ANALYSES OF SKIN IMAGES USING IMAGE PROCESSING
ABCD TECHNIQUES

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ABSTRACT
The skin properties like skin dryness, fungus and allergic symptoms i.e. etching kind of problem correlation with skin texture profile is discussed in the proposed thesis work. In the existing scenario, the skin images are analysed 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-color 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-color profile has been taken as the input parameter in order to ascertain the skin profile. In this paper, an ABCD technique is proposed to detect the melanoma skin cancer. This study narrates the procedure and methodologies of image processing and soft computing techniques used to diagnose the melanoma with better accuracy.

Key Words: Skin lesion image, Total Dermoscopic Score, Malignant Melanom, ABCD parameter

1.0 INTRODUCTION
In humans, skin is the largest organ of the integumentary system. The skin guards the underlying muscles, bones, ligaments and internal organs. Skin plays an important immunity role in protecting the body against pathogens and excessive water loss. Severely damaged skin will try to heal by forming scar tissue. This is often discoloured and depigmented. Skin is composed of three primary layers: the epidermis, the dermis and the hypodermis. In the epidermis layer, there exist melanocytes which are cells that contain melanin, and it is the melanin which gives colour to the skin. Cancer can be of two types, benign or malignant. Benign tumors aren’t cancerous. In most cases, they do not come back. Cells in benign tumors do not spread to other parts of the body. Malignant tumors are cancerous and are made up of cells that grow out of control. Cells in these tumors can invade nearby tissues and spread to other parts of the body. According to dermatologist, the skin texture has close relation with the individual’s diet, hormones, hydration and any allergic symptoms. Therefore, by analysing the skin texture by acquiring the skin texture image by exposing the human skin to imaging devices, the skin’s health may be defined. [1] Texture analysis in image processing is an important tool in analyzing the image of textural nature. The skin texture is the appearance of the skin smooth surface. To the features of this texture, many factors are occurring, for instance diet and hydration, amount of collagen and hormones, and, of course, skin care. A gradual decline in skin is moreover superimposed by age. As skin
It becomes thinner and more easily damaged, with the appearance of wrinkles. The deterioration is also accompanied by a darkening of skin color for an over absorption of the natural coloring pigment, melanin, by the top most cell layer in skin. The skin texture also depends on its body location. In the case of image processing, we have to consider the fact that texture appearance is changing with image recording parameters, that are camera, illumination and direction of view, a problem common to any real surface. The task to have a quantitative evaluation of the skin features is quite complex, as in all the cases where image analysis must be applied to surfaces with irregular nonperiodic patterns.

Scope of the work:

In this paper, an ABCD technique is proposed to detect the malignant melanoma at an early stage in order to reduce the medical cost of taking biopsy. First the skin image is filtered by using wiener filter and then segmented to extract the features by using Otsu thresholding and boundary tracing algorithm. The advantage of these methods for image segmentation is to obtain an accurate result for the feature extraction. The histogram of gradient method is used to extract the features of segmented image and then ABCD technique is applied to differentiate mole and melanoma and also find the spreading chances of melanoma.

2.0 LITERATURE REVIEW:

The image without shading is analysed by a previously introduced technique that extracts haemoglobin and melanin components by independent component analysis. The comparison shows an excellent match between the synthesized and actual images of changes due to tanning and alcohol consumption. Grain size and anisotropy are evaluated with proper diagrams. The possibility to determine the presence of pattern defects is also discussed. The skin color image is decomposed to the four texture components by multi-resolution analysis using wavelet transform. A variety of skin images with different conditions of skin color and texture are created in a linear combination of the texture components. Experimental results show good separation of skin textures by wavelet analysis and realistic synthesized images. To make improvement in this regard, we propose a new texture analysis synthesis framework that combines two main ideas. Firstly, in material space we decompose the texture contents into units with "basic shape" and 'feature vector". Based on this, the space spanned by a set of sampled textons is constructed to help introduce additional changes upon textons. Texture refers to visual patterns or spatial arrangement of pixels that regional intensity or color alone cannot sufficiently describe. Researchers have proposed numerous methodologies to automatically analyze and recognize textures, from deriving texture energy measures using a set of simple masks to using Gabor filters, for several image analysis applications, including texture classification and segmentation.
takes place. The essential step is feature extraction where the ABCD technique is applied. Then identification of malignant melanoma takes place based on parameters of feature extraction. The following section of this chapter will discuss in detail about the proposed method.

