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Medical Image Processing

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Abstract: Medical imaging is the method of forming visual representations of the internal parts of a body for scientific analysis and medical involvement. Medical imaging seeks to expose internal structures hidden by the skin and bones, as well as to identify and treat any disease. It also forms a database of normal composition and physiology to make it possible to identify various abnormalities.

Keywords: Image Processing, Magnetic Resonance Imaging (MRI), Detection.

I. INTRODUCTION

Over the years, medical practitioners had made remarkable contributions to a human ability to view inside the body. Medical imaging is the technique for process of creating visual representations of the inside of a body for medical analysis, intervention, as well as visual representation of the function of various organs or tissues. Medical imaging seeks to expose internal structures hidden by the skin and bones as well as to detect and take care of disease. The significant changes have been observed because of advance in quantum physics theory, tremendous increase in speed and capacity of integrated circuits. Advances in image have initiated a lot of technological innovations in the field of image processing. Modalities used for medical imaging produced a list of modern methods for finding the information regarding tissue composition, tissue detection, analysis of tumour etc. The specifications of medical image processing are: Medical image processing techniques do not decide, they just help us to decide whether data is rare and expensive.

II. DIFFERENT STAGE OF MEDICAL IMAGE PROCESSING

Medical image processing involves stages such as image acquisition, image segmentation, image pre-processing, feature extraction, image registration, algorithm specific to individual modalities and diseases.

A. Image Acquisition

It can be broadly defined as the action of retrieving an image from some source usually hardware based resource, so it can be passed to the next processes need to occur afterwards. It is the first step in image processing because without acquiring an image no processing is available. One of the ultimate goals of this process is to have source of input that operates within such controlled and guidelines are measured that the same image can, if necessary. It is also known as real time image acquisition. It creates a files stream that can be processed automatically, queued for next process or stored into a single media format.

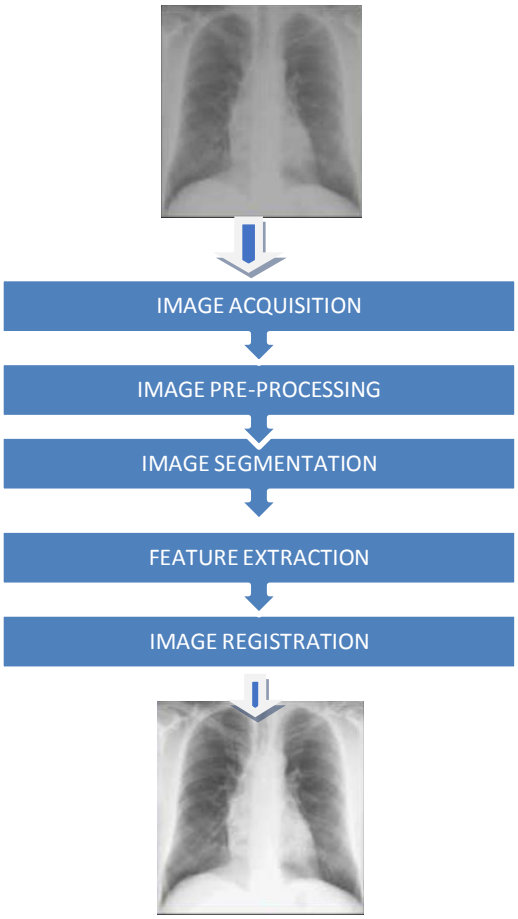

Figure 1: Different stages of medical image

One common technology is the background image acquisition, which describes both software and hardware that can promptly preserve the images flooding into a system. Three-dimensional (3D) image acquisition is one of the method which require the use of two or more cameras that have been aligned at precisely describes point around a target, forming a sequence of images that can be aligned to create a 3D or stereoscopic scene, or to measure distances.

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B. Image Pre-processing

This is used to upgrade the visual appearance of an image. The different techniques involve image resembling, greyscale contrast, noise removal and mathematical operations. Image resembling reduces or increases the number of pixels. Greyscale contrast improves the visualization by brightening the dataset. Noise removal removes noise from the images by using several types of filters. The mathematical operations are used to enhance the features. For operations like dilation, erosion on the images arithmetic operations are used. Mathematical operations also help us to identify the changes in brain size due to aging and dementia.

C. Image Segmentation

It is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. The output of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Threshold based Segmentation works on the assumption that the falling pixels in a certain range of intensity values represent one class and remaining pixels in the image represents the other class. Region based Segmentation regions are constructed by associating or dissociating neighbour pixels. Clustering techniques includes techniques that are primarily used in exploratory data analysis of high-dimensional measurement patterns. Matching -when we know what an object we wish to identify in an image (approximately) looks like, we can use this technique to locate the object in an image

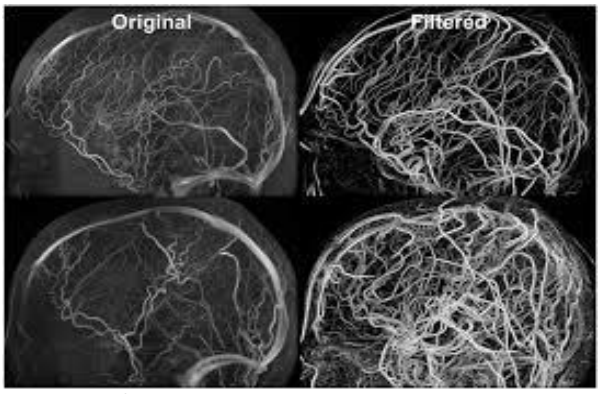

Figure 2: The first part shows there is a huge change in the image which is taken before and the other part depicts the brain after the segmentation. Second part shows how the brain looks.

D Feature Extraction

It is a type of reduction dimensionality that efficiently represents interesting parts of an image as a compact feature vector. This is useful when image sizes are large and to quickly complete tasks such as image matching and retrieval, a reduced feature representation is required. These methods can be used in applications which help to detect cancer nodules in the lung and are also applied on brain MRI images to predict the volume of tumour in the brain.

E. Image Registration

It is the process of aligning the same scene of images two or more times. Various methods were presented to perform image registration task. They are dimensionality, registration and nature of transformation, transformation domain, interaction, modalities and subject. The dimensionality is classified into spatial as well as time-series dimensions. The registration methods are classified into Extrinsic and Intrinsic methods. All the mapping methods of nature of transformation belongs to rigid (global) and non-rigid (elastic) transformations. In the rigid transformation methods, the entire 2D or 3D images are transformed. The images' coordinate transformation can be either global or local.

III. ALGORITHMIC SPECIFIC TO INDIVIDUAL MODALITIES AND DISEASES

The image processing techniques differ widely based on the application, imaging modalities and other aspects, various modalities are used in imaging, also on various body parts. MRI and CT scanners provide brain, liver, chest, abdominal images. Image processing methods applied to brain tissue has divergent demands from the methods used in the case of liver. The method which gives the correct result with respect to one modality may not work for another.

IV. CONCLUSION

In the past, the imaging quality was not good and innovations largely focussed on the development of new materials, the development of high dimensional techniques and high quality imaging techniques such as high field MRI, CT scanning etc, has made new innovations in image processing more important.

In future, the major goal of the medical practitioner to interpret the images better and derive more information. The days are not far; when a mirror at home may give, medical warning regarding the changes in our face or a person gets an alarm on some serious medical conditions such as seizures, depending on her/his walking style which are captured using imaging devices. This type of perfect decision is possible when advanced image processing algorithms are in place.

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