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Skin Disease Diagnosis Using Texture Analysis

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Abstract— The main objective of this project is to analyze the skin diseases using texture analysis of skin image and by comparing the test image to a predetermined or reference image. After comparison, the matching of test and reference images gives the percentage of skin diseases in the skin texture image.

Keywords— Texture analysis, Image processing, Matlab2011 software.

I. Introduction

Texture analysis is one of the fundamental aspects of human vision by which we differentiate between surfaces and objects.[1] Texture refers to visual patterns or spatial arrangement of pixels. The regional intensity or colour alone cannot sufficiently describe the skin diseases.Texture classification is concerned with identifying a given textured region from a given set of texture classes.[1] Each of these regions has unique texture characteristics. Statistical methods are extensively used to determine the texture as a quantitative measure of the arrangement of intensities in a region.[1]

II. Literature survey on texture analysis

Numerous methodologies are described in the literature to automatically analyse and recognize textures.

1) Fuzzy c-means technologies: It includes 3 major processes: The image capture process, feature extraction process, and pattern analysis process. In the image capture process, BS-88E Beauty Scope sensor is used to provide micro-hair quality images.[6] The sampling location around the cheek was gently touched by the BS-88E Beauty Scope sensor. The cosmetician's suggestions for the best image quality are to wash the sampling location using water first, and then to wait for 15 minutes before capturing the skin image. By comparing to Gray Level Co-occurrence Matrix and Wavelet Decomposition Matrix method it does not require beauty sensors, it require skin image obtained from any source of digital camera. The beauty sensor is very costly as it consumes significant time.[6]

2) Skin feature extraction: It is a statistical method for skin texture analysis. It is only used for spot detection of the skin texture image by using ROI (Region of interest).Using the Region of interest, we cannot extract the full skin diseases in the texture image.[5] It is one of the main disadvantages of this method but In the GLCM and WDM methods, we can choose the image in any random pixels value, also we can use spot detection. We can choose any pixel value of the skin texture image and diagnose the diseases using the skin texture image.[1]

3) Bidirectional imaging: It is also known as skin imaging method. This method captures significantly more properties of appearance than standard imaging. The observed structure of the skin's surface is greatly dependent on the angle of incident illumination and angle of observation.[4] Specific protocols to achieve bidirectional imaging are presented and used to create the Rutgers Skin Texture Database (clinical component). In GLCM and WDM methods, the texture image does not depend on the incident illumination and angle of observation. In case of replacement of this method, we use Diffusion polarization method.[4]

4) Diffusion polarization: This method deals with detecting regions of damage and disease in the texture of different types of fruit and vegetable images.[8] In this method, moments are used to estimate the components of the polarisation image (mean intensity, polarisation and phase) from images obtained with multiple polariser angles. Using the polarisation information and Fresnel theory, characterisation of the surface reflectance based on spherical harmonic coefficients will be developed. We use the normalised cut method to segment surfaces into different regions depending on their surface reflectance properties. This method depends on the light variation and polarization but GLCM and WDM methods do not depend on the light and polarization. [8]

III. Proposed methods

1) Gray level co-occurrence matrix: GLCM is a popular statistical method for texture analysis. GLCM indicates the probability of gray-level i occurring in the neighbourhood of gray-level j at distance d and direction y.[1] GLCMs can be computed from texture images using different values of d and y.[7] A gray level co-occurrence matrix (**GLCM**) contains information about the positions of pixels having similar gray level values.For texture characterization, we consider a set of features derived from four directional normalized symmetrical GLCMs: contrast (C), mean (M), entropy (N), and variance (V), standard deviation (SD), range(R).[1]

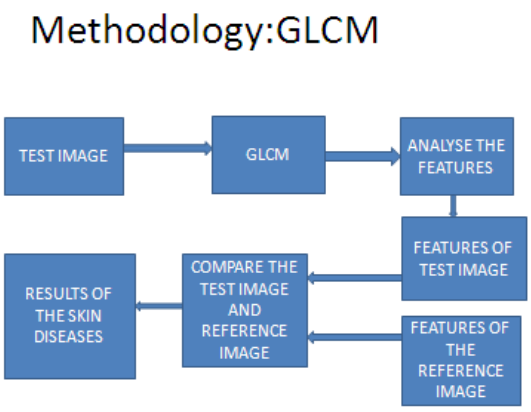

Fig.1 Methodology used in GLCM technique

Here the features of the test image and reference image is analysed using gray level co-occurrence matrix method And comparing both features of the test and reference image predict the percentage of the skin diseases

