

## Chapter 23

# Texture Segmentation and Features of Medical Images

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### ABSTRACT

*Texture analysis is one of the basic aspects of human visual system by which one can differentiate the objects and homogenous areas in an image. Manual diagnosis is not possible for huge database of images. Automatic diagnosis is required for greater accuracy in a shorter time. Texture analysis is required for effective diagnosis of medical images like functional MRI (magnetic resonance image) and diffusion tensor MRI, where only visualization is not sufficient to get the pathological information. This chapter explains the basic concepts of texture analysis and features available for analysis of medical images. Specifically, the intense review of texture segmentation and texture feature extraction and entropy measures of medical images have been done. The chapter also explores the available techniques for it. Common findings, comparative analysis, and gaps identified have also been mentioned on both issues.*

## **INTRODUCTION**

Texture Analysis is the most desirable technique to process images, mainly their classification. Texture Analysis has various application areas like computer vision, medical imaging, remote sensing, graphics and many more. In last few decades, various techniques have been proposed to achieve better classification, these techniques basically depend on statistics of the pixel values, modelling of images, image filtration using different kernels and multiple scale texture analysis. Most of work in this area has been motivated by human visual system. Medical imaging is a very important tool to obtain important information from normal and pathological processes related to health. Now a days without image processing we cannot think of living a healthy life. Various quantitative imaging techniques help to live a life in a healthy way by helping in diagnosis of various diseases, for example functional MRI and diffusion tensor MRI, where only visualization of the medical images are not sufficient to get the pathological information. Image processing is embedded in various important systems and applications, more extensively it is used in medicine from diagnosis of micro level disorder to therapy and surgery.

## **Evaluation of Texture Analysis**

It is a very complex task to evaluate the performance and compare the different texture analysis techniques (Laws, 1980) and this has received huge attention from the researchers. Visual texture is an interesting area of research in the field of image processing in which the basic recognition and segmentation do not have much importance when the images are real. There are infinite types of textures (Richards & Polit, 1974) having different properties which creates confusion, due to this it is a complex task to evaluate the relative performance of a specific algorithm for different textures. In medical images it is also very difficult to identify the dissimilarities and uniform intensities but with the help of texture analysis (Haralick, 1979) it can be done in effective way. Different feature sets have shown different performance rate for the same types of images. The performance can be measured for a specific application and for a particular set of images. A number of algorithms have been proposed by the researchers for a wide range of applications. In this chapter, theoretical concepts and literature of different texture analysis techniques has been discussed in the area of medical image processing.

## **Defining Texture**

Texture has been defined by various researchers. According to David Marr, texture is defined as a symbolic representation of visual information that is designed in the interpretation process (Marr & Hildreth, 1980).

A precise definition for texture is not possible to give, as it normally depends on the application. Few definitions with respect to various applications has been given by (Coggins, 1982). They are as given below:

- We may consider texture as a collection of macroscopic regions, its structure is attributed to the repetitive patterns (Tamura et al., 1978).
- Constant texture is a region of an image having constant set of local statistics (Sklansky, 1978).
- Image texture is nonfigurative in nature, a texture is considered as number of (tonal) primitives (Haralick, 1979).

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