ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

An Empirical Study and identification of Skin Texture Using GLCM Technique.

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ABSTRACT

In this paper we proposed a method to identify the diseased skin from that of the healthy skin by analyzing the texture of the skin. There are various skin properties which helps in analyzing the skin texture. Since Gray Level Co-occurrence Matrix of the image is computed, the input image is obtained as a gray scale image. The GLCM gives the texture of the input skin image by calculating the frequency of pairs of pixels with specific values that appear in any input image. The skin properties are further extracted from the matrix which helps to analyze the texture of the skin.

Keywords: GLCM-Gray Level Co-occurrence Matrix, Neural Networks, Wavelet transform

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INTRODUCTION

Skin texture is the appearance of the skin smoother surface. There are various factors like diet, hydration, amount of collation, hormones, exposure to sun light and ultra violet rays, skin care etc which contribute to the texture of the skin. Improper diet and over exposure to sun rays, ultra violet rays may affect the smoother texture of the skin. Further, the texture of the skin also changes due to aging. As the skin ages, it becomes thinner and fragile which increases the possibility of easier damage and wrinkles.

There are other factors which accompany the deterioration of the skin like increasing darkness of the skin color due to excessive absorption of coloring pigment called melanin. The skin texture also depends on its location in the body. In image processing, the skin texture appearance changes to a greater extend due to the image recording parameters like camera, direction of the image, lighting etc. therefore greater importance is given to this factor while obtaining the input image. Therefore by obtaining input image with all the proper parameters, the spatial organization of the image is accounted by obtaining the texture discrimination by attributes and features of the input image.

RELATED WORKS

Nidhal K. Al abbadi et al [1] used Neural Networks to classify the skin textures. First, the standard deviation, mean and skew are used to obtain the color distribution information which gives the color features of the input image. All the three values are obtained for each of the color planes (R G B). Second, the texture feature is obtained by identifying the variation between two skin textures using the variation degree of the textons. Neural Networks involves developing a library of input images with different features and the separating the skin and the non-skin areas in the input images. Finally the results show the difference in skin textures of the input image.

Yuanting GU et al [2] decomposed the input image using Wavelet transform. Multi-resolution analysis is done to the input image thereby obtaining four texture components. Large amount of input image with different color of the skin and texture of the skin are obtained in a liner combination of components of the texture. The experimental result shows the difference in skin texture obtained using Wavelet transform.

Motonori Doi et al [3] decompose the input image using Wavelet and Fourier transform in-order to obtain the skin texture components. Input images with complex texture patterns are analyzed using Wavelet transform which is suitable for Multi-resolution Analysis (MRA). Unlike Wavelet transform, Fourier transform does not support detection of non-periodic patterns. It results in obtaining the spatial and frequency information which involves in identifying the texture patterns.

Lei Huang et al [4] followed two approaches namely pixel based and region based methods to detect the skin texture. In pixel based method, each and every pixel of the input image is examined for skin or non-skin individually. But, since human skin is patch based this method is not so effective. And therefore, region based method is performed in order to identify the features of the skin from the input image. Region based method involves Maximally Stable Extremal Region (MSER) analysis. MSER analysis follows three steps. (i) Skin color model is developed. (ii) By using the skin color map and skin texture map, skin distance image is generated. (iii) Skin regions are obtained by performing modified MSER algorithm in the skin distance image.

Leszek A.Nowak et al [5] used an adaptive filter inspired by Swarm Intelligence (SI) Optimization algorithm. Selective image filtering is obtained by applying this algorithm in dermoscopic skin image. ABCD rule (Asymmetry, Border, Color, Dermoscopic structures) is used to calculating the Total Dermoscopy Score (TDS). By using the formula TDS coefficient is obtained. With this the skin texture is analyzed and diseased skin images are separated from the healthy skin samples.

Maryam Sadeghi et al [6] used Pigment network detection and streak detection methods to classify the healthy samples from melanoma affected samples. Pigment network detection involves two steps namely hole detection and net detection. The Laplacian of Gaussian (LOG) filter is used in both the steps. Streak detection involves blob identification using LOG filter. The melanoma affected skin image samples are identified with these two methods.

