CASTS TALKS

Special Program in Applied Mathematics and Applied Mechanics

Direct Modeling of Nonlinear Acoustics Propagations in Thermovicous Media

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2016 - 10 - 05 (Wed.)
15:00 - 18:00
308, Mathematics Research Center Building (ori. New Math. Bldg.)

The study of nonlinear acoustics propagations is of great interest in of non-invasive biomedical applications regarding the diagnostic and the treatment of tissue. In particular, the focused ultrasound surgery (FUS), is a biomedical technique aimed to destroy tissue by using high-intensity finite-amplitude propagations to raise the temperature of a confined region of interest. As devices capable of producing even higher intensities are becoming available, there is a renewed interest in accurate descriptions of the nonlinear distortions. These distortions are responsible for producing higher-order harmonics that can enhance heating e
ffects. Traditionally the methods used to describe nonlinear finite-amplitude propagations are based on discrete Fourier formulations. Although their success, these methods are limited to modeling moderate-intensity propagations as higher-order harmonics will form away from the region of interest. Here we are interested in very high-intensity propagations, as we expect higher harmonics to develop ahead of the region of interest. To overcome the aforementioned limitations, a new weak nonlinear model associated with a high-order finite difference scheme is here introduced. To illustrate our proposal, a solver based on traditional WENO methods is studied using one- and two-dimensional benchmark problems of the literature.

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