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Observability of 1-D waves in heterogeneous and semi-discrete media. (English)

Zbl 1007.93037

Rodellar, J. (ed.) et al., Advances in structural control. Barcelona: CIMNE. 1-30 (1999).

This paper concerns the observability problem in two one-dimensional cases: the wave equation with highly oscillatory coefficients and the finite-difference space semi-discretizations of the wave equation. It is shown that (in both cases) the interaction of waves with the microstructure of the heterogeneous medium may cause some pathological behaviours of the high frequencies. In particular, the velocity of propagation of waves may tend to zero when the wavelength of the solutions has the same size as that of the microstructure and this tends to zero. Most of the results contained in the paper have been obtained by the author with *C. Castro* [C. R. Acad. Sci., Paris, Sér. I 324, No. 11, 1237-1242 (1997; Zbl 1007.93036) (see above) and SIAM J. Appl. Math. 60, No. 4, 1205-1233 (2000; Zbl 0967.34074)] and by the author with *J. A. Infante* [M2AN, Math. Model. Numer. Anal. 33, No. 2, 407-438 (1999; Zbl 0947.65101)].

For the entire collection see [Zbl 0959.00020].

Reviewer: Luis Alberto Fernandez (Santander)

MSC:

93C20 Control/observation systems governed by partial differential equations
93B07 Observability
35L05 Wave equation

Keywords:

observability; 1-D wave equation; rapidly oscillating coefficients; finite-difference approximations; microstructure; heterogeneous medium; high frequencies