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Active and passive elastography: a medical imaging tool of elastic waves

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Elastography, sometimes referred as seismology of the human body, is an imaging modality recently implemented on medical ultrasound systems. It allows to measure shear waves within soft tissues and gives a tomography reconstruction of the shear elasticity. This elasticity map is useful for early cancer detection. A general overview of this field is given in the first part of the presentation as well as latest developments. In a second part, it is shown how the Lorentz force, resulting from density current and magnetic field within soft tissues, is used to generate shear waves. The third and last part is devoted to the application of noise correlation technique in the field of elastography. The idea, as in seismology, is to take advantage of shear waves naturally present in the human body due to muscles activities to construct shear elasticity map of the liver and the thyroid. It is thus a passive elastography approach since no shear wave sources are used.