Rapid, Precise Ultrasonic Elasticity Imaging

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Technology description

Ultrasonic elastography is an ultrasound imaging technique that detects and creates images of the stiffness properties, or strain, of tissues under compression. This method can reveal disease properties not detected by conventional ultrasound.

Because estimating strain involves measuring movement, the region of interest (ROI) of a patient’ s body is scanned at least twice. Although many strain imaging techniques track motion in only one direction, tracking motion in all directions allows a larger range of motion to be tracked, resulting in strain images with higher contrast and less noise. However, tracking large motion can be difficult and time consuming. UW-Madison researchers have developed an improved method of estimating strain that overcomes these limitations by using an adaptive search strategy that uses motion estimates at one place in the image to predict the motion in the neighboring region. Predicting motion allows the size of each search region to be reduced, allowing the rapid creation of strain images.

In this method, an ROI is repeatedly scanned with an ultrasound transducer. Varying stress is applied to the ROI, and ultrasound echoes are acquired at first and second stress levels. Sets of corresponding samples from the echoes at the first and second stress levels are compared, and the displacement vector for each comparison is estimated using block matching. After displacement vectors are estimated for samples throughout the ROI, corresponding strain values that indicate the degree of elasticity of the respective portions of the tissue are estimated. The system then displays an image that shows the strain distribution within the ROI as it is stressed.
The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an improved method of estimating strain.

Application area

Ultrasonic elastography

Advantages

Allows real-time display based on lower quality block matching, along with post-processed imaging using higher quality techniques

Provides an improved contrast-to-noise ratio as compared to previous methods
Able to handle large deformations
Computational burden is relatively low
Size and location of the search region for block matching are adjustable, based on measures of the reliability of current displacement estimates.
Stress on the ROI may be positive, causing compression, or negative, causing expansion.
Because this system is based on signals that contain phase information, unlike other systems that use enveloped echo signals or rely on feature matching, displacement estimates are more precise.

Institution

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