AbstractID: 9888 Title: Elastography – Real-time Ultrasound Elasticity Imaging Technique

Ultrasound elasticity imaging or elastography is real-time imaging technique capable of determining tissue elasticity of certain organs such as breast and prostate. Elasticity imaging, applied during standard ultrasound examinations, is a patient-friendly, reliable and cost-efficient method to diagnose cancer or other diseases based on the changes in tissue elasticity that are usually related to some abnormal, pathological processes.

The main objective of this course is to expose the audience to elasticity imaging with emphasis to principles, approaches and applications. The course will provide both a broad overview and comprehensive understanding of both static and dynamic approaches in elasticity imaging. Starting with a brief historical introduction to elasticity imaging, we will examine the foundation and basic principles of elasticity imaging (theory of elasticity including both the equation of equilibrium and the wave equation, mechanical properties of soft tissues, etc.). We will then discuss practical aspects of ultrasound elasticity imaging including imaging hardware, signal and image processing algorithms, etc. Motion tracking methods will be introduced and analyzed. In this part of the course, we will also analyze noise (sources) and primary artifacts. Finally, elasticity imaging techniques and their clinical applications will be presented. The course will conclude with overview of several experimental and commercial systems capable of elasticity imaging.

Educational Objectives:

1. Understand the underlying principles of both static and dynamic approaches in elasticity imaging
2. Understand the practical aspects related to an elasticity imaging experiment including design, data acquisition and signal/image processing
3. Understand the issues related to clinical application of ultrasound elasticity imaging

Stanislav Emelianov received the B.S. and M.S. degrees in physics and acoustics in 1986 and 1989, respectively, from the Moscow State University, and the Ph.D. degree in physics in 1993 from Moscow State University, and the Institute of Mathematical Problems of Biology of the Russian Academy of Sciences, Russia. In 1989, he joined the Institute of Mathematical Problems of Biology, where he was engaged in both mathematical modeling of soft tissue biomechanics and experimental studies of noninvasive visualization of tissue mechanical properties. Following his graduate work, he moved to the University of Michigan, Ann Arbor, as a post-Doctoral Fellow in the Bioengineering Program, and Electrical Engineering and Computer Science Department. From 1996 to 2002, Dr. Emelianov was a Research Scientist at the Biomedical Ultrasonics Laboratory at the University of Michigan. During his tenure at Michigan, Dr. Emelianov was involved primarily in the theoretical and practical aspects of elasticity imaging. Dr. Emelianov is currently an Associate Professor of Biomedical Engineering at the University of Texas at Austin. His research interests are in the areas of medical imaging for therapeutics and diagnostic applications, elasticity imaging, ultrasound microscopy, photoacoustic imaging, cellular/molecular imaging, and functional imaging.