

Chapter 12

Medical Image Registration in Clinical Diagnosis: An Introduction

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ABSTRACT

The term medical image covers a wide variety of types of images (modality), especially in medical image registration with very different perspective. In this chapter, spatial technique is approached and analyzed for providing effective clinical diagnosis. The effective conventional methods are chosen for this registration. Researchers have developed and focused this research using proven conventional methods in the respective fields of registration Affine, Demons, and Affine with B-spline. From the overall analysis, it is clear that Affine with B-Spline performs better in registration of medical images than Affine and Demons.

INTRODUCTION

A critical stage in visualizing the process is the alignment or registration of the images. This includes transformation, scaling and skews as well as the rigid body parameters in matrix form by preserving all the parallel lines. Rigid body registration is widely used in medical applications where the structures of interest (region of interest) are either bone or are enclosed in bone as noted in works by Yang (1999); Hill (2001);

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Zitova (2003); Yang et al. (2007) and Viergever et al. (2016). Furthermore, this article focuses discussion on medical image registration on attempting to provide a clinical justification for diagnosis by observers' classification.

RELATED WORK

This Section aims to provide a survey of recent literature concerning medical image registration. Van Den Elsen et al. (1994) describes the intensity re-mapping for MR–CT registration. High intensities are re-mapped to low intensities using MR–CT registration by transforming the CT image intensities. This creates a virtual image from the CT images that has an intensity distribution more like an MR image (in which bone is dark). By using cross correlation the MR image and the virtual MR image created from CT are then registered.

Maes (1997) proposed a new approach to the problem of multimodality medical image registration using Mutual Information (MI) or relative entropy. The accuracy of the MI criterion is validated for rigid body registration of Computed Tomography, Magnetic Resonance Imaging, Positron Emission Tomography images by comparing with the stereotactic registration solution. Their results demonstrate that considering sub voxel accuracy with respect to the stereotactic reference, the solution can be achieved automatically. Maintz et al.'s (1998) survey is taken as a reference for various medical image registration techniques. The various registration techniques used for specific modality are summarized and is given in Table 1.

MATERIALS AND METHODS

The registered images helps in clinical diagnosis by guiding the physicians and radiologists independently without disturbing the patient. An added advantage of this registration techniques is, they can be effectively used by the radiologists, for the detail they expect to achieve without disturbing the patient and without subjecting the patient to take scan for several times. Thus this registration system helps in effective clinical diagnosis.

Registration System Module

In this section, details on the methodology used, which is essentially based on the widely known general image registration framework is provided. However have evaluated three algorithms from the perspective of the transformation used: such as Affine (AFF), Demons (DEM), and Affine with B-Spline (BSP) is given in Figure

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