Method and Apparatus for Acoustoelastic Extraction of Strain and Material Properties

View U.S. Patent No. 7,744,535 in PDF format.

WARF: P06115US

Inventors: Ray Vanderby, Hirohito Kobayashi

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an analysis technique that uses reflected ultrasound data from the near and far surfaces of a material to calculate both material properties and strain.

Overview

Elastography is an acoustical imaging method used to estimate the elastic properties, or stiffness, of soft tissue by assessing the tissue in different states of stress or compression. Tissue that exhibits less strain under a given amount of stress is assumed to be stiffer than tissue that exhibits more strain.

Conventional analyses of strain involve measuring the motion of tissue, and cannot determine the degree of strain without making assumptions about the material properties, including stiffness, of the tissue.

The Invention

UW-Madison researchers have developed an analysis technique that uses reflected ultrasound data from the near and far surfaces of a material, thereby including wave propagation data from when the wave passed through the tissue, to calculate both material properties and strain. When acoustic waves propagate through deformed elastic materials, characteristics such as acoustic impedance and wave velocity depend on the material properties and the magnitude of the stress. This phenomenon is known as “acoustoelasticity.” These data can be combined into acoustoelastic analyses to accurately calculate strain and material stiffness without additional information about tissue properties or loads.

Applications

- Elastography

Key Benefits

- Uses more information from the reflected ultrasound signal to allow the operator to calculate material properties and strain
- Can be implemented using the Stiffness Gradient Identification (SGI) technique, which is used for tissue type identification and enhancing ultrasound images, or the Acoustoelastic Strain Gauge (ASG) technique, which is used for evaluating in vivo strain
- Because the relationship between stiffness and strain varies from one tissue type to another, this provides another characteristic for distinguishing tissue types that would appear similar in standard or elastographic ultrasound images.
- Could be used to evaluate many types of biological and non-biological materials

Additional Information

For More Information About the Inventors

- Ray Vanderby

Related Technologies

- See WARF reference number P03347US for a method of using acoustoelasticity, rather than motion, to determine strain.

Tech Fields

- Medical Imaging : Ultrasound

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846