SUBJECT:

3D ultrasound imaging technology for the next generation portable scanners.

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Project Description

3D ultrasound is now widely available in top-class big cart systems. However, only 2D imaging is supported in portable/handheld scanners for Point-of-Care applications. The development of highly integrated and low-power 3D solutions is a major engineering challenge. The main goal of this work is to propose and evaluate innovative image reconstruction algorithms and signal processing solutions for the next generation portable ultrasound 3D scanners.

The objective of the research will be a development of spectral domain imaging method that would provide a solution for the technical limitations of the current 3D ultrasonography. The method ingeniously combines the benefits of well-known time domain (TD) and frequency domain (FD) imaging methods. Specifically, it is based on the FD data processing [1] to reduce 3D image reconstruction time, which results in the increased frame rate. Moreover, the method explores a plane acoustic wave transmission [2] and sub-aperture ultrasound data acquisition [3], which is typical for the TD multi-element synthetic transmit aperture method. This class of reconstruction algorithms has potential to solve the challenges of portable ultrasound scanners like: low-power consumption, limited data bandwidth, and limited computational power.

Our Lab is very well equipped with the instrumentation for real-time acquisition and processing of ultrasound data for both 2D and 3D imaging.

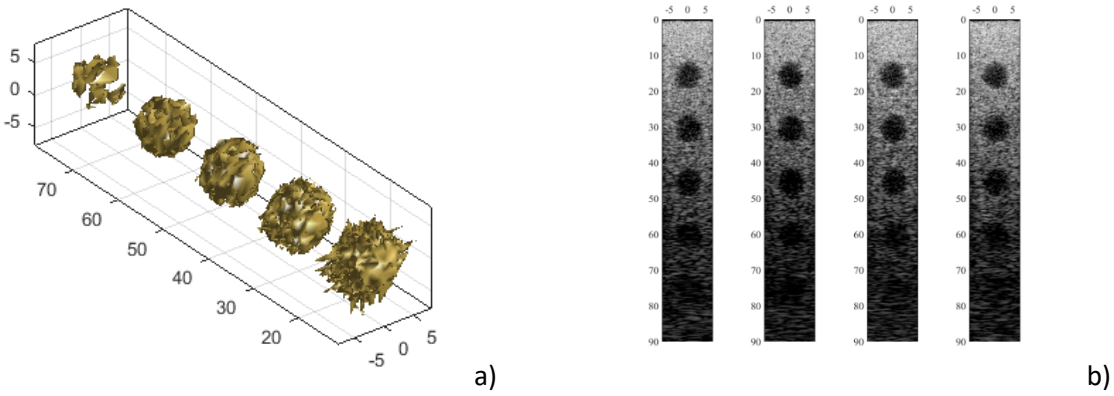

Fig 1. Reconstruction of numerically simulated acoustic data for a series of 8-mm spheres. (a) 3D visualization of scattering spheres for 64×64 elements RX sub-aperture; -30 dB isosurface is shown. (b) 2D slices of 3D anechoic spheres for (from the left to the right panels) 64×64, 32×32, 16×16 and 8×8 elements RX sub-apertures.

Bibliography

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3. Y. Tasinkevych, Z. Klimonda, M. Lewandowski, A. Nowicki, P.A. Lewin, Modified multi-element synthetic transmit aperture method for ultrasound imaging: A tissue phantom study, Ultrasonics, vol. 53, no. 2, pp. 570–579, 2013.

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