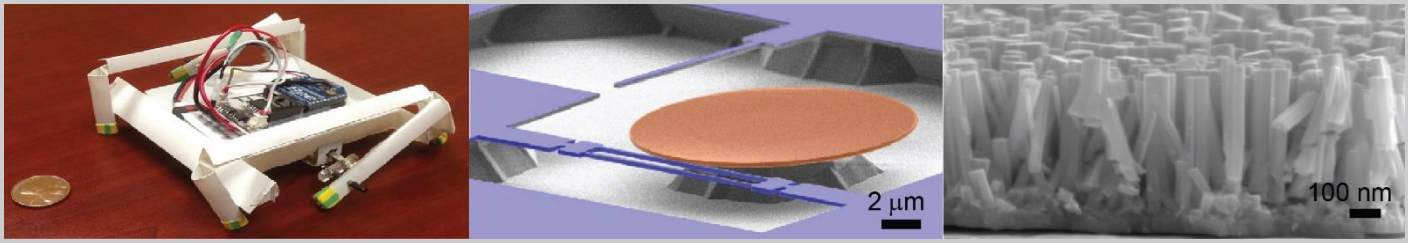
WPI MECHANICAL ENGINEERING



WPI ME Graduate Seminar Series 2019-2020

New Paradigm of Medical Ultrasound with Robotic Instrumentation

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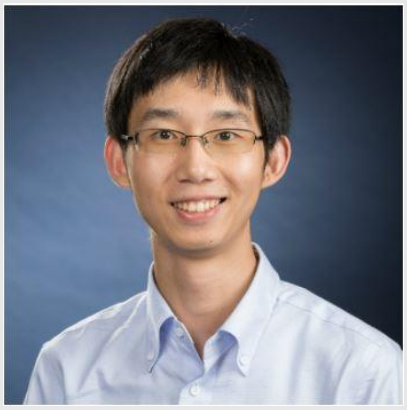
10:00-10:50 am, Wednesday, April 29
Zoom: https://wpi.zoom.us/j/97451388080

This talk introduces a new paradigm of medical ultrasound imaging with robotic instrumentation for diagnosis and image-guided intervention with two case studies. The first case is for diagnosis. Conventional medical ultrasound procedures are performed manually by an occupational operator. These procedures require high physical and cognitive burden and yield clinical results that are highly operator-dependent, therefore frequently diminishing trust in ultrasound imaging data accuracy in repetitive assessment. A robotic ultrasound procedure, on the other hand, is an emerging paradigm integrating a robotic arm with an ultrasound probe. It achieves an automated or semi-automated ultrasound scanning by controlling the scanning trajectory, region of interest, and the contact force. The second case is for image-guided intervention. To perform needle insertion/intervention under ultrasound guidance, physicians require to manage hand-eye coordination between the needle and ultrasound image. The needle is easily got lost its location and requires a reinsertion when the needle trajectory deviates from the image. We present a new imaging configuration with concentric ring arrays and an open hole inside the ring where the needle can be inserted. This allows for the needle path maintained at the center of the reconstructed image and visualizes arbitrary forward-views by mechanically tracking of needle shaft rotation.

About the Speaker



Dr. Haichong (Kai) Zhang is an Assistant Professor in Biomedical Engineering and Robotics Engineering with an appointment in Computer Science at Worcester Polytechnic Institute (WPI). He is the founding director of the Medical Frontier Ultrasound Imaging and Robotic Instrumentation (Medical FUSION) Laboratory. His research interests include advanced imaging and robotic instrumentation with emphasis on ultrasound and photoacoustics for medical applications. Dr. Zhang received his B.S. and M.S. in Human Health Sciences from the Kyoto University, Japan, and subsequently earned his M.S. and Ph.D. in Computer Science from the Johns Hopkins University. He is the recipient of the NIH Director's Early Independence Award (DP5) in 2019 and the Early Investigator Research Award from the Department of Defense Prostate Cancer Research Program in 2018.