Department of Electrical and Computer Engineering

TEXAS TECH UNIVERSITY
Edward E. Whitacre Jr.
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Spring 2012 Seminar Series

Seminar Title: Overcoming Physical Challenges in Medical Imaging
Time: April 13th, 2012, 3:00 - 4:00 PM
Location: Lankford Lab ECE 101

Speaker:
A. H. Tewfik
Cockrell Family Regents Chair in Engineering and Chairman,
Dept. of Electrical and Computer Engineering,
University of Texas, Austin

Abstract:
This talk describes a set of novel approaches that can enhance diagnostic and surgical imaging and expand their applicability. The approaches will be described in the contexts of imaging in minimally invasive surgery and rapid magnetic resonance imaging (MRI).
Minimally invasive surgery and biopsies, and in particular natural orifice translumenal endoscopic surgery (NOTES) and single-port laparoscopy suffer from a restricted visualization of the surgical field problem. Single port procedures use a single small incision instead of an open incision as in traditional surgery or multiple small incisions in laparoscopic surgery. NOTES procedures forgo the abdominal incision entirely and surgery is performed through a single natural orifice using a flexible endoscope. Minimizing the size and number of incisions should reduce hospitalization time, lower complication rates, and ultimately reduce the morbidity and mortality from surgery. However, limiting the surgeon's field of view may increase the risk of complications during surgery. This talk describes an innovative approach for providing the surgeon with a real time 3D view of the organs as they deform during the surgery. The talk will describe the first ever demonstration of ex-vivo 3 D organ tracking using limited optical views.
The talk will also describe extension of the approaches that aim at speeding up MRI. Magnetic Resonance Imaging suffers from speed limitation caused by physical (gradient amplitude and slew-rate) and physiological (nerve stimulation) constraints. Dynamic imaging of organs under motion requires the acquisition of each frame to be short relative the object motion. The challenge is to improve both spatial and temporal resolution to fully capture the dynamic characteristics of the organ in the presence of motion noise. This talk proposes a radically novel approach to achieve high speed MRI with reduced data acquisition and faster image reconstruction in a segmented fashion.

Speaker Bio:
Ahmed H Tewfik received his B.Sc. degree from Cairo University, Cairo Egypt, in 1982 and his M.Sc., E.E. and Sc.D. degrees from MIT, in 1984, 1985 and 1987 respectively. He is the Cockrell Family Regents Chair in Engineering and the Chairman of the Department of Electrical and Computer Engineering at the Univeristy of Texas Austin. He was the E. F. Johnson professor of Electronic Communications with the department of Electrical Engineering at the University of Minnesota until September 2010. Dr. Tewfik worked at Alphatech, Inc. and served as a consultant to several companies. From August 1997 to August 2001, he was the President and CEO of Cognicity, Inc., an entertainment marketing software tools publisher that he co-founded, on partial leave of absence from the University of Minnesota. His current research interests are in minimally invasive surgery, genomics and proteomics, brain computing interfaces and programmable wireless networks. Prof. Tewfik is a Fellow of the IEEE. He was a Distinguished Lecturer of the IEEE Signal Processing Society in 1997 - 1999. He received the IEEE third Millennium award in 2000. He was elected to the position of VP Technical Directions of the IEEE Signal Processing Society in 2009 and served on the board of governors of that Society from 2006 to 2008. He has given several plenary and keynote lectures at IEEE conferences.