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Time-domain analysis of wave propagation in micropolar elastic solids using 2-D EFIT

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ABSTRACT

This paper presents an EFIT (Elastodynamic Finite Integration Technique) formulation for 2-D micropolar elastodynamics. For the ultrasonic nondestructive testing (UT) for inhomogeneous materials, such as micropolar elastic solids, to understand the ultrasonic wave propagation behavior becomes important. The micropolar elastic solids are the microscopic inhomogeneous materials, such as concretes, bedrocks, and bones that compose the human body. In general, the classical theory of elasticity deals with homogeneous elastic solids and the microscopic inhomogeneity is not considered. Therefore, the numerical methods based on the classical theory of elasticity cannot be used to simulate wave propagation behaviors accurately, due to the microscopic inhomogeneity. In this research, we focus on the micropolar elastodynamic theory. According to the micropolar theory, three kind of waves (P, S and M-waves) having different wave velocities exist (Fukui 1992) in micropolar elastic solids, and two of them (S and M-waves) have the dispersibility in 2-D formulation. In this paper, an EFIT is proposed for 2-D micropolar elastodynamics. The EFIT is a grid-based numerical method based on the FDM (Finite Difference Method), and can easily treat the boundary conditions on the interface between different materials. Some numerical examples for wave propagation and scattering in 2-D micropolar elastodynamics are shown to validate the proposed EFIT formulation.

REFERENCES

T. Fukui and Y. Okui. (1993), "Boundary element analysis of scattering problems in two dimensional micropolar elasticity", Elsevier, 283-292.

K. Nakahata, S. Hirose, F. Schubert and B. Kohler. (2009), "Image based EFIT simulation for nondestructive ultrasonic testing of austenitic steel", Journal of solid mechanics and materials engineering, **3**(12), 1256-1262.

V. Kaliraman and R. K. Poonia. (2018), "Elastic wave propagation at imperfect boundary of micropolar elastic solid and fluid saturated porous solid half-space", Journal of solid mechanics, **10**(3), 655-671.

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