Session 2aBAb

Biomedical Acoustics: Advances in Ultrasound Imaging

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Chair's Introduction—9:30

Contributed Papers

9:35

2aBAb1. A Hybrid magnetic-ultrasonic technique for spectral viscoelastic characterization of soft solids. Rafael Tarazona (Universitat Politècnica de València, València, Spain, ratatar@ibv.upv.es), Alejandro Cebrecos, Noé Jiménez, and Francisco Camarena (i3M, CSIC, Universitat Politècnica de València, València, Spain)

We present a hybrid technique that combines magnetic forces and ultrasonic waves (MMUS based) to explicitly characterize the complex elastic modulus of soft-solids in the frequency domain. The results show the dependence of the viscoelastic properties with the frequency content of the applied magnetic impulse.

9:40

2aBAb2. Effect of retraction time and thrombin concentration on porcine whole blood clot elasticity and rt-PA susceptibility. Chadi Zemzemi (Univ. of Cincinnati, Cincinnati, OH, zemzemci@uc.edu), Matthew Phillips (Univ. of Cincinnati, Cincinnati, OH), Kenneth B. Bader (Univ. of Chicago, Chicago, IL), Kevin J. Haworth, and Christy K. Holland (Univ. of Cincinnati, Cincinnati, Ohio)

In vitro porcine blood clots mimicking deep vein thrombosis were formed in glass pipettes using 2.5 U/ml or 15 U/ml bovine thrombin and incubated at 37°C for 15, 30, 60, or 120 min. Clot stiffness, measured by shear wave elastography, increased and rt-PA susceptibility decreased with incubation time until 3-day old highly retracted clot characteristics were recapitulated.

9:45

2aBAb3. Arterial stiffness estimation with shear wave elastography. Tuhin Roy (Civil Eng., North Carolina State Univ., Raleigh, NC, troy@ncsu.edu)

In arterial shear wave elastography, the arterial wall is excited with acoustic radiation force and the resulting wave propagation through the arterial wall is analyzed to estimate the wall modulus. In this talk, we present a guided wave inversion framework not only to estimate elastic modulus but also the viscoelasticity, which is often considered an important additional biomarker.

9:50

2aBAb4. Ultrasound measurement of transmural fiber orientation and 3D tissue strain in excised myocardium under uniaxial loading. John M Cormack (Medicine, Univ. of Pittsburgh, Pittsburgh, PA, jmc345@pitt.edu)

The noninvasive measurement with ultrasound of myofiber orientation and 3D tissue strain through the tissue thickness during the application of uniaxial tension is demonstrated on porcine myocardium. Complex tissue deformation, including rotation of myofiber sheets, during the application of stretch is observed.

9:55–10:10 Discussion

10:10

2aBAb5. H-scan analysis of subtle changes in scattering. Kevin J. Parker (Electr. & Computer Eng., Univ. of Rochester, Rochester, NY, kevin.parker@rochester.edu)

The H-scan analysis provides a matched filter approach to quantifying the scattering transfer function of tissue, at high resolution, in medical ultrasound. The approach yields quantitative estimates and high resolution images where color encodes the scattering information, and the results on normal and diseased tissues will be presented.

10:15

2aBAb6. Evaluation of H-scan imaging in phantoms and *ex vivo* tissue. Anushka Yadav (Electr. Eng., Indian Inst. of Technol. Gandhinagar, Gandhinagar, Gujarat, India, yadav_anushka@iitgn.ac.in)

H-scan ultrasound imaging is a recently reported technique for tissue characterization. In this study, we report on the evaluation of H-scan imaging in hydrogel phantoms with scatterers of different sizes and in *ex vivo* tissue.

10:20

2aBAb7. Towards real-time super-resolution imaging with fast-AWSALM. Kai Riemer (Imperial Coll. London, London, UK, Kr616@ic.ac.uk), M. Toulemonde, M. Lerendegui, K. Christensen-Jeffries, S. Harput, G. Zhang, C. Dunsby, and M-X Tang

Localization-based ultrasound super-resolution imaging can visualize the microvascular structure beyond the diffraction limit but is sensitive to contrast concentration and requires acquisition for seconds. Low-boiling-point phase-change nanodroplets achieve super-resolved images with sub-second temporal resolution through activation and destruction with high frame rate plane waves in real-time.

10:25

2aBAb8. Alleviating the tradeoffs between spatial and temporal resolution in super-resolution ultrasound. Costas Arvanitis (School of Mech. Eng., Dept. of Biomedical Eng., Georgia Inst. of Technol., Atlanta, GA, costas.arvanitis@gatech.edu) and Scott D. Schoen (Georgia Inst. of Technol., Atlanta, GA)

Despite the rapid progress of super-resolution ultrasound, tradeoffs between spatial and temporal resolution may challenge the translation of this promising technology to the clinic. To temper these tradeoffs, we propose a new and computationally efficient method that can extract hundreds