PROPOSED ARCHITECTURE

In the proposed architecture (Fig 1) the input is a high resolution image obtained. It is the first stage of the architecture that is proposed. The input image is a color image. But, further processing of the image is done in a gray image. Therefore, the input color image is converted into a gray scale image. Grayscale image is when each pixel of the image carries only intensity value. Grayscale images are images with two colors, black and white, and it is also called as binary image

The grayscale image is then enhanced to remove the noises present in the image. Image is mainly enhanced in order to improve the interpretability or perception of information in images for human viewers. It is the process by which the resulting image is more useful for further image analysis. This process improves the quality of the image by removing all the unnecessary information present in the image. The histogram of the grayscale image is obtained by using the hist() function. The histogram of the image gives the graphical representation of different colors present in the image.

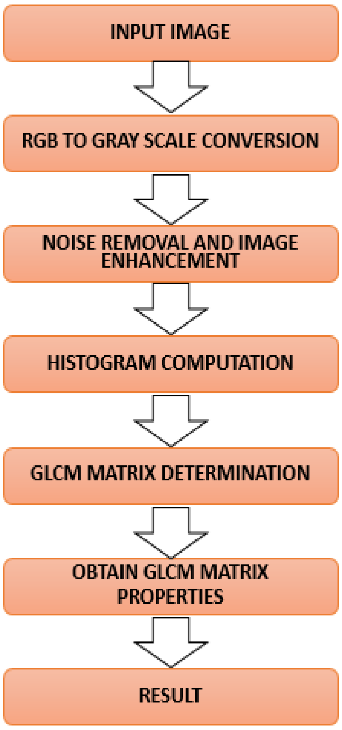


Figure 1: Proposed Architecture

Gray level co-occurrence matrix (GLCM) calculates different pixel pairs with certain values and in a certain spatial relationship that occur in any input image with which the texture of skin can be identified. The size of the GLCM matrix is determined by the number of gray levels present in the image. The graycomatrix function generates the gray level co-occurrence matrix. The matrix helps to obtain different properties related to the gray level spatial distribution in the image.

The properties of the GLCM matrix are obtained from the generated matrix. Contrast, correlation, energy and homogeneity properties of the GLCM matrix are calculated using the function available. From the obtained properties the image is classified.

EXPERIMENTAL RESULTS

The input image samples are obtained from dermnet skin atlas. As many images are collected for checking the feasibility of the system.

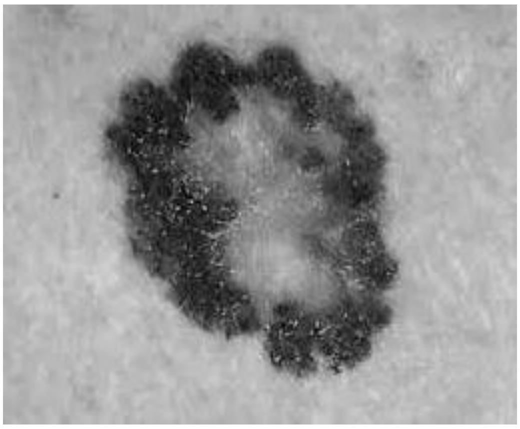
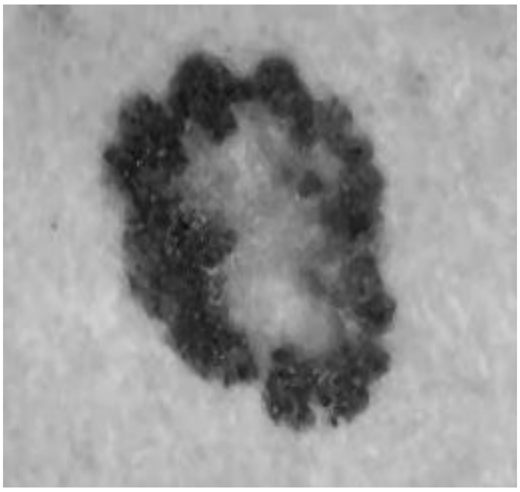


Figure 2: Diseased Input image **Figure 3: Gray scale for diseased image**

The input image is a color image obtained from the dermnet atlas. The sample of the diseased skin is given in (Fig 2). The input image is then converted into gray scale image by using the pre-defined function rgb2gray (Fig 3).

The noises and the other unnecessary details present in the image is removed by filtering. The filtered image is shown in (Fig 4). The histogram of the filtered image is then obtained (Fig 5). By applying the algorithm the affected portion of the input image is identified (Fig 6).



