Thesis defense: Time reversal elastography, mechanical characterization of biological tissues by shear-wave phased array
Tuesday, October 30th, 2018
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Location: Conference room, INSERM – Cours Albert Thomas Lyon 3

Abstract

Time reversal elastography, mechanical characterization of biological tissues by shear-wave phased array

By Chadi ZEMZEMI

This thesis is in line with shear-wave elastography research led in laboratory of Therapeutic Applications of Ultrasound LabTAU.

After, a bibliographic review of shear-wave elastography by ultrasound, magnetic resonance and optic, this manuscript presents an experimental study showing that the resolution limit of all these methods is not the wavelength of shear-wave but rather the resolution of the imaging system measuring the elastic wave field.

Today, clinic elastography is based on using a single shear-wave source. The original aspect of the chapters that follow is in the use of a phased array of mechanical sources to generate and control shear waves. A time reversal mirror of six shakers shows a space-time control of shear-wave field in gelatin-graphite phantom. Compared to the use of a single source, this shear-wave phased array improves by 10dB the signal to noise ratio. This method applied on human skull model shows the possibility to deliver and control shear waves in brain using bone conduction.

Finally, the application of this method on shear-wave elastography of abdominal layers is shown by a study on synthetic model and in vivo on a healthy volunteer.