Diagnosis of melanoma achieved by using ABCD rules with new method for determine asymmetry based on rotation of lesion and divide lesion to two parts horizontally and vertically then count the number of pixels mismatched between the two parts based on union and intersection between the two parts. New method to determine the number of colors based on suggestion of color regions for each color shade was suggested in this paper.

THE ABCD RULE:

The ABCD rule was introduced by dermatologists in detection of skin lesions to assess the risk of malignity of a pigmented lesion. This way is able to provide a more objective and reproducible diagnostic of skin cancers in addition to its speed of calculation. It is based on four parameters:

(A) stands for ASYMMETRY: One half of a mole or birthmark doesn’t match the other. two orthogonal axes bisect the lesion. For both axes, asymmetry is assessed regarding shape, colors and/or dermoscopic structures. A score of two is given if there is asymmetry along both axis, it is scored one if there is asymmetry along one axis, and zero otherwise.

(B) stands for BORDER: The edges are irregular, ragged, notched or blurred.

(C) stands for COLOR: The color is not the same all over, but may have different shades of brown or black, sometimes with patches of red, white or blue. We look for the occurrence of the six colors (white, red, light brown, dark brown, blue-grey and black).

The score is incremented by one for each existing color.

(D) stands for DIAMETER: where is larger than 6 millimeters (about ¼ inch or the size of a pencil eraser) or is growing larger.

Image acquisition:

The first step in detecting skin cancer is the detection of melanoma and in computer aided diagnostic system. It involves acquisition of the digital image of affected skin. Dermo-scopy involves an evaluation of the skin surface. During a dermo-scropy assessment, the pigmented skin lesion is covered with a liquid (usually oil or alcohol) and examined under a specific optical system. Applying oil reduces the reflectivity of the skin and enhances the transparency of the stratum corneum.

Pre-processing: The main goal of pre-processing is to improve the image quality to make ready to further processing by removing or reducing the unrelated and surplus parts in the background of the dermoscopic images. The noise and high frequency components removed by filters. Image pre-processing is the term for operations on images at the lowest level of abstraction.
These operations do not increase image information content but they decrease it if entropy is an information measure. The aim of pre-processing is an improvement of the image data that suppresses undesired distortions or enhances some image features relevant for further processing and analysis task. Pre-processing uses the redundancy in images, hence there are two types of filter are used namely median and wiener filter.

Figure 1: Flowchart of proposed method

Figure 2: (a) Original Image (b) Gray Image
RESULTS AND DISCUSSIONS

ABCD technique provides differentiation between the normal moles, benign and malignant melanoma and also used to identify malignant melanoma at an early stage without taking biopsy. The skin lesion attached with a piece of equipment called dermatoscopy. Although analysis of dermoscopy images plays an important role to detect malignant melanoma in the early stage, this traditional method is subjective and time-consuming. Due to these limitations, computer-aided diagnosis system is an urgent need for dermatologists for the clinical evaluation to detect early the risk factor of melanoma. Even though computer is not so much intelligent like human, it may be able to extract information accurately and quickly which may not be realized by human eyes. To analyze dermoscopy images several algorithms such as the seven-point checklist, ABCD rule, and the Menzie’s method can be used and it can improve the diagnostic performance of the clinicians. Different segmentation process is used in the most of the proposed techniques that may cause a problem due to skin lesion irregularity. A variety of patterns is shown in the skin in the dermoscopy view. The results of the technique are given in Table.

