



RESEARCH ARTICLE

HUMAN SKIN TEXTURE ANALYSIS USING GLCM AND PNN

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ABSTRACT

The skin properties like skin dryness, parasite and hypersensitive side effects i.e. carving sort of issue relationship with skin composition profile is examined in the proposed thesis work. In the current situation, the skin images are analyzed in frequency domain. However, it is watched that the skin shading in surface images does not differ over a wide range. In this way, the histogram profile of the skin structure remains level. In the current work had done based on moved the skin surface analysis towards the gray level profile examination. The gray shading profile of the skin composition may give reasonable thought regarding the skin affectability and is another rising skin surface examination instrument. In the proposed work, gray Level skin image is enrolled as info parameter so as to discover skin composition investigation, through gray level co-occurrence matrix of skin image computed. Here in this proposed method DWT is using for dividing the image in to high and low frequency components of the input image. Features are extracted from this sub bands of the input image.

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INTRODUCTION

As indicated by dermatologist, the skin surface has close connection with the individual's diet routine, hormones, hydration and any unfavorably susceptible manifestations. In this manner, by examining the skin texture by obtaining the skin texture images by uncovering the human skin to imaging gadgets, the skin's well being might be characterized. Surface examination in picture preparing is an imperative instrument in breaking down the image of textural nature. The skin arrangement is the nearness of the skin smooth surface. To the components of this surface, numerous variables are happening, for occurrence eating regimen and hydration, measure of collagen and hormones, and, obviously, healthy skin. A progressive decrease in skin is in addition superimposed by age. As skin ages, it gets to be more slender and all the more effectively harmed, with the presence of wrinkles. The crumbling is additionally joined by an obscuring of skin shading for an over ingestion of the characteristic shading color, melanin, by the top most cell layer in skin. The skin composition likewise relies on upon its body area. On account of image preparing, we need to consider the way that

composition appearance is changing with image recording parameters, that are camera, brightening and heading of perspective, an issue regular to any genuine surface. The assignment to have a quantitative assessment of the skin features is very intricate, an issue general to any certified surface. The task to have a quantitative appraisal of the skin components is exceptionally complex, In the Digital image processing, a few strategies have been created to classify and statistical distance among them, with the plan to choose whether, in an arrangement of numerous images, there exist some which are near any subjective images before hand experienced The texture discrimination can be obtained by choosing a set of attributes, the texture features, which account for the spatial organization of the image.

Related works

The skin color image is decomposed to the four texture components by multi-resolution analysis using wavelet transform. A grouping of skin pictures with different states of skin shading and surface are made in a straight mix of the composition parts. Test Results demonstrate great detachment of skin compositions by wavelet examination and practical integrated images. The skin properties like skin dryness organism and unfavorably vulnerable symptoms of skin layer may provoked starting indications of destructive melanoma

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skin threat. The correct identification of skin spots based on certain features is the key steps in detecting the skin cancer disease in advance. The affected skin texture profile correlation with malignant melanoma skin cancer location utilizing glcm lattice examination and svm classifier. The matching of test and reference images compared that yields the percentage of skin diseases in the captured skin texture image. this texture analysis is done by utilizing GLCM Matrix through Discrete Wavelet Transform. Glcm characterizes the likelihood of dark level i happening in the area of another dim level j at a separation d in bearing θ . Directional glcms are processed along four bearings level = 0° vertical = 90° right slanting = 45° and left askew = 135° and an arrangement of θ Highlights figured from each are found the middle value of θ to give an estimation of the composition class. The framework is tried utilizing 180 pictures relating to three dermatological skin conditions viz dermatitis skin inflammation urticaria a precision of 96.6% is utilizing a multilayer perceptron (MLP) as a classifier. Anil Kumar Mittra *et al.* This paper proposes a computerized framework for perceiving sickness states of human skin in setting to wellbeing informatics. The malady conditions are perceived by investigating skin composition pictures utilizing an arrangement of standardized symmetrical Gray Level Co-event Matrices (GLCM). GLCM characterizes the likelihood of dark level I happening in the area of another dim level j at a separation d in heading θ . The framework is tried utilizing 180 pictures relating to three dermatological skin conditions viz. Dermatitis, Eczema, Urticaria. An exactness of 96.6% is acquired utilizing a multilayer perceptron (MLP) as a classifier. The geometric, irregular field, fractal, and sign preparing models of surface are displayed. The real classes of surface preparing issues, for example, division, arrangement, and shape from composition are talked about. The conceivable application territories of surface, for example, robotized review, archive preparing, and remote detecting are compressed. A list of sources is given toward the end to further perusing. The connection between the nonlinear results by Monte Carlo simulation (MCS) and the changed Lambert Beer's law (MLB) is additionally elucidated, accentuating the significance of the outright estimations of skin shades and their impact on the mean way length utilized as a part of MLB. Pictures of oxygenated hemoglobin with a recently created four wavelength camera are introduced to exhibit the upsides of a multi wavelength framework.

