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Analytical Study on Human Texture Skin Diseases

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Abstract: ***The skin diseases like skin acne, fungus and allergies like hives, skin rashes i.e. etching kind of problem correlation with skin texture profile is discussed in the proposed paper. Skin detection is the process of finding skin coloured pixels and regions in an image. In the paper, we have formulated problem that in existing scenario skin images are analysed in frequency domain it is observed that in frequency domain image texture does not vary over wide range so we are proposing instead of using frequency domain we can use gray level profile analysis.***

Keyword: gray level, frequency domain

1. Introduction

According to dermatologist, the skin texture has close relation with the individual's diet, hormones, hydration and any allergic symptoms. Estimation of skin roughness is an increasing interest especially in the field of cosmetic research. There are some established methods for assessing skin roughness. For fundamental research on ultra structure of the stratum corundum surface scanning electron microscopy is a suitable method. A direct method is the surface evaluation of living skin, which is based on an optical system in a CCD camera measuring four parameters of roughness, scaling, smoothing and wrinkling. A similar but non-direct method is optical profilometry using skin replicas. Laser profilometry produces a variety of data that can be analyzed using complex mathematical functions. A new method is transparency profilometry (skin viscometers) using a very thin skin print that allows parallel light to pass through and is analyzed immediately after production. The different methods can be used for characterization of the skin micro relief in dermatomes or for dynamic measurements of time-dependent changes in skin surface topography after application of cosmetic or medical products.

There are several parameters of the skin that can be determined objectively, and in this study the skin roughness is the purpose to be determined. Skin replica image acquisition was conducted using a commercial skin viscometer which is connected to the computer for further analysis. However, during acquiring the image, some environmental condition such as moisture contents of the stratum conium must be considered.

In the digital image processing, several methods have been developed to classify images and define statistical distances among them, with the aim to decide whether, in a set of many images, there exist some which are close to any arbitrary image previously encountered. The texture discrimination can be obtained by choosing a set of attributes, the texture features, which account for the spatial organisation of the image.

1.1 Texture Analysis

Image texture, defined as a function of the spatial variation in pixel intensities (gray values), is useful in a variety of applications and has been a subject of intense study by many researchers. Texture is the most important visual cue in identifying the types of homogeneous regions. This is called texture classification.

The goal of texture classification then is to produce a classification map of the input image where each uniform textured region is identified with the texture class it belongs to. We could also find the texture boundaries even if we could not classify these textured surfaces. This is then the second type of problem that texture analysis research attempts to solve — texture segmentation.

The goal of texture segmentation is to obtain the boundary map. Texture synthesis is often used for image compression applications. It is also important in computer graphics where the goal is to render object surfaces which are as realistic looking as possible. The goal is to extract three-dimensional shape information from various cues such as shading, stereo, and texture. The texture features (texture elements) are distorted due to the imaging process and the perspective projection which provide information about surface orientation and shape.

1.2 Medical Image Texture Analysis

Image analysis techniques have played an important role in several medical applications. In general, the applications involve the automatic extraction of features from the image which is then used for a variety of classification tasks, such as distinguishing normal tissue from abnormal tissue. Depending upon the particular classification task, the extracted features capture morphological properties, colour properties, or certain textural properties of the image. The textural properties computed are closely related to the application domain to be used.

Some diseases, such as interstitial fibrosis, affect the lungs in such a manner that the resulting changes in the X-ray

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images are texture changes as opposed to clearly delineated lesions. In such applications,

Texture analysis methods are ideally suited for these images. Sutton and Hall propose the use of three types of texture features to distinguish normal lungs from diseased lungs. These features are computed based on an isotropic contrast measure, a directional contrast measure, and a Fourier domain energy sampling.

2. Related Work

Reshmi M. P1, V. J Arul Karthick Visual information from the lips can be an effective candidate for facial biometrics applications when other facial organs are covered. In this paper identity recognition is determined by this lip features. Initially face detection is done by a very powerful method known as Viola and Jone's algorithm. To detect the lip contour, more gray scale characteristics from the lips are employed to resist the influences from various skin colours and environments. For capturing the features of the lips five various mouth corners are detected through the proposed system. These detected five
points are used for further recognition purpose. Support Vector Machine (SVM) is used for the recognition stage as it gives better recognition. [1]

Sangita Gudadhe1, Priti Subramanium2 Skin detection is the process of finding skin colour pixels and regions in an image or a video. Skin detection plays an important role in a wide range of image processing applications ranging from face detection, face tracking, gesture analysis, and content-based image retrieval systems and to various human computer interaction domains. Skin colour has proven to be a useful and robust cue for face detection, localization and tracking. During skin detection some non-skin pixels are usually detected as skin pixels. It is very difficult in images to select skin areas with complex background. The purposed work is an improved skin detection method that uses colour spaces and combines colour spaces to detect skin areas. The experimental result can separate skin and non-skin colour under complex background. [2]

