

# Nonlinear Post Beamforming Filter for Imaging

IP Status: Issued US Patent; Application #: 10/143,206

## Volterra Model Post Beamforming Filter Preserves Image Detail

Ultrasound imaging using a dynamic nonlinear post-beamforming filter (e.g., based on a pthorder Volterra model) is capable of separating the linear and nonlinear components of image data (e.g., extracting the nonlinear components of the image data). The technique is applicable (but not limited) to both tissue and contrast agent nonlinearity. A system identification algorithm derives the filter coefficients. The filter based approach is capable of extracting a broad band of frequencies that allow for contrast enhancement while preserving image detail. True nonlinear interaction between these frequency components is accounted for by using a pth-order Volterra filter. The method for ultrasound imaging of matter in a region provides wave energy into the region, where the wave energy has a pulse spectrum centered at a fundamental frequency. Wave energy returned from the region is transduced to form a set of receive signals, which are beam-formed to provide data representative of at least a portion of the region. The linear and nonlinear components of the beam-formed data are separated based on a pth-order Volterra model (where p is equal to or greater than 2). The non-linear components of the beam-formed data can be processed to form an image.

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# Separates Linear and Nonlinear Components of Image Data

Most conventional ultrasound scanners create 2D tissue images, and while ultrasound wave energy is tissue is nonlinear, harmonic imaging still receives signals from tissue, limiting the specificity between contrast agent and tissue. Various improvements to ultrasound imaging for diagnostic use have been made in recent years, but even these enhancements suffer from limitations. This technology offers an improvement over existing ultrasound imaging using a dynamic nonlinear post-beamforming filter in order to separate linear and nonlinear components of image data.

# Technology ID z02093

#### Category

Engineering & Physical Sciences/Instrumentation, Sensors & Controls Life Sciences/Diagnostics & Imaging Life Sciences/Human Health Software & IT/Algorithms Agriculture & Veterinary/Veterinary Medicine

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### **BENEFITS AND FEATURES:**

- Dynamic nonlinear post-beamforming filter
- Separates linear and nonlinear components of image data
- Improves ultrasound imaging
- Beam-formed data representatives tissue region
- Applies (but is not limited) to both tissue and contrast agent nonlinearity

#### **APPLICATIONS:**

• Ultrasound imaging

#### Phase of Development - Conceptual

# **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 us 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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