Chapter 9
A Novel Framework on Biomedical Image Analysis Based on Shape and Texture Classification for Complex Disease Diagnosis

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ABSTRACT

The wide acceptance of applying computer technology in medical imaging system for manipulation, display, and analysis contribute better improvement in achieving diagnostic confidence and accuracy on predicting diseases. Therefore, the need for biomedical image analysis to diagnose a particular type of disease or disorder by combining diverse images of human organs is a major challenge in most of the biomedical application systems. This chapter contributes an overview on the nature of biomedical images in electronic form facilitating computer processing and analysis of data. This describes the different types of images in the context of information gathering, screening, diagnosis, monitor, therapy, and control and evaluation. The characterization and digitization of the image content is important in the analysis and design of image transmission.

DOI: 10.4018/978-1-6684-7544-7.ch009

INTRODUCTION ON THE NATURE OF BIOMEDICAL IMAGES

Bio-medical image analysis is the visual view of human body interiors for medical investigations and interventions in order to reveal hidden structures of skin, bone, organs, tissues to diagnose diseases and abnormalities. It uses technologies like imaging, radiology, endoscopy, photograph, tomography, etc. The medical imaging is interpreted for radiology as it involves videos and pictures thus acquiring quality image for diagnostic is still a challenge. Many scientific investigations and research contribute radiology as relevant area of medical science. The various medical investigations include cardiology, psychology, neuroscience etc, Magnetic resonance imaging instrument are powerful to polarize the human tissue water molecules enabling detectable signals resulting the human body image.

Although the instruments are capable there arises more health risks associated to the exposure of radio fields. The other applications are detecting of tumour and assessing vascular disruption effects since computers are considered as integral components of medical imaging performance, image generation, and analysis and data acquisition are the tasks preferred. Though there are increases in modalities of medical imaging the nature increase in complexity and their associated problems lead to the need for advanced solutions. Thus use of medical imaging has improved the diagnosis of specific diseases on discovering a comprehensible visual display. Developing an algorithm for medical image analysis is the variability features like signals, images and systems. Bio medical image analysis techniques incorporates techniques for i) quantification, ii) computer aided diagnosis and iii) evaluation and validation techniques. Quantification is the method radiologist use to measure and extract objects from images by segmentation. Computer aided diagnosis measures the features of a diagnosis procedure for accuracy and efficiency. A common medical image analysis requires prior knowledge on the disease symptoms, ability to classify the features by matching the model to sub images, description of their shapes.

A digital image is the signal sampled in space or time quantized based on amplitude. However, any medical image can be processed i) manually, ii) semi – automatic or iii) automatic analysis. Thus it has become important in health care the use of digital image processing for medical diagnosis. Picture image are composed of pixel values assigned with discrete brightness or colours. With the emergence of advanced imaging techniques the bio-medical images are processed efficiently and quickly. The "biomedical image processing" covers areas like image capturing, image visualization and image analysis. Both of these achieved by applying any of the technique like sampling quantization, matrix representation, blur and spread function or image resolution as described by authors Alvarez, Lions & Morel (1992). Further the analysis of image shape with respect to factors like compactness, moments, chord length structure improves the quality of the image. The analysis of texture based on directional filtering, Gabor filtering and finally pattern oriented classification and diagnostic detection will provide efficient measurement on diagnostic accuracy.

Today most of the diagnosed images suffer loss of quality due to artifacts and practical limitations. The presented methods and mathematical derivations shall provide a better understanding on biomedical image analysis. Each system in human body composed of many physiological processes that are complex including neural, hormonal or control simulations. Investigating such systems requires sophisticated techniques and the chapter provides methods related to analysis of such real time specimens and their diagnosis. Several imaging procedures and techniques have limitations on the quality and information content. Therefore special imaging techniques are required to facilitate visualization. The case study is on the image segmentation for tumour analysis. However some malignant tumours have smoothed shapes