Pushpa Gopal Ambhore1, Lokesh Bijole2 The progression of biometric technology has provided criminal investigators additional tools to determine the criminal's identity. In addition to DNA and circumstantial evidence, if a dormant fingerprint is found at an investigative sight or a surveillance camera captures an image of a suspect's face, then these cues may be used to determine the identity of culprit's, using automated biometric identification. However, many crimes occur when none of such information is present, but instead an eye-witness of the crime is available. In such situation a forensic artist is often used to work with the witness or the victim in order to draw a sketch that depicts the facial appearance of the culprit according to the verbal description; such sketch drawn depending on the description given by an eye witness is called forensic sketch. Using feature based approach how to match a forensic sketch to a gallery of mug shot images described here. To match forensic sketches against mug shot images a robust framework called local feature-based discriminate analysis (LFDA) is used. In this paper experiments are carried out using 45 forensic sketches for matching against a gallery of 150 photo images. In this framework, both sketch and photo images are considered for extracting feature descriptors using scale invariant feature transform (SIFT) and multiscale local binary pattern (MLBP) method. The experimental results demonstrate the matching performance using the presented feature based approach. [3]

3. Problem Formulation

The skin properties that irritate, clog, or inflame your skin can cause symptoms such as redness, swelling, burning, and itching. Allergies, irritants, our genetic makeup, and certain diseases and immune system problems can cause dermatitis, hives, and other skin conditions. Many skin problems, such as acne, also affect our appearance, skin texture profile is discussed in the proposed thesis work. In the existing scenario, the skin images are analyzed in frequency domain. However, it is observed that the skin color in texture images does not vary over a wide range. Hence, the histogram profile of the skin texture remains almost flat.

In the proposed work, we have shifted the skin texture analysis towards the gray level profile analysis. The gray colour profile of the skin texture may give fair idea about the skin sensitivity and is a new emerging skin texture analysis tool. In the proposed work, skin gray colour profile has been taken as the input parameter in order to ascertain the skin profile.
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4. Problem Methodology

A statistical method of examining texture that considers the spatial relationship of pixels is the gray-level co-occurrence matrix (GLCM), also known as the gray-level spatial dependence matrix. 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.

The thesis work is divided into following stages:

1) Image Acquisition
2) Conversion to Gray Scale Image
3) Image Enhancement using Histogram Equalization
4) Histogram Computation of the enhanced image
5) Computation of GLCM Matrix of skin texture image
6) Computation of Contrast
7) Computation of Entropy
8) Computation of Energy
9) Computation of Homogeneity
   - Computation of Intensity
   - Correlation with Skin Symptoms

5. GLCM Extraction

A statistical method of examining texture that considers the spatial relationship of pixels is the gray-level co-occurrence matrix (GLCM), also known as the gray-level spatial dependence matrix. The GLCM functions characterize the

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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. The number of gray levels in the image determines the size of the GLCM. The gray-level co-occurrence matrix can reveal certain properties about the spatial distribution of the gray levels in the texture image. For example, if most of the entries in the GLCM are concentrated along the diagonal, the texture is coarse with respect to the specified offset.

To create a GLCM, use the graycomatrix function. The graycomatrix function creates a gray-level co-occurrence matrix (GLCM) by calculating how often a pixel with the intensity (gray-level) value i occurs in a specific spatial relationship to a pixel with the value j. By default, the spatial relationship is defined as the pixel of interest and the pixel to its immediate right (horizontally adjacent.

After you create the GLCMs, image contrast, energy, co-relation, intensity and homogeneity can be computed as:

- **Contrast**: Measures the local variations in the gray level co-occurrence matrix. Contrast is 0 for a constant image.
- **Correlation:** Measures the joint probability occurrence of the specified pixel pairs. Correlation is 1 or -1 for a perfectly positively or negatively correlated image. Correlation is NaN for a constant image.
- **Energy:** provides the sum of squared elements in the GLCM. Also known as uniformity or the angular second moment. Energy is 1 for a constant image
- **Homogeneity**: Measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal. Homogeneity is 1 for a diagonal GLCM.
- **Intensity:** intensity transformations operate on single pixels of an image, principally for the purpose of contrast manipulation and image thresholding.

6. Conclusion

The main focus of our paper is on analyzing the texture of skin thereby using it to diagnose the skin diseases. We will use various techniques to analyse skin diseases based on the combination of feature vector set of contrast, correlation, energy, intensity and homogeneity.

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