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Human Skin Texture Analysis Using GLCM

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Abstract: Various types of skin diseases are affecting human life like skin dryness, fungus, and allergic symptoms. The objective of this paper is to analyze the skin disease using texture analysis of skin image and by comparing the test image to a defined images or reference images. When image processing is concerned in the skin analysis, it is important to quantitatively evaluate such differences using texture features. The GLCM (Gray Level Co-occurrence Matrix) functions distinguish the texture of an image by calculate how often pairs of pixel with specific values and in a specified spatial association occur in an image, create a GLCM, and then extracting statistical procedures from this matrix.

Keywords: Digital Image Processing, Gray level co-occurrence matrix, Skin Texture Analysis, Wavelet decomposition Matrix.

I. Introduction

Texture analysis is one of the feature in image processing used to analyze the images that captured by the imaging devices on human skin. Normally human skin texture having different types like smooth, dryness which is happened based on individual human food habits, living environment, genetic and etc. The skin texture varied depending on their age as well. The major properties of skin are rough, smooth, random and regular. The following are some of common skin diseases,

a) Allergic Skin Disorders – Allergic conditions such as Atopic Dermatitis and Contact Dermatitis

- ***Atopic Dermatitis*** is a chronic skin condition that usually begins in infancy or early childhood and is often associated with food allergy, allergic rhinitis and asthma.
- When certain substances come into contact with your skin, they may cause a rash called ***contact dermatitis.***

b) Viral Skin Disease - Disorders caused by viruses such as shingles and varicella

- ***Shingles*** causes uncomfortable and painful symptoms due to inflammation of the sensory nerves
- ***Chickenpox (varicella),*** a viral illness characterized by a very itchy red rash, is one of the most common infectious diseases of childhood.

c) Bacterial Skin Diseases – A bacterial infection is a proliferation of a harmful strain of bacteria on or inside the body. It caused by bacterial infections such as cellulitis and folliculitis

- ***Cellulitis*** causes a painful, red infection that is usually warm to the touch.
- ***Folliculitis*** is an infection of the hair follicles that causes red, swollen bumps that look like pimples.

d) Fungal Skin Diseases – Fungal skin infections are caused by different types of fungi and can be a common culprit of itchy skin. Disorders such as ringworm, and yeast infections

- ***Ringworm*** appears as a red, circular, flat sore that is sometimes accompanied by scaly skin.
- ***Yeast infections*** of the skin are called cutaneous candidiasis and are caused by yeast-like fungi called candida.

a) Allergic Skin Disorders

b) Viral Skin Disease

c) Bacterial Skin Diseases

d) Fungal Skin Diseases

II. Texture Analysis

Texture analysis Approaches to texture analysis are usually categorised into

- structural,
- statistical,
- model-based and
- transform methods

Structural approaches (Haralick 1979, Levine 1985) represent texture by well defined primitives (microtexture) and a hierarchy of spatial arrangements (macrotexture) of those primitives. The choice of a primitive (from a set of primitives) and the probability of the chosen primitive to be placed at a particular location can be a function of location or the primitives near the location. The advantage of the structural approach is that it provides a good symbolic description of the image; however, this feature is more useful for synthesis than analysis tasks.

Statistical approaches do not attempt to understand explicitly the hierarchical structure of the texture. Instead, they represent the texture indirectly by the non-deterministic properties that govern the distributions and relationships between the grey levels of an image. Methods based on second-order statistics (i.e. statistics given by pairs of pixels) have been shown to achieve higher discrimination rates than the power spectrum (transform-based) and structural methods (Weszka 1976).

Model based texture analysis (Cross 1983, Pentland 1984, Chellappa 1985, Derin 1987, Manjunath 1991, Strzelecki 1997), using fractal and stochastic models, attempt to interpret an image texture by use of, respectively, generative image model and stochastic model. The fractal model has been shown to be useful for modelling some natural textures. It can be used also for texture analysis and discrimination (Pentland 1984, Chaudhuri 1995, Kaplan 1995, Cichy 1997); however, it lacks orientation selectivity and is not suitable for describing local image structures.

