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Ultrasonic TOFD Technique for Cracks Sizing and Locating Based on PSO

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Abstract : Ultrasonic Non-destructive testing has been widely used in industry to detect, characterize and size defects in materials. In this paper, an ultrasonic testing technique and an ultrasonic signal processing method are used to size and locate flaws in materials. The ultrasonic testing technique is based on determination of the time of flight of diffracted echoes from the defect edges (time of flight diffraction TOFD). To improve the arrival time resolution of a TOFD signal, an estimation technique based on Particle Swarm Optimization (PSO) and Matching Pursuit decomposition (MP) is proposed. The finite element method (FEM), using the ABAQUS software package, is employed for modeling the TOFD technique in a two-dimensional geometry. Simulation and experimental results proved the efficiency of the proposed method.

Keywords : Ultrasonic testing, Time of flight diffraction, Wave propagation, Finite element methode, Particle Swarm Optimization, Crack