Proposed work

A statistical technique for analyzing composition that considers the spatial relationship of pixels is the dark level co-event matrix (GLCM), otherwise called the dim level spatial reliance grid. The GLCM capacities portray the surface of a picture by ascertaining how regularly matches of pixel with particular qualities and in a predefined spatial relationship happen in a image, making a GLCM, and after that separating factual measures from this framework.

Algorithm

Step1: Image Acquisition (diseased image or normal Skin Images).

- Step2: Convert the original image (RGB) to Gray Scale Image.
- Step3: Remove the noise from the gray scale image by using Filters
- Step4: Apply the DWT to the skin image, for getting high level and low level components. These components also called as sub bands, those are approximation and detailed sub bands [LL,LH,HL,HH].
- Step5: After applying the DWT, then lifting to haar wavelet.
- Step6: Compute the Gray Level Co-occurrence Matrix for the [LL,LH,HL,HH] all sub bands.
- Step7: Computation of Contrast, Entropy, Homogeneity, Correlation with Skin Symptoms for all sub bands.
- Step8: Extracting features (Contrast, Entropy, Homogeneity, Correlation) are stored in the data base.
- Step9: These features are classified into diseased and Normal images.
- Step10: This classification is done by using different classification algorithms. In this proposed Method neural networks are used to classify the diseased and normal images.

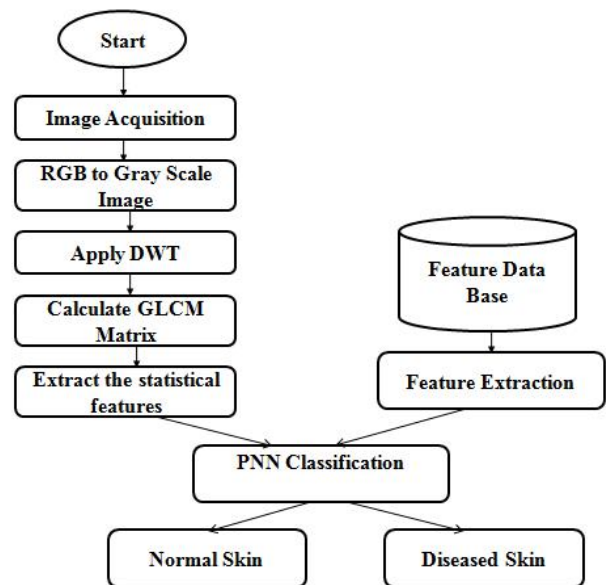


Figure 1. Block Diagram for Proposed Method

Discrete wavelet transform

The discrete wavelet Transform (DWT) is a straight change that works on an information vector whose length is a whole integer power of two, transforming it into a numerically diverse vector of the same length. It is a tool that isolates information into various recurrence segments, and after that concentrates every segment with resolution coordinated to its scale. DWT is processed with a course of separating took after by a component 2 sub examining.

In this work one and only arrangement of DWT inferred elements is considered. It is a vector, which contains energies of wavelet coefficients computed in sub bands at progressive scales. To figure the wavelet features in the initial step Haar wavelet is computed for entire image. As a consequence of this change there are 4 sub band pictures at every scale.

