AbstractID: 6012 Title: MR-Guided Mechanically Assisted Interventions

Magnetic Resonance Imaging (MRI) has become the gold standard in the imaging of many soft tissues, osseous and joint conditions, but to date there has been limited success in harnessing this excellent imaging modality for interventional procedures. MRI is an ideal interventional guidance modality: it provides real-time high-resolution images at arbitrary direction and is able to monitor therapeutic agents, surgical tools, biomechanical tissue properties, and physiological function. At the same time, MRI poses formidable engineering challenges by limited access to the patient and a strong magnetic field that prevents the use of conventional materials and electronic equipment. Currently, no exigent technical solution exists to assist MRI-guided needle placement procedures in an accurate, simple, and economical manner.

A wide variety of procedures may be performed on open magnets but the trend is to use high field closed magnets, mainly because of improved imaging quality and wider availability of pulse sequences. The higher the field the higher the SNR and the higher SNR can be used to improve spatial and temporal resolution and can make techniques like temperature or flow sensitive imaging, functional brain MRI, diffusion imaging or MR spectroscopy more useful. Considering these trends, we believe that the use of conventional high-field closed MRI scanners for guidance will allow more successful dissemination of MR-guided techniques to radiology facilities throughout the country and eventually beyond.

The talk will survey major trends and achievements in MR compatible interventional robotics, and present specific research projects and results currently in progress at the Johns Hopkins University and collaborators.