Adaptive Refocusing of Ultrasound Arrays Using Synthetic Aperture Imaging Data

Technology #20160018

Adaptive Image-Based Refocusing for Focused Ultrasound

An adaptive image-based refocusing algorithm uses synthetic-aperture imaging data for safe and effective focused ultrasound in imaging and treating tissue abnormalities in complex media. The refocusing technology, designed for ultrasound arrays with transmit-receive capabilities, is well-suited for any imaging array with transmit-receive capability (in particular, for large-aperture arrays capable of operating in therapeutic and imaging modes, like dual-mode ultrasound arrays (DMUAs)). The array is capable of imaging in both synthetic aperture (SA) and single-transmit focus (STF) modes, and imaging provides real-time feedback for quality refocusing. The algorithm can be implemented on any existing imaging system with software or hardware access to pre-beamformed raw element data and contains hardware features for efficient real-time adaptive refocusing as new system architecture.

Combines Synthetic Aperture and Single-Transmit Focus Echo Data

Ultrasound imaging arrays are increasingly being used in pulse-echo imaging of complex media (e.g., transcranial imaging of the brain, breast, large-aperture trans-thoracic cardiac imaging), and non-invasive high-intensity focused ultrasound may even be used for deep-brain stimulation (instead of electrical stimulation via embedded electrodes). However, bone causes beam distortions and defocusing, a major hindrance of using focused ultrasound successfully in these applications. This new adaptive refocusing method offers imaging interspersed within energy bursts/shots and combines synthetic aperture (SA) and single-transmit focus (STF) echo data and performs the optimization in multiple bands in order to maximize the focusing gain.

BENEFITS AND FEATURES:

- Imaging capability in synthetic aperture (SA) and single-transmit focus (STF) modes
- Large-aperture arrays
- Imaging arrays with transmit-receive capability

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• Enhanced ability to aim, minimized collateral damage, reduced treatment time

APPLICATIONS:

• Deep-brain stimulation
• Ultrasound imaging
• Existing imaging systems with software or hardware access to pre-beamformed raw element data
• Transcranial applications of focused ultrasound (neuromodulation, blood brain barrier)

PHASE OF DEVELOPMENT:

Preliminary animal data in rats, ex vivo human skulls. The refocusing algorithm has been demonstrated in transcranial focusing in rat brain.

Interested in Licensing?

The University relies on industry partners to scale up technologies to large enough production capacity for commercial purposes. The license is available for this technology and would be for the sale, manufacture or use of products claimed by the issued patents. Please contact Kevin Nickels to share your business needs and technical interest in this technology and if you are interested in licensing the technology for further research and development.

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