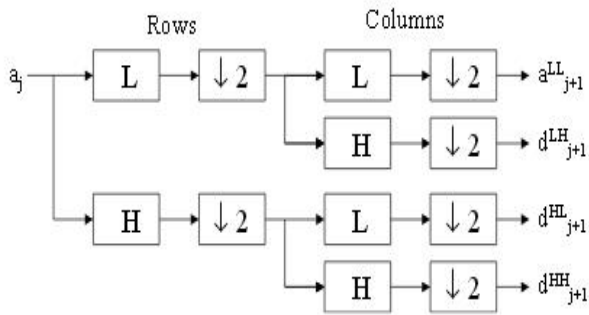


Figure 2. Wavelet decomposition for two-dimensional pictures

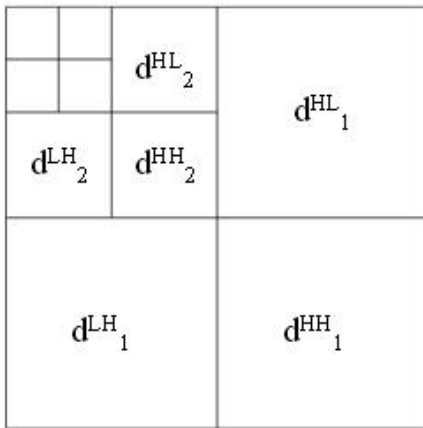


Figure 3. Sub band Images

GLCM Extraction

A measurable strategy for inspecting surface that considers the spatial relationship of pixels is the gray-level co-occurrence matrix (GLCM). The GLCM capacities describe the surface of a image by ascertaining how regularly combines of pixel with particular qualities and in a predetermined spatial relationship happen in a image, making a GLCM, and afterward extricating factual measures from this grid. The quantity of gray levels in the image decides the measure of the GLCM. The gray level co occurrence grid can uncover certain properties about the spatial appropriation of the gray levels in the surface image. For instance, if the vast majority of the passages in the GLCM are concentrated along the corner to corner, the surface is coarse as for the predetermined counterbalance. To make a GLCM, utilize the graycomatrix function. The graycomatrix function makes a gray level co occurrence matrix (GLCM) by computing how regularly a pixel with the force (gray level) esteem i (specified row value) happens in a particular spatial relationship to a pixel with the quality j (specified column value). Of course, the spatial relationship is characterized as the pixel of interest and the pixel to its prompt right (on a level plane nearby).

Contrast: Contrast is a local gray level difference in the GLCM matrix. It can be considered as a straight dependency of gray levels of neighboring pixels.

$$Contrast = \sum_{i,j} |i - j|^2 f(i, j) \tag{1}$$

In (1) i and j are the flat and vertical cell directions and p is the cell esteem. On the off chance that the neighboring pixels are fundamentally the same as in their gray level values then the complexity in the picture is low. If there should be an occurrence of surface, the gray level variations demonstrate the variety of composition itself. High complexity qualities are normal for substantial compositions and low for smooth, delicate surfaces. The scope of Contrast is $[0, (size(GLCM,1)-1)^2]$ where Contrast is 0 for a steady image

Homogeneity: Homogeneity measures the consistency of the non-zero intensity pixel in the GLCM. It weights values by the backwards of difference weight.

$$Homogeneity = \sum_{i,j} \frac{1}{1 + |i - j|^2} f(i, j) \tag{2}$$

The GLCM homogeneity of any surface is high if GLCM concentrates along the corner to corner, implying that there are a great deal of pixels with the same or fundamentally the same as gray level worth. The bigger the adjustments in gray qualities, the lower the GLCM homogeneity making higher the GLCM contrast. The chance of homogeneity is $[0,1]$. On the off chance that the picture has little variety then homogeneity is high and if there is no variety then homogeneity is equivalent to 1. Accordingly, high homogeneity alludes to surfaces that contain perfect tedious structures, while low homogeneity alludes to huge variety in both, composition components and their spatial arrangements of action. A „inhomogeneous texture“ alludes to a picture that has no reiteration of surface components and spatial closeness in it is truant.

Dissimilarity: Disparity is a measure that characterizes the variety of dark level sets in a picture. It is the nearest to Contrast with a distinction in the weight – Contrast not at all like Dissimilarity becomes quadratically.

$$Dissimilarity = \sum_{i,j} |i - j| f(i, j) \tag{3}$$

It is normal that these two measures carry on similarly for the same surface since they ascertain the same parameter with various weights. Difference will dependably give marginally higher qualities than Dissimilarity. Difference ranges from $[0,1]$ and acquire most extreme when the gray level of the reference and neighbor pixel is at the extremes of the conceivable gray levels in the surface example.

Entropy: Entropy in any framework speaks to turmoil, where on account of composition investigation is a measure of its spatial issue.

$$Entropy = - \sum_{i,j} f(i, j) \log (f(i, j)) \tag{4}$$

A totally arbitrary appropriation would have high entropy since it speaks to disorder. Strong tone picture would have an entropy estimation of 0. This component can be helpful to let us know whether entropy is greater for overwhelming compositions or for the smooth surfaces giving us data about which sort of surface can be considered measurably more riotous.

Energy: Energy is a measure of neighborhood homogeneity and subsequently it speaks to the inverse of the Entropy. Essentially this component will let us know how uniform the composition is.

$$Energy: \sum_{i,j} f(i,j)^2 \tag{5}$$

Correlation Coefficient: Measures the joint likelihood event of the predetermined pixel sets.

$$Correlation\ Coefficient: \frac{n \sum xy - (\sum x)(\sum y)}{n \sum x^2 - \sum x^2 - n \sum y^2 - \sum y^2} \tag{6}$$

It give back a worth between - 1 and 1, where: 1 shows a solid positive relationship. - 1 shows a solid negative relationship

PNN Classification

In this proposed work Classification done taking into account PNN Classification neural networks, Artificial neural networks are generally rough electronic systems of neurons in view of the neural structure of the cerebrum. They prepare records each one in turn, and learn by contrasting their grouping of the record (i.e., to a great extent self-assertive) with the known real arrangement of the record. The blunders from the underlying grouping of the primary record is nourished once again into the system, and used to change the systems calculation for further cycles.

