A SURVEY ON SKIN TEXTURE ANALYSIS FOR MEDICAL DIAGNOSIS USING IMAGE PROCESSING TECHNIQUES

[1]K.INDUPRIYA, [2]Dr. G. P. RAMESH KUMAR

[1]Research Scholar, Department of Computer Science, SNR Sons College, Tamilnadu, India, indupriya1406@gmail.com

[2]Head and Department of Computer Science, SNR Sons College, Tamilnadu, India,gpr.snr@gmail.com

ABSTRACT

Skin texture analysis is one of then challenging issues in the field of medical diagnosis. 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. The matching of test and reference images compared that yields the percentage of skin diseases in the captured skin texture image.

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

1. 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 eczema and contact dermatitis

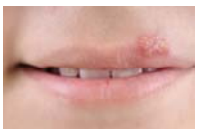
b) Viral Skin Disease - Disorders caused by viruses such as shingles, cold sores and measles

c) Bacterial Skin Diseases – It caused by bacterial infections such as acne and folliculitis

d) Fungal Skin Diseases – Disorders such as ringworm, athletes foot and yeast infections

a) Allergic

b) Viral



c) Bacterial

d) Fungus

2. TEXTURE ANALYSIS

Texture is a feature that supports to segment images into regions of interest and to classify those regions. Texture is a complex visual patterns that composed by different entities having the individual characteristic like color, shape and size. Texture is uniform for human visual system. Texture refers to visual patterns or spatial arrangement of pixels.[1]

Texture analysis performed based on the following number of process in a step wise manner.

Feature extraction: On this process can describe its texture properties by computing characteristic of a digital image able to numerically;

Texture classification: to determine to which of a finite number of physically defined classes (such as normal and abnormal tissue) a homogeneous texture region belongs;

Texture analysis approaches are usually categorized into the following,

- Structural
- Statistical
- Model-based
- Transform

Structural approaches (Haralick 1979, Levine 1985) represent texture by well- defined primitives and a hierarchy of spatial arrangements of those primitives. To describe the texture, one must define the primitives and the placement rules. 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. The abstract descriptions can be ill defined for natural textures because of the variability of both micro- and macrostructure and no clear distinction between them. A powerful tool for structural texture analysis is provided by mathematical morphology (Serra 1982, Chen 1994). It may prove to be useful for bone image analysis, e.g. for the detection of changes in bone microstructure.

In contrast to structural methods, statistical approaches

Citation: 10.2348/ijset09151161
ISSN (O): 2348-4098
ISSN (P): 2395-4752

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). Human texture discrimination in terms of texture statistical properties is investigated in (Julesz 1975). Accordingly, the textures in grey-level images are discriminated spontaneously only if they differ in second order moments. Equal second- order moments, but different third-order moments require deliberate cognitive effort. This may be an indication that also for automatic processing, statistics up to the second order may be most important (Niemann 1981). The most popular second-order statistical features for texture analysis are derived from the so-called co-occurrence matrix (Haralick 1979). They were demonstrated to feature a potential for effective texture discrimination in biomedical-images (Lerski 1993, Strzelecki 1995). The approach based on multidimensional co-occurrence matrices was recently shown to outperform wavelet packets (a transform-based technique) when applied to texture classification (Valkealathi1998).[9]

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 parameters of the model are estimated and then used for image analysis. In practice, the computational complexity arising in the estimation of stochastic model parameters is the primary problem. The fractal model has been shown to be useful for modeling 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. [9]

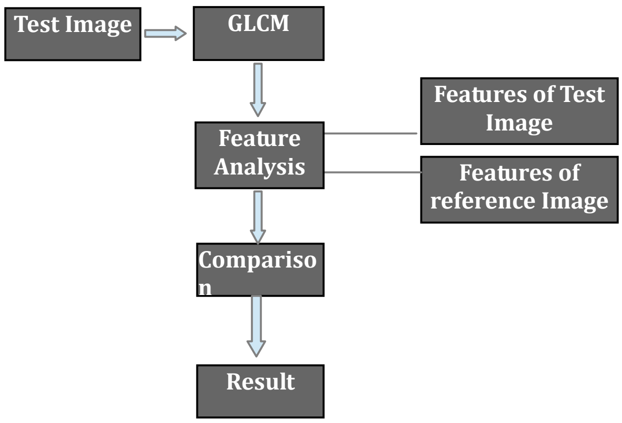
Transform methods of texture analysis, such as Fourier (Rosenfeld 1980), Gabor (Daugman 1985, Bovik 1990) and wavelet transforms (Mallat 1989, Laine 1993, Lu 1997) represent an image in a space whose co-ordinate system has an interpretation that is closely related to the characteristics of a texture (such as frequency or size). Methods based on the Fourier transform perform poorly in practice, due to its lack of spatial localization. Gabor filters provide means for better spatial localization; however, their usefulness is limited in practice because there is usually no single filter resolution at which one can localize 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.