Transform methods of texture analysis, such as Gabor (Daugman 1985, Bovik 1990) and wavelet transforms (Mallat 1989, Laine 1993, Lu 1997) represent an image in a space whose co-ordinate system has an interpretation that is closely related to the characteristics of a texture (such as frequency or size). Methods based on Gabor filters provide means for better spatial localisation; however, their usefulness is limited in practice because there is usually no single filter resolution at which one can localise a spatial structure in natural textures. Compared with the Gabor transform, the wavelet transforms feature several advantages:

- varying the spatial resolution allows it to represent textures at the most suitable scale,
- there is a wide range of choices for the wavelet function, so one is able to choose wavelets best suited for texture analysis in a specific application.

They make the wavelet transform attractive for texture segmentation. The problem with wavelet transform is that it is not translation-invariant (Brady 1996, Li 1997).

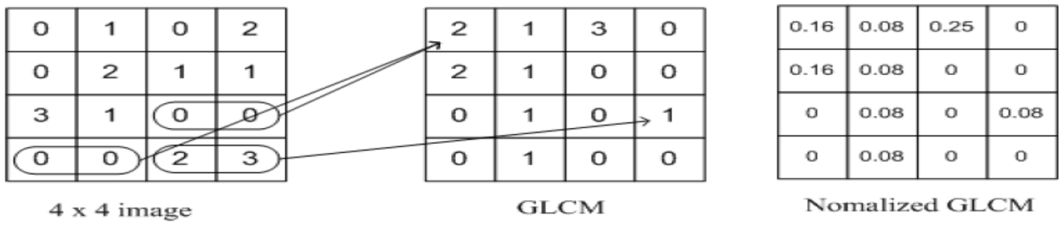
III. Digital Image Processing

An image may be defined as a 2-D, where x and y are spatial (plane) coordinates. When x, y, and the intensity values of f are all finite, discrete quantities, we call the image a digital image. It refers to processing digital images by means of a digital computer.

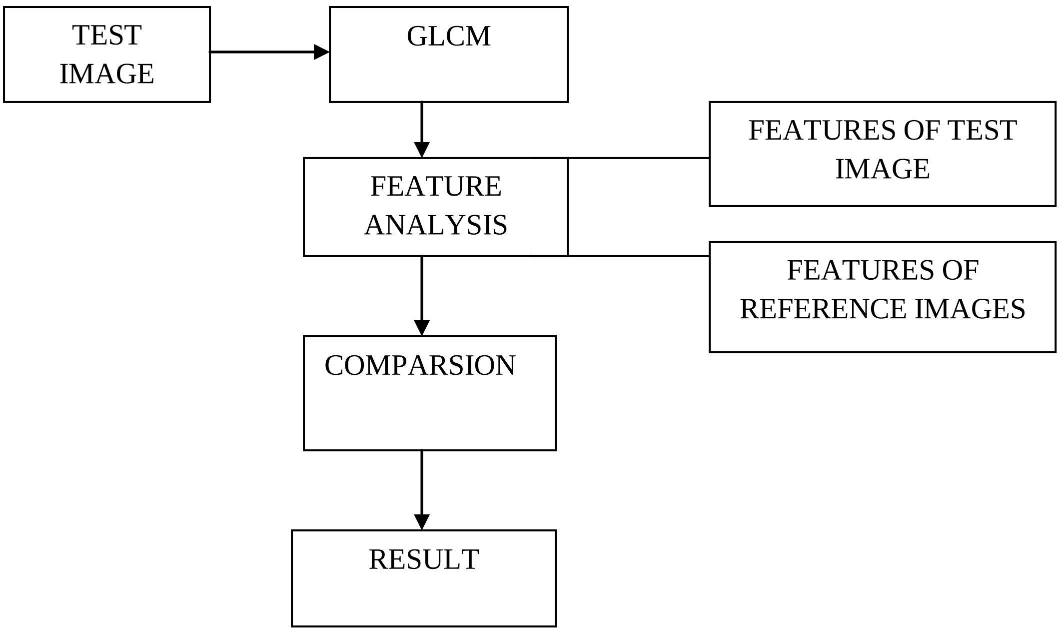
Fig: A digital picture produced in 1921 from a coded tape by a telegraph printer with special type faces.(McFarlane)

3.1 Gray Level Co-occurrence Matrix (GLCM)

Gray Level Co-occurrence Matrix (GLCM) is used for texture analysis. We consider two pixels at a time, called the reference and the neighbour pixel. We define a particular spatial relationship between the reference and neighbour pixel before calculating the GLCM. For eg, we may define the neighbour to be 1 pixel to the right of the current pixel, or it can be 3 pixels above, or 2 pixels diagonally (one of NE, NW, SE, SW) from the reference.



