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Research Interests

The research in my group encompasses several new technologies being applied to improving the clinical value of diagnostic ultrasound. The scope of this work is best understood by considering some of my active projects.

1. 2D Arrays (funded by NIH RO1 grant)

Conventional ultrasound transducers almost always comprise a single row of (N) piezoelectric elements that are scanned to form a 2D image. In this work, we are forming an N x N element array. Our early prototypes involve the use of 32 x 32 elements. Clearly, this presents many interesting design challenges. The bulk of our design uses a sophisticated and exceptionally versatile Finite Element Analysis modeling package (PZFlex). In addition to considering piezoceramic based arrays, we are now investigating micromachined silicon transducers. Other work that is ongoing in the area of transducers involves research into high bandwidth design and in novel approaches to reducing inter-element crosstalk.

2. Mouse Heart Imaging (funded by NIH RO1 grant)

The mouse heart is less than one tenth of the linear dimension of the human heart and beats approximately ten times as fast. Therefore, the investigation of the progression of cardiovascular disease in the mouse heart (using disease models closely related to the human case) presents many interestinging challenges. This work involves the development of new transducers and innovative image processing approaches for quantifying the resultant ultrasound images.

3. Prostate Cancer (funded by UVA Mellon Institute and US Army (pending))

In this work a new approach is being employed to investigate the replacement of a conventional, but primitive, diagnostic approach (DRE) with a highly sensitive ultrasound-based approach.

4. Breast Cancer (funded by The Whitaker Foundation)

This work involves the detection of mobile suspicious lesions by detecting anomalous image motion during an ultrasound scan. It also involves innovative approaches to 3D imaging.

5. Obstructive Sleep Apnea (funded by The Carilion Biomedical Institute)

This is a small-scale project that is investigating the utility of ultrasound in the diagnosis and understanding of a condition that affects more than 12 million Americans.

For additional information about ultrasound technology at The University of Virginia, please check the Web site for the Virginia Medical Ultrasound Technology Group.

Recent Publications

Phillips LC, Klibanov AL, Bowles DK, Ragosta M, Hossack JA, Wamhoff BR
Focused in vivo Delivery of Plasmid DNA to the Porcine Vascular Wall via Intravascular Ultrasound Destruction of Microbubbles.

More Publications | Patents