Table: Average PSNR value of images

<table>
<thead>
<tr>
<th>S. No</th>
<th>FILTER</th>
<th>PSNR (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Median filter</td>
<td>27.9726</td>
</tr>
<tr>
<td>2</td>
<td>Wiener filter</td>
<td>30.9940</td>
</tr>
</tbody>
</table>

Figure 3: Pre-processing image using (a) Median filter (b) Wiener filter
Figure 4: Comparing the lesion segmentation between expert and proposed method.

A. Original image. B. edge detection by the suggested method. C. Segmented lesion is obtained by the suggested method. D. Segmented image by expert physician. E. Difference between expert and proposed method.

Figure 5: Values of (A, B, C, D and TDS) for benign and malignant lesion sample.

In determine the TDS value when using the ABCD rules, we introduced new technique to determine the asymmetry factor based on rotate the lesion and count the number of pixels mismatched between two parts of lesion. Also, we suggested new method to count number of colors appear in the region based on suggestion new ranges for each color shade.
Table: Interpretation of skin lesion images based on TDS value

<table>
<thead>
<tr>
<th>Images</th>
<th>Parameter</th>
<th>Asymmetry</th>
<th>Border</th>
<th>Color</th>
<th>Diameter</th>
<th>TDS value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image 1" /></td>
<td>Asymmetry</td>
<td>1.23</td>
<td>0.6</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image2.png" alt="Image 2" /></td>
<td>Border</td>
<td>3.21</td>
<td>1.1</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image3.png" alt="Image 3" /></td>
<td>Color</td>
<td>4.02</td>
<td>1.2</td>
<td>0.81</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image4.png" alt="Image 4" /></td>
<td>Diameter</td>
<td>4.3</td>
<td>1.8</td>
<td>1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image5.png" alt="Image 5" /></td>
<td>TDS value</td>
<td>12.76</td>
<td>4.7</td>
<td>3.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image6.png" alt="Image 6" /></td>
<td>Interpretation</td>
<td>Malignant melanoma</td>
<td>Benign</td>
<td>Mole</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the method of ‘feature extraction on skin lesion detection’ has mainly two phases to detect the melanoma. First phase is Otsu’s segmentation method which is fully unsupervised and requires no changes in the skin parameters. Second phase is Feature Extraction which defines the basis of diagnosis of disease. There are three diagnoses i.e. Melanoma, Suspicious and Benign. Feature extraction is done using the ABCD rule of dermatoscopy. The decision of diagnosis is based on the value of TDV. A method on ‘skin cancer detection and feature extraction based on clustering techniques’ in which detection of Melanoma Skin Cancer using Image Processing tools. The Lesion Image analysis tools checks for the various Melanoma parameters Like Asymmetry, Border, Colour, Diameter,(ABCD) etc., by texture, size and shape analysis for image segmentation and feature stages

CONCLUSION:

Moreover, at an early stage, skin cancer is very economical to treat, while at a late stage, cancerous lesions usually result in near fatal consequences and extremely high costs associated with the necessary treatments. When a mole is suspected to be a melanoma mole, it must go through all four analyses “ABCD”, not just the first which were described. In fact, the classification result is not complete, because only three clinical features of early malignant melanoma are being looked at in this work. A classified "non-melanoma" may be found to be a melanoma tumor after it gone through the size analysis, so size analysis should not be omitted. The above estimated parameters are not enough for the detection of melanoma because different types of melanoma are spreading widely. Hence further findings of minute parameters are required for detection of upcoming skin cancers and skin diseases. After all, the best way to prevent ourselves from getting this disease is to look after ourselves carefully, to stay away from the Sun, and keep our body as healthy as we can. It is better and easier to prevent than to find a cure. Moreover, understanding ourselves, being observable,
and staying alert to pigmented spots on the skin are all good ways to reduce the chance of getting any skin cancer which is a risk to human life.

REFERENCES:


