Asociación Argentina
de Mecánica Computacional

Mecánica Computacional Vol XXXIX, págs. 5-5 (resumen)
F.E. Dotti, M. Febbo, S.P. Machado, M. Saravia, M.A. Storti (Eds.)
Bahía Blanca, 1-4 Noviembre 2022

LEVERAGING VIBRATION AND WAVE PHENOMENA: FROM ENERGY HARVESTING AND BIOINSPIRED ROBOTICS TO METAMATERIALS AND TRANSCRANIAL ULTRASOUND

Alper Erturk[a]

[a]*George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, Georgia, USA.* *alper.erturk@me.gatech.edu; https://www.me.gatech.edu/faculty/erturk*

Keywords: Energy Harvesting; Bioinspired Robotics; Metamaterials; Transcranial Ultrasound.

Abstract. This talk will review our recent efforts on exploiting vibration and elastic/acoustic wave phenomena in emerging fields and across disciplines for various applications. The first part will discuss examples from the domain of vibration energy harvesting for small electronic components by using piezoelectric transduction in conjunction with concepts from nonlinear dynamics and fluid-structure interaction. Multifunctional scenarios will also be presented, such as combining energy harvesting and bio-inspired actuation in the same robotic platform, as well as concurrent energy harvesting and metamaterial-based vibration attenuation. In the second part, the focus will first be placed on phononic crystal-based manipulation of 2D elastic and 3D acoustic wave propagation. Specifically, in-air sound wave focusing and underwater ultrasonic wave focusing using 3D-printed phononic crystals with tailored microstructure will be summarized for applications including wireless power transfer. Then, ultrasonic power/data transfer to wireless components in metallic enclosures will be addressed along with the use of phononic crystals for crosstalk minimization via bandgap formation between the piezoelectric channels. Examples will also be given on programmable piezoelectric metamaterials with synthetic impedance circuits. Finally, the leveraging of vibrations and guided waves in the human skull will be discussed briefly for purposes ranging from high-fidelity modeling and parameter identification via vibroacoustic experiments to investigating the role and potential use of guided waves in cranial/transcranial ultrasound.