Politecnico di Torino

Department of Electronics and Telecommunications

DET TALKS

Prof. Luis Espinosa

Université de Technologie de Tarbes

Quantitative ultrasound imaging for the diagnostic of the integrity of growing biological materials

INFO

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Sala Maxwell, DET

coffee break after the talk

ABSTRACT

Long bones and green wood are two living materials with close structural characteristics. They evolve with age and they are in constant adaption to the environmental constraints. Their mechanical properties vary in successive stages from the juvenile state to the mature state. The study of the quality of these materials to improve the management of dysfunctions is the subject of advanced research. Quantitative ultrasound techniques have been previously used to evaluate bone quality, by giving information about the bone mechanical parameters. For trees, acoustic and ultrasound non-destructive imaging methods have been recently used to analyze their inner structures without altering their condition. This study aims to conduct a theoretical, numerical and experimental joint study of these two materials, in order to propose an efficient and optimized procedure for the characterization and cross-section imaging of growing living materials such as long bones or tree trunks. First, the interaction of acoustic waves with the growing material is modeled, to analyze the phenomena of wave interaction with these complex materials. Then, in order to solve the inverse problem, the Full Waveform Inversion (FWI) method is used. The imaging method is validated using measurements from reference materials.