Each entry of the GLCM[i,j] holds the count of the number of times that pair of intensities appears in the image with the defined spatial relationship. The matrix may be made symmetrical by adding it to its transpose and normalised to that each cell expresses the probability of that pair of intensities occurring in the image. Once the GLCM is calculated, we can find texture properties from the matrix to represent the textures in the image.



3.2 Wavelet Decomposition

Wavelets are generated from one single function (basis function) called the mother wavelet. Mother Wavelet is a prototype for generating the other window functions.

Wavelet is a mathematical function used to analyze 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.

The DWT can be interpreted as spectral analysis using a set of basic functions those are localized in both time and frequency, in contrast to the infinite-extent sinusoids used in Fourier analysis.

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.

IV. Conclusion

This survey paper describes some techniques and models that have been used till now for the feature extraction of the image. These methods produced great results in the field of skin diseases diagnosis but still needs some improvements. When the extraction is to be done in the field of medical it has to be very accurate so that the proper treatment can be given to the concerned patient. Although the technique of GLCM has proven to be very near to accurate, it has few drawbacks which can be removed using Haar wavelet technique along with it. The future work will be based on developing algorithms to identify various other skin diseases, to improve the overall efficiency and also to further reduce the computational time. A case study regarding various techniques for texture analysis are being analyzed and the most suitable and more efficient statistical method for texture analysis was determined.

References

[1] C.Vinayaga Jagadeesh Raja and M.Jeyaprakash, "Skin Disease Diagnosis Using Texture Analysis", Sethu Institute of Technology and Chettinad College of Engg & Tech, India, International Journal of Advanced Research in Computer Scienceand Software Engineering India, Vol 4, Issue 1, January 2014 ISSN: 2277 128X

[2] Damanpreet Kaur and Prabhneet Sandhu," Human Skin texture Analysis using Image processing techniques", Patiala Institute of Engineering & Technology for Women, Punjab India, International journal of science and research(IJSR), India Online ISSN: 2319 – 7064

[3] Kriti Jain,Nidhi Sethi and Vishal Sharma, " Skin Texure analysis for medical diagnosis – A review" , DIT University, Dehradun, (India), IJARSE, ISSN-2319- 8354(E).

[4] Dr.SArivazhagan, Mrs.R.Newlin Shebiah, Ms.K.Divya and Ms.M.P.Subadevi, "Skin Disease Classification by extracting Independent Components", Mepco Schlenk Engineering College, Sivakasi, TN,India, Journal of Emerging Trends in computing and Information Sciences, Vol.3, No.10 Oct2012, ISSN 2079-8407.

[5] A.A.L.C. Amarathunga, E.P.W.C.Ellawala, G.N Abeysekara and C.R.J.Amalraj, "Expert System For Diagnosis of Skin Diseases", Hasanuddin University, Makassar, Indinesia, Internation Journal of Scinece and Technology Research Vol 4, Issue 01, Jan 2015, ISSN 2277-86-16.

[6] Norimichi Tsumura, etal."Image-based skin color and texture analysis/synthesis by extracting hemoglobin and melaninin formation in the skin",IEEE-2012

[7] Damanpreet Kaur, Prabhneet Sandhu Human "Skin Texture Processing Techniques" IJSRISSN:2319-7064.

[8] A. Papoulis, Probability, Random Variables and Stochastic Processes, McGraw-Hill, 1965.

[9] P. Brodatz, Textures - A Photographic Album for Artists and Designers, Dover, 1966.

[10] O. Mitchell, C. Myers and W. Boyne, "A Max-Min Measure for Image Texture Analysis", IEEE Trans. Computers, 408-414, 1977.