

Computational Registration of Biomedical Data Towards More Effective Image Analysis

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Abstract

Data registration, i.e., the process of transforming a dataset so that the entities represented are properly adjusted to the homologous entities represented in a second dataset, has been a topic of huge research in various scientific fields. In Image Analysis, such transformation is frequently applied on static images, but also on image sequences, and is usually known as image registration. For example, in biomedicine, computational methods of data registration have been assuming an essential role in supporting enhanced image-based diagnosis, by addressing the fusion of information conveyed in images acquired by different techniques, the more effective follow-up of organs and pathologies, the definition of the best paths in computer-assisted surgery or in radiotherapy treatments, among others [1]. Hence, the computational registration of biomedical data has been a remarkable tool for clinicians and researchers since, after the truthful registration of the data involved, tasks such as image analysis, comparison of a given clinical case with previously studied ones, the automatic identification of regions of interest and information fusion, are facilitated and can be performed automatically and without subjectivity.

Usually, associated with the topic of data registration one finds the topics of data matching, i.e. the searching for correspondences between two related data sets [2-6], and data interpolation, specially due to the application of the transformation found to one data set in the discrete domain [1].

During this presentation, the topic of biomedical data registration is going to be introduced, automatic computational methodologies to matching and registering static images and image sequences that we have been developed are going to be described, and application cases involving static images, image sequences and images acquired by different imaging modalities are going to be presented and discussed [2-13].

Keywords: Image Matching, Image Registration, Image Alignment, Spatio-Temporal Registration, Medical Imaging

Acknowledgments

This work was partially done in the scope of the projects “Methodologies to Analyze Organs from Complex Medical Images – Applications to Female Pelvic Cavity” and “Cardiovascular Imaging Modeling and Simulation - SIMCARD”, with references PTDC/EEA-CRO/103320/2008 and UTAustin/CA/0047/2008, respectively, financially supported by Fundação para a Ciência e a Tecnologia (FCT) in Portugal.

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