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Intelligent, Real-Time Tracking Method to Enhance Ultrasound-Based Strain and Elasticity Imaging

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Technology description

Ultrasound-based elasticity imaging is used in medicine for non-invasive analysis of tissue movement and displacement. These types of techniques determine how tissue moves in response to pressure, much like the pressing of tissue by a physician to feel differences in elasticity in the underlying structures. Because tumors often are stiffer than surrounding tissue, elasticity measurements can be used to help diagnose breast, liver or prostate cancer.

In ultrasound strain imaging, two images obtained with an ultrasound probe are analyzed to deduce the amount of displacement in the material at a number of corresponding regions. The displacement between corresponding regions is determined by identifying a multi-point region, known as a reference kernel, in the material before it is compressed. Then the reference kernel is compared to a target kernel in the material after compression.

Calculation of the displacement vectors depends on "seeds," or original points obtained by an algorithm, and the kernels associated with these points. In areas of substantial tissue displacement, an error known as "peak hopping" occurs when these seed vectors and the associated kernels are falsely matched to target kernels. UW–Madison researchers have developed a new process that combines a regularized speckle tracking algorithm and a quality-based seeding strategy. The method improves the identification of high quality seed displacement vectors by evaluating similarity and correlation of seed kernel displacement calculations as well as local continuity. This combined approach greatly reduces the risk of the selected seed kernels having peak hopping errors while preserving the benefits of a quality-based seeding strategy.

The method improves image quality and reduces image reconstruction time by using an algorithm that chooses the highest quality seeds possible with the highest probability of accuracy. Seed quality is improved by factoring in specific organs and types of transducers. As a result, noise in the reconstructed image is reduced.
The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method to produce high quality strain and elastic modulus images for diagnostic use.

Additional Information

For more information about high precision ultrasound elasticity imaging, see WARF reference number P07059US.
http://www.warf.org/technologies/summary/P07059US.cmsx

Application area

Three- or four-dimensional strain imaging
Image reconstruction software used in ultrasound imaging

Advantages

Ensures high quality seeds are given priority in image construction
Reduces image noise
Performs ten times faster than multi-grid approach alone
Reduces required computational power significantly

Institution

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