A probabilistic neural Networks (PNN) is a feedd forward neural system, which was gotten from the Bayesian system and a factual calculation called Kernel Fisher discriminate analysis. It was presented by D.F. Specht in the mid 1990s. In a PNN, In the PNN, the operations are implemented in to a four layer feed forword network.

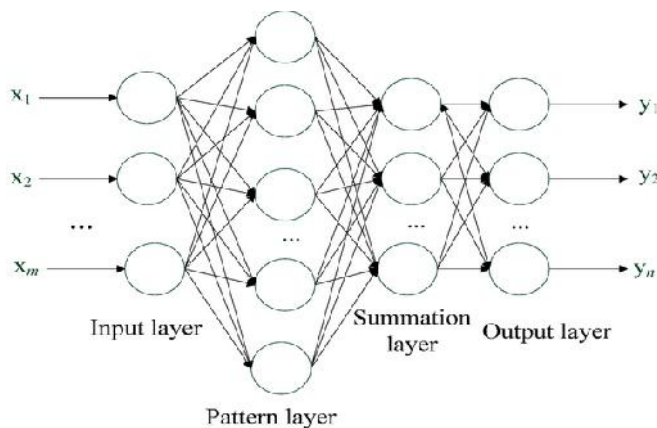


Figure 4. Classification Using Neural Networks

RESULTS AND DISCUSSION

For surface portrayal, we consider an arrangement of components got from GLCM lattice: contrast (C), homogeneity (H), mean (M), energy (N), and variance (V). images are gotten from Dermnet Skin illness map book. Dermnet is the biggest free photograph dermatology source. Dermnet gives data Dermnet gives more data on a wide area of skin conditions. In our proposed strategy is produced in view of the

wavelet changes and probabilistic neural system order for climate the skin is unhealthy or typical skin.

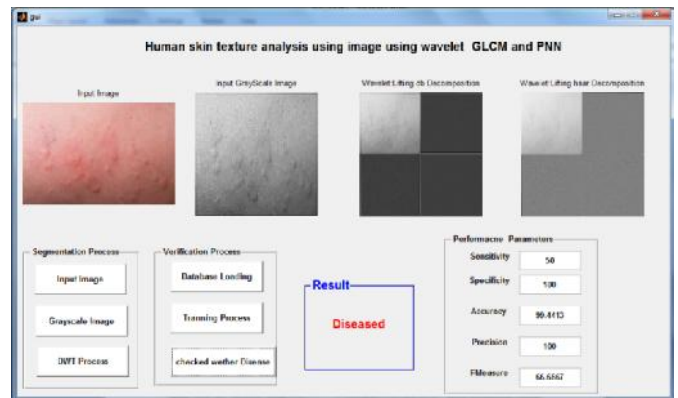


Figure 4. Result for Diseased Image

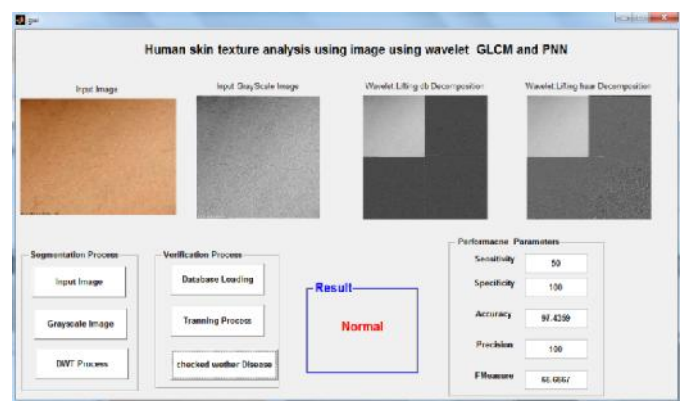


Figure 5. Result for Diseased Image

Conclusion

The primary center of this paper is on breaking down the surface of skin accordingly utilizing it to analyze the skin ailments. Different skin maladies can be investigated in light of the blend of highlight vector set of contrast, correlation, energy and homogeneity. From the trial results examined above, we gather that the multi-class arrangement can serve as a successful apparatus in recognizing skin maladies. The future work will be founded on creating calculations to recognize different other skin ailments and it's name of ailment, to enhance the general effectiveness furthermore to promote lessen the computational time.

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