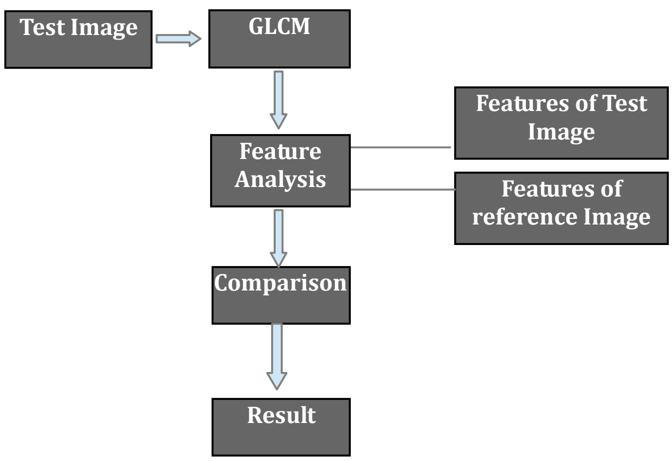
They make the wavelet transform attractive for texture segmentation. The problem with wavelet transform is that it is not translation-invariant.[9]

3. TEXTURE ANALYSIS TECHNIQUES

3.1 Gray level co-occurrence matrix: One of the popular statistical methods for texture analysis is GLCM. The texture of an image can be found out by constructing 2D array of pixels of the image and it is known as Gray Level Co-occurrence Matrix (GLCM). Both the structural and statistical properties of the image can be defined using GLCM. This matrix is calculated by considering the two neighboring pixels and the probability of their co-occurrence in the image at a given offset. The first pixel is the reference pixel and the other one is the neighboring. The matrix is calculated along the four directions i.e. horizontal, vertical, right diagonal, left diagonal. The angles associated are 0 deg, 45deg, 90deg, 135deg. These are then normalized to get the desired output. The GLCM is totally dependent on directions. GLCM elements are G (i, j, d, Θ) where I is the reference pixel, j is neighboring pixel, dis the sample distance between pixels and Θ is the angle along which the matrix has been calculated.[1]



3.2 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]



Citation: 10.2348/ijset09151161
ISSN (O): 2348-4098
ISSN (P): 2395-4752

4. 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. Therefore to make the observations as accurate as it can be the methods and techniques will be worked upon and implemented. 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. 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.

ACKNOWLEDGEMENT

I express my greatfull thanks to Dr.H.Balakrishnan, Principal, SNR Sons College for making all the necessary facilities to start my research work. I thank Dr.AnnaSaro Vijendran, Director, Computer Application (PG) for her constant support rendered in all my endeavors. I place my deep sense gratitude to my research guide Dr.G.P.Ramesh Kumar, Head, Computer Science for his support, formal reviews and valuable suggestions in writing this paper and for my research work.

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]. Bipin Mokal, AartiBokade, Uttam Bagal, Swati Checker, Neethu Rajan and G.D Jindal, "Skin Texture Analysis Using Matlab", MGM's College of Engineering & Technology,India, International Journal of Scientific & Engineering Research, vol 5, Issue 2, Feb 2014.

[7]. Damilola . Okuboyejo, Oludayo O.Olugbara, and Solomon A.Odunaike,"Automating Skin Disease Diagnosis Using Image Classificaion", Proceedings of the World Congress on Engineering and Computer Science 2013 Vol II, WCECS 2013

[8]. Y.P.Gowramma, Pavithra.N,Manasa.S.B, Peetambari.B.P and Vimala "Detection of skin diasease using curvlets",Kalpataru Institute of Technology, Tiptur, IJRET, eISSN:2319-1163| pISSN:2321-7308.

[9]. A.Materka and M.Strelecki, "Texture Analysis Methods – A Review", Technical University of Lodz, Institute of Electronics, COST B!! report, Brussels 1998.

[10]. A.Sparavigna and R.Marazzato, "An Image processing analysis of skin Textures", Italy.

[11] Mark S.Nixon and Alberto S.Aquado,"Feature Extraction and Image Processing", FirstEdition2002, ISBN 07506 5078 8.

BIOGRAPHIES

Dr. G. P. RAMESH KUMAR MCA., M.Phil., Ph.D., Head, Department of Computer Science has teaching experience of 20 years. He has published 10 International Journals and 6 National Journals. He has attended 7 International Conference and 15 National Conference. His area of interest includes Image Processing and Soft Computing.

K. INDUPRIYA, M.Sc., M.Phil.,has teaching and development experience of 7 years. She has published one national Journal. Her area of interest includes Digital Image Processing and Data mining.