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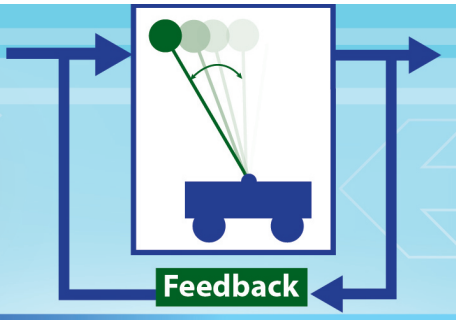
Control Seminar



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Development of a Magnetic Resonance Imaging-Guided Intravascular Active Catheter System

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Department of Electrical Engineering and Computer Science

Friday, October 13, 2017

3:30 – 4:30 pm • 1500 EECS

ABSTRACT: Atrial fibrillation, with an estimated prevalence of 2.1-6.1 million in the United States and more than 200,000 new cases annually, is the most common form of cardiac arrhythmia. In atrial fibrillation, the cardiac atria no longer follow the normal intrinsic pacemaker of the heart and undergo uncoordinated movements (fibrillation) due to disorganized electrical impulses that start at the roots of the pulmonary veins and spread throughout the atria. Catheter ablation is a routinely used minimally invasive technique for treating atrial fibrillation, where a catheter is used to create ablation barriers in the left atrium to prevent the spread of the irregular electrical signals. However, the efficacy of the atrial fibrillation ablation procedure is reported to be around 40-70%, frequently leading to recurrences requiring repeat procedures.

This talk presents the current state of our research towards development of a robotic active catheter system for performing atrial fibrillation ablation under real-time intra-operative magnetic resonance imaging (MRI) guidance. The proposed system will employ a new MRI-compatible magnetic actuation scheme, in which current-carrying micro-coils mounted on the catheter is used to generate deflection of the catheter inside the magnetic field of the MRI scanner. The location of the catheter tip and the target tissue will be measured by magnetic resonance imaging in real-time, and the robotic control algorithms will use this information to actively control the catheter tip. Finally, I will conclude the presentation with our recent work on probabilistic active sensing algorithms that will be used to control the image acquisition system.

BIO: M. Cenk Cavusoglu is currently a Professor at the Department of Electrical Engineering and Computer Science of Case Western Reserve University (CWRU), with secondary appointments in Biomedical Engineering, and Mechanical and Aerospace Engineering. He received the B.S. degree in Electrical and Electronic Engineering from the Middle East Technical University, Ankara, Turkey, in 1995, and the M.S. and Ph.D. degrees in Electrical Engineering and Computer Sciences from the University of California, Berkeley, in 1997 and 2000, respectively. He was a Visiting Researcher at the INRIA Rhones-Alpes Research Center, Grenoble, France (1998); a Postdoctoral Researcher and Lecturer at the University of California, Berkeley (2000-2002); and, a Visiting Associate Professor at Bilkent University, Ankara, Turkey (2009-2010). He is a Fellow of the American Institute for Medical and Biological Engineers. See http://engr.case.edu/cavusoglu_cenk/

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