Multi-line Transmit Beam Forming for Fast Cardiac Imaging Using Ultrasound

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Venue: Room 204K, Chow Yei Ching Building

Speaker:
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Abstract:
Ultrasound is the modality of the choice when imaging the heart not only due to the fact that it is non-invasive, inexpensive, and easy to use, but also because it operates at real-time. Currently, a frame rate of about 30-70 Hz can typically be obtained for 2D sector scanning in most of the cardiac ultrasound systems. This frame rate is sufficient to visualize the global motion of the heart and to roughly assess the cardiac kinematics. However, it is too low to resolve the short-lived cardiac phases, in particular the isovolumetric contraction (typically around 30 ms) and relaxation (typically around 80 ms), which may contain potentially important information in cardiac (patho-)physiology. To fully resolve these short-lived cardiac phases, a frame rate in hundreds of hertz is thus desired. However, in ultrasound imaging, obtaining such a high frame rate remains a challenge, as there is always a trade-off among frame rate, image quality, and field-of-view. To meet this challenge, we have recently proposed to use multi-line transmit beam forming (MLT), i.e., simultaneously transmitting multiple ultrasound beams in different directions. Using this approach, a high frame rate of about 500 Hz can be achieved without significantly compromising image quality and field-of-view. In this talk, the principle of multi-line transmit beam forming will be reviewed and its capacity to assess cardiac morphology and function at high frame rate will be discussed and demonstrated.

Biography of the Speaker:
Ling TONG received her M.Sc. degree in physics from Peking University, China in 2009 and her Ph.D. degree in biomedical sciences from University of Leuven (KU Leuven), Belgium in 2013. In 2014, she joined the Center for Bio-Medical Imaging Research and Department of Biomedical Engineering at Tsinghua University, China as a postdoctoral researcher where she is funded by the Tsinghua University Post-doctoral Support Program and the National Postdoctoral International Exchange Program -Import Project. She serves as a reviewer of a major ultrasound-engineering journal, IEEE-TUFFC. Her current research interests include medical ultrasound simulation, beam forming approaches, and their applications in fast cardiac imaging.