# Enhanced Ultrasound Imaging

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## Technology description

Researchers at Princeton University, Department of Electrical Engineering, have proposed a method to improve ultrasound image quality.
Ultrasound operates like radar, with a probe beam sent to the object and an echo recorded. 2D and 3D images are then built up point-by-point in a scanning fashion. In many cases, however, the resulting image has poor quality. This is especially true in biomedical ultrasound, as inhomogeneity in tissue causes a variety of problems. These problems become worse with increasing probe frequency and increasing sample depth.
Currently, there are many ways of improving ultrasound image quality. For instance, Tissue Harmonic Imaging records a nonlinear signal a different frequency than that of the probe, Contrast-enhanced Ultrasound uses contrast agents (such as microbubbles) to create a nonlinear amplification, and Spatial Compounding averages signals taken at different angles. These images are taken as the final result, without regard to the basic probe-echo response of simple ultrasound. This is unfortunate, as the fundamental image contains information that the other signals do not.
The innovation consists of two parts. First, it creates an improved final image by using the fundamental signal in conjunction with the more advanced images. The method identifies relevant features and leverages the mutual information between images. Second, it uses this information as a starting point for wavefront shaping and new probe/transducer designs. Both approaches result in higher contrast, less noise, improved resolution, fewer artifacts, and more tissue-specific response.
The innovation is compatible with all existing ultrasound devices, and can improve all types of ultrasound imaging in real time.

## Application area

- Ultrasound imaging

1. Image acquisition
2. Image processing

- Medical diagnosis
- Material testing

## Advantages

- Higher contrast
- Lower noise
- Improved resolution
- Fewer artifacts
- More tissue-specific, material-specific response

## Institution

Princeton University

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