Session 1aBAb

Biomedical Acoustics: Instrumentation and Simulation in Biomedical Acoustics

Virginie Papadopoulou, Chair
Univ. of North Carolina, Chapel Hill, NC 27599

Chair's Introduction—9:30

Contributed Papers

9:35

1aBAb1. Considerations for neuronavigation-guided blood–brain barrier opening in humans. Antonios Pouliopoulos (Columbia Univ., New York, NY, ap3623@columbia.edu), Omid Yousefian, Sua Bae, Hermes Kamimura, Robin Ji, Maria Murillo, Rachel Weber, Alec Batts, Rebecca Lynn Noel, and Elisa Konofagou (Columbia Univ., New York, NY)

In this talk, I will discuss the challenges of performing neuronavigation-guided blood–brain barrier opening in human subjects. I will describe the simulation framework required for treatment planning and the hardware needed to achieve targeted therapies.

9:40

1aBAb2. Transcranial radiation characteristics of leaky Lamb waves in different regions of a human skull. Eetu Kohtanen (Georgia Tech, Atlanta, GA, ekohtanen3@gatech.edu), Matteo Mazzotti (CU Boulder, CO), Massimo Ruzzene (CU Boulder, CO), and Alper Erturk (Georgia Tech, Atlanta, GA)

Guided (Lamb) waves in the human skull have received attention as a promising alternative to conventional ultrasound techniques for transcranial transmission, especially to access the brain periphery efficiently and thereby to increase the treatment envelope. We present detailed investigations of transcranial leaky Lamb waves and their radiation characteristics for degassed slices of a human skull through finite-element simulations based on microcomputed tomography scans (that account for high resolution diploë porosity) as well as rigorous experiments to extract the radiation angle dispersion spectra.

9:45

1aBAb3. Reconstruction of arrays of acoustic vortices using holograms for multiple particle trapping. Noé Jiménez (Universitat Politècnica de València, Valencia, Spain, nojigon@upv.es), Gabriela Sánchez-Rodríguez, Sergio Jiménez-Gambín, Diana Andrés, and Francisco Camarena (Universitat Politècnica de València, Valencia, Spain)

Arrays of acoustic vortices are synthesised using 3D printed holograms in the ultrasound regime. This technique paves the way for simultaneous trapping of multiple particles and such as arrays of cells, microbubbles or drug-delivery carriers using a low-cost device.

9:50

1aBAb4. Broad depth-of-field Bessel beams using acoustic holograms. Sergio Jiménez-Gambín (Universitat Politècnica de València, Valencia, Spain, serjigam@upv.es), Diana Andrés, Noé Jiménez, José M. Benlloch, and Francisco Camarena (Universitat Politècnica de València, Valencia, Spain)

Ideal Bessel beams can be useful for ultrasound imaging, biomedical ultrasound and particle manipulation. Since traditional passive methods to generate these beams are not capable of achieving a flat-intensity beam along the axial coordinate, we use acoustic holograms to produce ideal broad depth-of-field Bessel beams at zero-th and high-order topological charges.

9:55

1aBAb5. Ultrasound imaging simulations using Fullwave. Gianmarco Pinton (Joint Dept. of Biomedical Engineering, Univ. of North Carolina at Chapel Hill, NC, gia@email.unc.edu)

The latest advancements in diagnostic ultrasound imaging simulations based on the first principles of nonlinear attenuating propagation and reflection in the human body are presented.

10:00–10:15 Discussion