Zaizi and Iskandar *GigaScience* 2013, **2**:12
http://www.gigasciencejournal.com/content/2/1/12

REVIEW **Open Access**

Using image mapping towards biomedical and biological data sharing

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Abstract

Image-based data integration in eHealth and life sciences is typically concerned with the method used for anatomical space mapping, needed to retrieve, compare and analyse large volumes of biomedical data. In mapping one image onto another image, a mechanism is used to match and find the corresponding spatial regions which have the same meaning between the source and the matching image. Image-based data integration is useful for integrating data of various information structures. Here we discuss a broad range of issues related to data integration of various information structures, review exemplary work on image representation and mapping, and discuss the challenges that these techniques may bring.

Keywords: Data integration, Spatial relations, Biomedical data, Biomedical image, Image mapping

Review

Image-based data integration in eHealth domain and life sciences

Biomedical imaging informatics has become a crucial part of modern healthcare, clinical research and basic biomedical sciences. Rapid improvement of imaging technology and advancement of imaging modalities in recent years have resulted in a significant increase in the quantity and quality of such images. Being able to integrate and compare such image-based data has developed into an increasingly critical component in the eHealth domain and life sciences.

Image-based data integration in eHealth and life sciences is typically concerned with the method of anatomical space mapping. Anatomical space mapping involves mapping between spatial regions in the source and matching images in a database. The mapped regions have similar semantics. Image-based data integration is useful for integrating data from various information modalities. For example, patients are now routinely undergoing a variety of digital medical imaging investigations, such as magnetic resonance imaging (MRI) and computed tomography (CT) scanning. The images resulting from these investigations become part of patients' medical records and are kept indefinitely. The integration of different medical imaging modalities for a single patient can be useful for operations, such as to automatically restaging a condition by comparing the scan from today against the one taken from the previous years, or to predict disease progression. Likewise, the integration of medical imaging modalities from multiple patients with the same disease can yield useful information for diagnosis and prediction; for example, to make automated stratification of patients into different risk categories, or to compare the range of abnormalities in patients. Being able to integrate and compare such image-based data has developed into an increasingly critical component in the life sciences and eHealth domain. It demonstrates potential clinical benefits to retrieve, compare and analyse large volumes of biomedical data for epidemiological studies, educational uses, and monitoring the clinical progress of a patient or translational science purposes.

A biomedical atlas consists of a graphical model, the ontology associated with the graphical model and a mapping between those two. The ontology contains a collection of anatomical domains and relations between those domains. The graphical model is a digital image of an object (e.g., of a human or animal body) along with the identified anatomical domains. Image-based data integration is needed for integrating images and natural-language descriptions in a spatial space. Images may come from biomedical atlases and patients' clinical images. On

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