



## **ENABLING TECHNOLOGIES FOR ULTRASOUND IMAGING IN COMPUTER-ASSISTED INTERVENTION**

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**Hosted By: Nabil Simaan**

There has been an increasing interest in minimally invasive ultrasound-guided interventions that require precise placement of a surgical tool (needle, tissue ablator, radiation therapy, etc...) to the anatomical target. To address this problem, we have developed a collection of novel technologies and integrated those in prototype systems.

In this talk, we will introduce multiple system embodiments that involve robotics, tracking, anatomical modeling, ultrasound image processing, and elasticity monitoring. The underlying themes in these systems are (1) simultaneous tracking of surgical tool with respect to the US images and (2) monitoring physiological changes, specifically tissue coagulation, throughout the procedure. For the first theme, the talk will include a description of a robust method for 2D and 3D ultrasound probe calibration with a closed-form solution. As a result, one can discern the unknown spatial transformation between image pixels and tracker coordinates in realtime, in-vivo while the patient is being scanned.

With respect to the second theme, we will present a rapid ultrasound-based approach to monitor ablative therapy by optimizing shape parameters. The method involves the integration of a biomechanical computational model of the tissue, a correlation approach to estimate and track tissue deformation, and an optimization method to solve the inverse problem of recovering the shape parameters in the volume of interest. In addition, a breast irradiation planning system based on multi-modality fusion will be introduced.



***Emad Boctor, Ph.D.*** is an Assistant Professor of Radiology and Computer Science. Emad Boctor received B.Sc. and M.Sc. in Biomedical Engineering from Cairo University, in 1995, and 1998, respectively. He also got an MSCS degree in Engineering Mathematics and Computer Science from University of Louisville, Kentucky in 2000. Dr. Boctor received his master and doctoral degree in 2004 and 2006, respectively from the Computer Science Department at the Johns Hopkins University. Since 2007, he joined the Department of Radiology and Radiological Science at the Johns Hopkins Medical Institute, where he has started a research program in the field of advanced interventional ultrasound imaging. Dr. Boctor's research focuses on advanced ultrasound imaging, and image-guided intervention; a subject in which he has authored and co-authored over 25 manuscripts, more than seven pending patents, and has received a number of recognized awards and fellowships.

**Thursday, May 7, 2009**

**11:00-12:00pm Room 233 Mudd**

**Lunch served at 12:00pm in ME lobby**