Hong Kong Association of Medical Physics
香港醫學物理學會

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

Department of Health Technology and Informatics
醫療科技及資訊學系

HTI Seminar

Modeling Deformation of Pelvic Anatomy in Prostate Cancer Radiation Therapy

Prof. Jeffrey F. Williamson

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Editor-in-Chief, Medical Physics

Date:	**28 August 2018 (Tuesday)**
Time:	**6:45 p.m. – 7:45 p.m.**
Venue:	**Room TU101, 1/F, Tin Ka Ping Lecture Theatre, Yip Kit Chuen Building, PolyU**
Reception:	**8:00 p.m. – 9:30 p.m., Staff Restaurant, 4/F, Communal Building, PolyU**

Abstract

Deformable image registration (DIR) seeks to estimate the voxel-to-voxel mapping (displacement vector field or DVF) between images representing different instances of 3D organ anatomy, i.e., shapes and locations. In radiation therapy, DIR is used to map organ segmentations or other data from feature-rich images onto differently deformed instances of patient anatomy (usually CT images) and to sum dose distributions across a sequence of deformed anatomies representing different fractions or time quanta of treatment delivery.

Population-based statistical models of systematic and random 3D interfraction voxel displacement for prostate cancer radiation therapy: By quantifying the daily displacement of the tumor centroid from its planned location for a population of patients, simple statistical models of rigid organ motion can be constructed. Tumor safety margins needed to assure that 95% of the population achieves acceptable target coverage can be derived. Prof. Williamson's group has generalized this approach to individual deforming organ voxels by mapping each patient's daily CT image to his planning image as well as deformably registering each patient's planning image onto a single reference anatomy.

Biography

Prof. Williamson is currently a Professor of Radiation Oncology at Washington University in St. Louis and Editor-in-Chief of *Medical Physics* (since 2014), the leading international journal in medical physics research. He received his Ph.D. in Biophysical Sciences/Medical Physics at the University of Minnesota in 1982. During his long career, he has served as a clinical physicist, research scientist, teacher and administrator, all in university-based radiation oncology departments. From 1989 to 2002, he was the Professor of Radiation Oncology and Chief of Brachytherapy Physics at Washington University in St. Louis. He served as Chair of Medical Physics (2002-2012) and Professor of Radiation Oncology (2002-2016) at Virginia Commonwealth University (VCU), where he initiated accredited MS., Ph.D., and residency programs in medical physics.

Prof. Williamson's research focused on improving clinical outcomes through innovative applications of medical imaging to targeting and assessment of radiotherapy. His most ambitious project involved using on onboard and off-line 3D/4D daily CT imaging, combined with deformable image registration to mitigate the impact of tissue motion and deformation due to setup error, normal physiological processes, and tumor regression on radiation therapy dose delivery.

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