2) Wavelet decomposition matrix: A wavelet is a mathematical function used to analyse a time-dependent signal at different resolution. The discrete wavelet transform (DWT) analyses the signal at different resolutions by decomposing it into an approximation component and a set of detail components.[1] We used Haar wavelet transforms for a 1D signal. The decomposition component such as A (approximation component,) and Hp, Vp, and Dp are the horizontal, vertical, and diagonal detail components at level p, respectively. For a wavelet decomposition operation, the collection of matrices A,,Hp, Vp, and Dp is the WDM.[1]

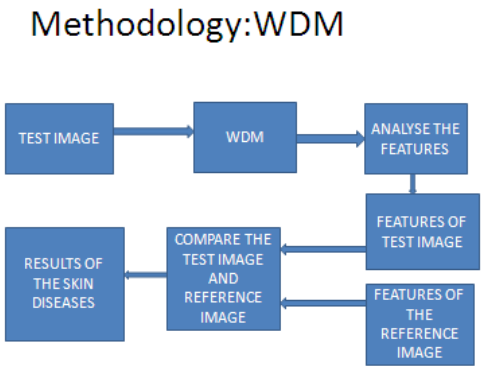

Fig 2 Methodology used in WDM technique

Here the features of the test image and reference image is analysed using wavelet decomposition matrix method And comparing both features of the test and reference image predict the percentage of the skin diseases

IV. Skin diseases

Here three class of diseases such as class A, class B, class C and the diseases such as acne, eczema, urticaria respectively, we use the class A type diseases.[1]

Acne-it is a skin condition that causes pimples or zits. This includes whiteheads, blackheads, and red, inflamed patches of skin. It commonly appears on the face and shoulders.

V. Results

The parameters considered in the project include mean, standard deviation,

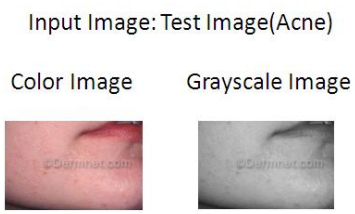

Fig.2Test Image

Here the test image is colour image it is converted into a gray scale image because the gray level co-occurence matrix and wavelet decomposition matrix using a gray scale image

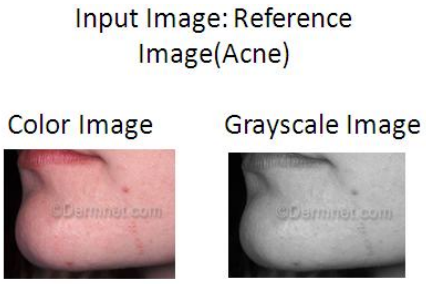

Fig.3 Reference Image

Here the test image is color image it is converted into a grayscale image because the gray level co-occurence matrix and wavelet decomposition matrix using a gray scale image

TABLE-I Image features comparison

Image	**Input image**	**Reference image**
Entropy(E)	6.7677	7.1790
Mean(M)	132.8336	135.3787
Total variance (V)	1.1193	0.0452
Total standard deviation (SD)	33.4566	63.6017
Total median (m)	166	161

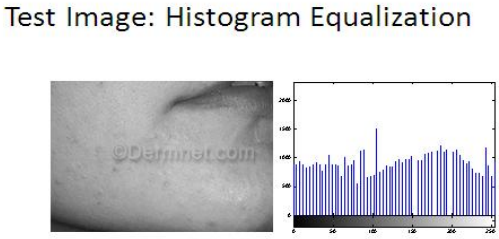

Fig 4 Histogram Equalization for Test Image

For the test image histogram equalization is obtained This method usually increases the global contrast of gray scale images and also for accomplishes the most frequent intensity values.

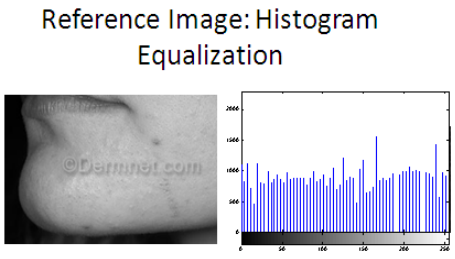

Fig 5 Histogram Equalization for Reference Image

For the reference image histogram equalization is obtained this method usually increases the global contrast of gray scale images and also for accomplishes the most frequent intensity values.

VI. Conclusions:

In this GLCM method, we obtained the characteristic features of the test and the reference images such as entropy, mean total variance, total standard deviation and analyse the skin diseases using texture analysis of skin image and by comparing the test image to a predetermined or reference image. After comparison, level at which the test and the reference images matches gives the percentage of skin diseases in the skin texture image. A case study regarding various techniques for texture analysis are being analysed and the most suitable and more efficient statistical method for texture analysis was determined.

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