EDITORIAL

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Special issue: medical image understanding and analysis

The understanding and analysis of medical and biomedical images is not a new topic; it could probably be traced back to the first cases of medical diagnosis in which, intuitively, vision was linked to pattern recognition, both based inside the human brain. In more recent years, the use of technology and computers has turned the field around with a myriad of algorithms and imaging tools. On one side of the development are novel acquisition technologies that provide a new or improved way of acquiring data-sets from different specimens, from cells in petri dishes, to animals, to humans. On the other side, there are new techniques to interpret or assist the interpretation of the conditions inherent in those data-sets. This special issue concentrates on the latter, namely the tools and technologies that enable the understanding and analysis of medical images. Despite a considerable number of years of research, the field is still open for development as is demonstrated by several conferences that focus on the area.

This issue of *Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization* (CMBBE:I&V) presents a collection of selected work presented at the *Medical Image Understanding and Analysis* (MIUA) (Reyes-Aldasoro & Slabaugh 2014) conference that was organised by City University London and held in London in July 2014. This conference has been hosted at different locations in the United Kingdom, and whilst it began as a national conference, it now attracts delegates from nearly every continent. For this issue, extended papers were requested from the authors with top-scoring submissions. The papers went under the standard CMBBE:I&V peer review and revisions prior to publication.

The six papers that form this special issue represent the variety of image acquisition techniques, which include phase-contrast microscopy, *in vitro* optical projection tomography, ultrasound, magnetic resonance imaging (MRI) and optical mapping. In terms of the application, these papers deal with cancer, cardiology, Alzheimer's disease and microscopy, which can be applied in different areas of biomedicine.

Despite the lack of contrast that is provided by phase-contrast microscopy, it remains a popular acquisition technique that avoids detrimental tagging effects of fluorescence microscopy.

Jaccard et al. present a segmentation algorithm that can discriminate cells from a background using local histograms and random forest classifiers. The work of Zhang and co-authors is of great interest in the area of colon cancer, as it explores the morphology of the surface of excised colorectal polyps with a multi-scale approach and the use of level sets method. Also on the area of cancer, Bakas et al. describe a segmentation algorithm applied to focal liver lesions observed through a contrast-enhanced ultra- sound acquisition. The problem of a complete and reliable set of cardiac planes acquired with MRI is approached by Margeta and co-authors. They propose a methodology based on convolutional neural networks and classification forests that addresses noise and missing DICOM information. The analysis of the variability of the hippocampus on patients with Alzheimer's disease is presented by Cury et al. who investigate the shapes through the deformation of templates with diffeomorphic techniques. Finally, Yu and co-authors present the use of optical mapping as a tool to assess cardiac electrophysiology. This manuscript describes both the techniques to isolate and observe a murine heart and the algorithms to perform the analysis of the data.

We trust that this special issue will provide a snapshot of the interesting work presented at MIUA 2014 and thus help attract high-quality submissions to future MIUA conferences.

Reference

Reyes-Aldasoro CC, Slabaugh G, editors. 2014. Medical image understanding and analysis 2014. 18th ed. London: BMVA.