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Prostate Cancer Imaging

Computer-Aided Diagnosis,
Prognosis, and Intervention

International Workshop
Held in Conjunction with MICCAI 2010
Beijing, China, September 24, 2010
Proceedings

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Preface

Prostatic adenocarcinoma (CAP) is the second most common malignancy with an estimated 190,000 new cases in the USA in 2010 (Source: American Cancer Society), and is the most frequently diagnosed cancer among men. If CAP is caught early, men have a high, five-year survival rate. Unfortunately there is no standardized image-based screening protocol for early detection of CAP (unlike for breast cancers). In the USA high levels of prostate-specific antigen (PSA) warrant a trans-rectal ultrasound (TRUS) biopsy to enable histologic confirmation of presence or absence of CAP.

With recent rapid developments in multi-parametric radiological imaging techniques (spectroscopy, dynamic contrast enhanced MR imaging, PET, RF ultrasound), some of these functional and metabolic imaging modalities are allowing for definition of high resolution, multi-modal signatures for prostate cancer in vivo. Distinct computational and technological challenges for multi-modal data registration and classification still remain in leveraging this multi-parametric data for directing therapy and optimizing biopsy. Additionally, with the recent advent of whole slide digital scanners, digitized histopathology has become amenable to computerized image analysis. While it is known that outcome of prostate cancer (prognosis) is highly correlated with Gleason grade, pathologists often have difficulty in distinguishing between intermediate Gleason grades from histopathology. Development of computerized image analysis methods for automated Gleason grading and predicting outcome on histopathology have to confront the significant computational challenges associated with working these very large digitized images.

This workshop aims to bring together clinicians, computer scientists, and industrial vendors of prostate cancer imaging equipments to discuss (1) the clinical challenges and open problems, (2) present state-of-the-art research in quantitative image analysis and visualization methods for prostate cancer detection, diagnosis, and prognosis from multi-parametric imaging and digitized histopathology, and (3) advances in image guided interventions for prostate cancer therapy and biopsy. The workshop aims to acquaint clinicians, urologists, radiologists, oncologists, and pathologists on the role that quantitative and automated image analysis can play in prostate cancer diagnosis, prognosis, and treatment and also for imaging scientists to understand the most pressing clinical problems.

This year's workshop hosted two invited talks. The first was on challenges in histopathological imaging and analysis of prostate cancer by Dr. John Tomaszewski, MD, Chair, Department of Pathology, Hospital at the University of Pennsylvania, Philadelphia, PA. The second invited talk was given by Dr. Jurgen J. Fütterer, MD, Dept of Radiology, Radboud University Nijmegen Medical Centre, The Netherlands, who will be speaking about the role of MRI in prostate cancer detection and diagnosis.

A total of 13 papers were received in response to the call for papers for the workshop. Each of the 13 papers underwent a rigorous, double-blinded peer-reviewed evaluation, with each paper being reviewed by a minimum of 2 reviewers. Based on

the critiques and evaluations, 11 of the 13 papers were accepted for presentation in the workshop. An additional two invited papers, from two prominent groups working in the areas of prostate cancer diagnosis and prognosis were also received. The papers cover a range of diverse themes, including (a) prostate segmentation, (b) multi-modal prostate registration, and (c) computer-aided diagnosis and classification of prostate cancer. The clinical areas covered included (1) radiology, (2) radiation oncology, (3) digital pathology, and (4) image guided interventions.

July 2010

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