

AbstractID: 9365 Title: Encoding Ultrasound Acquisitions

Encoding methods are proposed for acquiring ultrasound images that increase the SNR without decreasing the frame rate. Composite ultrasound beams with wave-fronts directed in many directions simultaneously are used. The resulting composite returns are approximately linear combinations of the conventional returns from each individual direction so they can be solved for as combinations of the composite returns. The primary advantage of encoding is that the noise is averaged during the solution. So the SNR is increased by the square root of the number of directions forming the composite pulses with no increase in acquisition time. The increased SNR provides flexibility to improve imaging: e.g., to increase penetration or use higher frequencies improving the spatial resolution with the same penetration.

A simple example is easy to construct. A conventional acquisition sends a wave-front in each direction sequentially. To encode two directions, the directions from which the image is formed would be divided into pairs. Each pair of wave-fronts is sent out simultaneously and the returns from both directions are recorded. Then the same two wave-fronts are sent out again but one is inverted. The returns from the two individual directions can be reconstructed by taking the sum and the difference of the composite returns. The results of the conventional and encoded acquisitions are identical to the extent that the system is linear but the noise is reduced by a square root of two.