Special Issue of Computerized Medical Imaging and Graphics on "Whole Slide Microscopic Image Processing"

Recent advances in technological solutions for automated high-speed and high-resolution whole slide imaging (WSI) have set the basis for a digital revolution in microscopy. This ability to observe and analyze entire specimens rather that single microscopic fields of view is affecting the way microscopic evaluation is practiced. However, WSI outputs quite huge multiple channel (at least three color channels) images (e.g. 30-40 GB) for a single slide and managing such amount of data is a unique challenge for this new era of digital microscopy. Currently, WSI workstations are mainly used to perform virtual microscopy, the practice of converting entire glass slides into high-resolution digital slides that can be viewed and managed across networks.

WSI will find a great number of users from pathology to pharmaceutical research to basic science and industrial inspection applications. A WSI system equipped with the right storage and computing infrastructure can significantly improve workflow, hence increasing the productivity while reducing the costs, and increase workflow reliability, enable automated image analysis, quantification and quality control tools. For example, in pathology departments, there are great workflow inefficiencies that result from the necessary physical connection between glass slides and the highly paid labor required to read them. In the current workflow, slides are occasionally lost in the mail, when an additional opinion is needed from a specialized pathologist. An all-digital pathological environment should help overcome workflow inefficiency, and increase workflow reliability. Additionally, such an environment will enable easy access to worldwide expertise even from remote locations. WSI complimented with automated image analysis and quantitation tools will significantly improve the quality of the workflow as well. If WSI can be shown to be sufficient for pathologists to make reliable diagnosis decisions and compose complex diagnosis reports, WSI image analysis tools have yet to prove such abilities by validation studies in order to move from virtual microscopy to full quantitative analysis. Storage and computing infrastructure will also be needed, because in one year, a laboratory can produce about 30000 cases, which requires up to 30 Terabytes of massive archiving system in today's standards.

The aim of the proposed special issue is to present some of the cutting-edge works currently being done in Whole Slide Imaging and reveal the challenges that still lie ahead. The special issue will be a mix of invited and solicited papers. A perspective editorial written by the special issue guest editors will introduce the technology; describe potential applications and pitfalls. Invited papers are intended to provide reviews both from the medical and the image processing sides. The invited papers will be contributed by (the authors have given their approval):

- Christel Daniel (MD, PhD), Université Paris Descartes and Hôpital Européen Georges-Pompidou, Paris, France: *"Standardizing the use of whole slide images in collaborative digital anatomic pathology"*
- Michael D. Feldman (MD, PhD), University of Pennsylvania, USA: *"WSI Medical Challenges"*
- Anant Madabhushi (PhD), Rutgers The State University of New Jersey, USA: *"Computer-aided Prognosis: Towards Quantitative Personalized Medicine"*
- Thomas J. Fuchs, Joachim M. Buhmann (PhD), Swiss Federal Institute of Technology Zurich, Switzerland: *"Computational pathology: Statistical learning for cancer diagnosis."*

Original papers are solicited addressing, but not limited to, one or more of the following topics:
- Devices and Probes
- Image enhancement, calibration
- Image segmentation
- Image registration
- Computer-Aided Detection, Diagnosis, Grading and Prognosis
- Automated Defect Recognition
- Content-based image retrieval
- Case studies

A provisional calendar for the special issue is:
- Submission of invited and solicited manuscripts: June 1, 2010
- Acceptance/rejection notification: September 1, 2010
- Revised manuscripts due: December 1, 2010
- Publication of Special Issue: 2011

Paper Submission
Manuscripts should conform to the standard guidelines of CMIG. Prospective authors should submit an electronic copy of their manuscript through the CMIG online submission system at http://ees.elsevier.com/cmig. Papers should be marked as "Special Issue: Whole Slide Microscopic Image Processing " in the Article Type section and " Whole Slide Microscopic Image Processing "

special issue should be mentioned in the cover letter. Each paper will be reviewed by at least two independent reviewers.

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