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Wavelets for studing signals propagation in inhomogeneous medium

K. Terletska

Ukranian Academy of Sciences S.P. Timoshenko Institute of Mechanics (E-mail Catty@svitonline.com)

An original method for the description of the signal evolution in inhomogeneous materials is presented. Materials are considered within the framework of two-phase mixture model. A peculiarity of the proposed technique consists in using the wavelet-analysis on the base of "Mexican hat" wavelets. These wavelets are elastic wavelets, that is, they are additionally solutions of the basic system of wave equations for an elastic material. As distinct from the prior studies when initial pulses had to satisfy rather strict conditions, it is shown that initial impulse shape can be an arbitrary form (it should only admit wavelet representation and be solitary one). Representation of the solution on the base of elastic wavelets permits to reveal the influence of inhomogeneity, namely the essential dependence of the distance, on which evolution is visible, on characteristic size of material inhomogeneity, and to extend the class of the investigated initial pulses. For wavelet technique demonstration initial pulse is taken from the experiments with short-time loadings or with detonation of explosive. Obtained results can be useful in studying of the internal structure and physical properties of real medium by the acoustic probing technique.