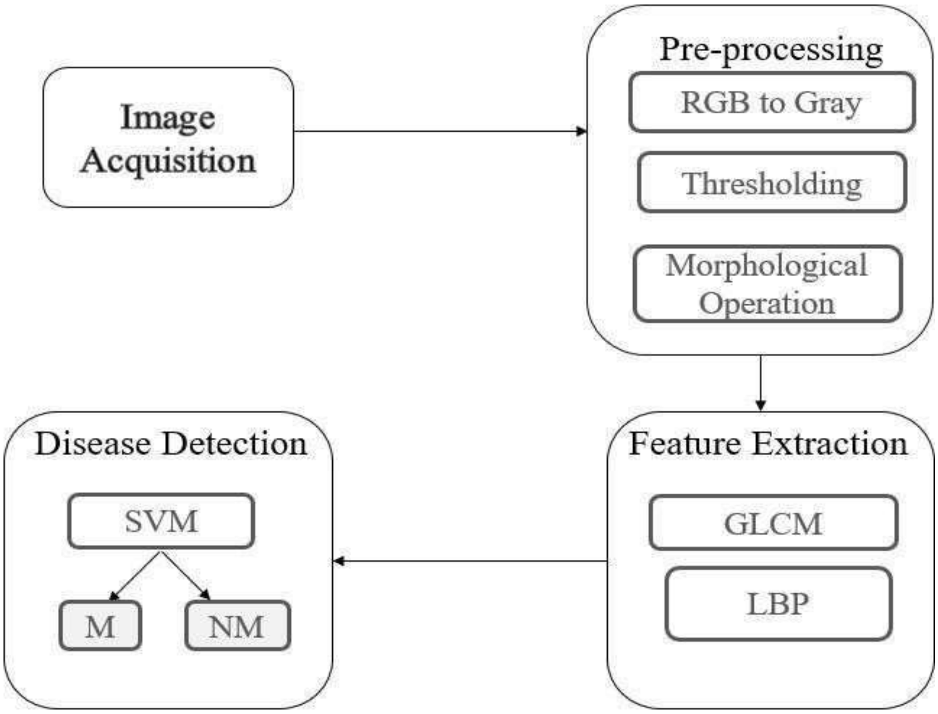

Fig 3.2 ARCHITECTURE OF PROPOSED SYSTEM

IV. RESULTS AND DISCUSSION

In this study, we employed local binary pattern (LBP) features in conjunction with support vector machine (SVM) classifier for the detection of skin cancer. The LBP method effectively captures the texture information from the skin images, enabling robust feature representation. SVM, known for its capability in handling high-dimensional data and binary classification tasks, was employed as the classifier to distinguish between malignant and benign skin lesions based on the extracted LBP features. The combination of LBP and SVM achieved high accuracy rates, effectively discriminating between different types of skin lesions with minimal false positives. Additionally, the computational efficiency of the proposed method makes it suitable for real-time applications. Overall, our findings underscore the potential of the LBP-based approach with SVM classifier as a reliable tool for automated skin cancer detection, offering prospects for enhancing early diagnosis and treatment of this critical medical condition.

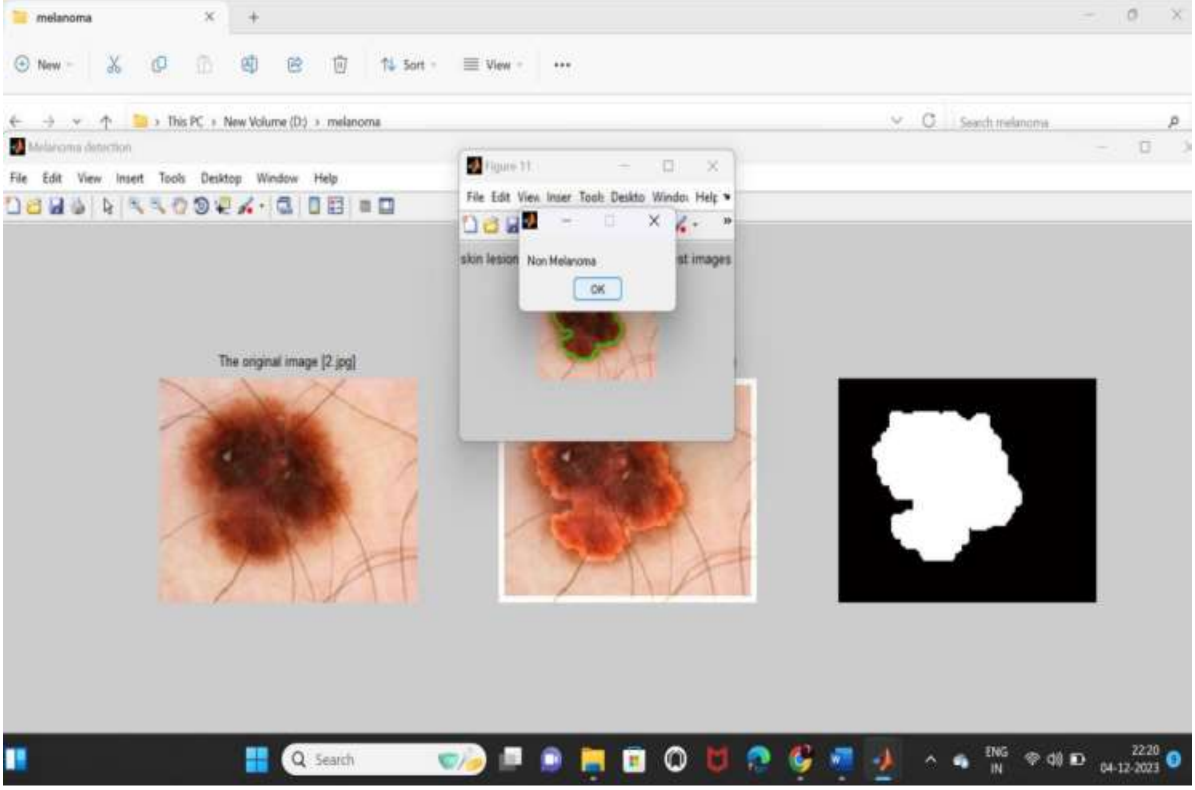

Fig. 4.1 RESULT

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