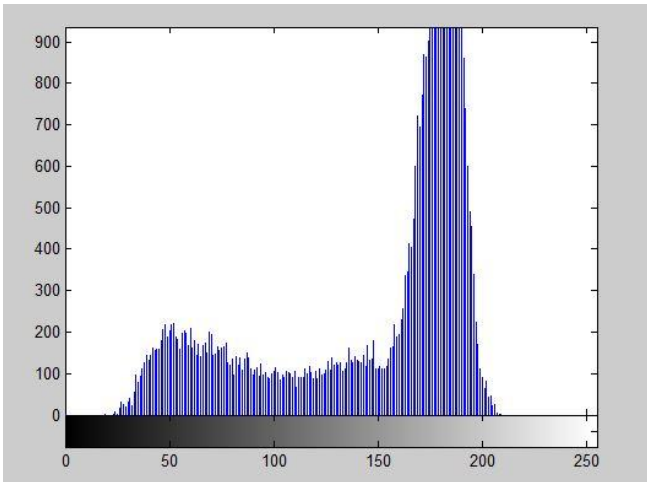


Figure 4: Filtered diseased image **Figure 5: Histogram of the diseased image**

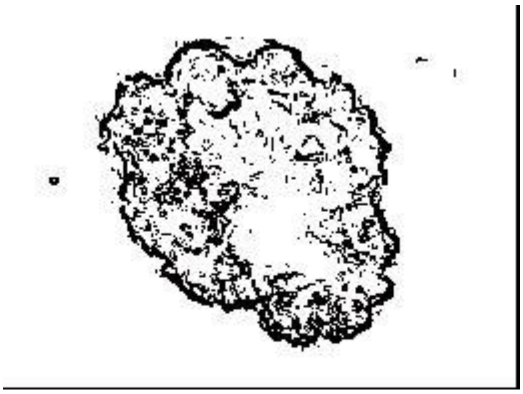


Figure 6: Disease identified image **Figure 7: Healthy input image**

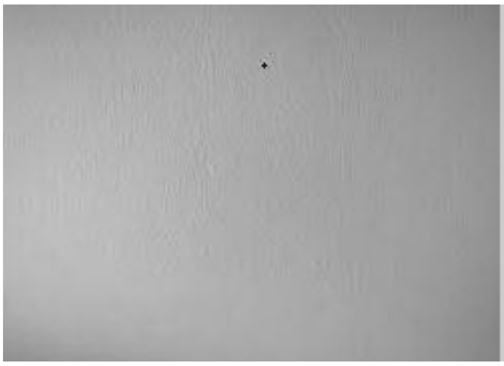


Figure 8: Gray scale for Healthy image

Figure 9: Filtered image of healthy sample

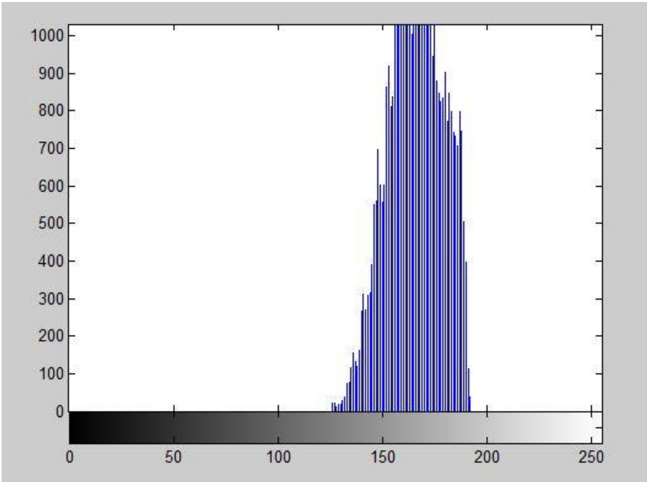


Figure 10: Histogram of healthy image

The healthy input sample without any disease is shown in (Fig 7). The image is converted into gray scale image (Fig 8). The noises are removed by filtering and the resulting image is (Fig 9). The histogram of the healthy sample is shown in (Fig 10). As there is no diseased part present in the image, no region will be marked in the final step.

CONCLUSION

The importance of this paper is to analyze the texture of skin thereby identifying the diseased skin image from the healthy skin image. It is an effective system as it calculates all the properties of gray level co-occurrence matrix. The future work can be done by improving the system to identify the type of disease that the skin is affected with.

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