

Interactions of Lamb waves with defects in a thin metallic plate using the finite element method

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Abstract:

A Lamb waves-based technique for damage detection is one of the promising diagnostic tools due to their ease of excitation and detection along with their ability to travel long distances. However, their dispersive and multimodal nature causing complicated wave signals and data interpretation in the damage detection process. The finite element method was performed in this study to understand their behaviour when interacting with defects for a successful implementation of this technique in Structural Health Monitoring system. FEA analysis was implemented to simulate the propagation of Lamb waves in the healthy and defective aluminium plate. The sensors are placed based on the configuration of the pulse-echo and pitch-catch method. It is noticed that there is an additional wave packet for the detected signals for defective plate based on the pulse-echo method whereas there is a significant delay in signal arrival for the pitch-catch method. This simulation study shows a significant feature extraction for the interactions of Lamb waves with defects. It is helpful for a good understanding before applying this technique for a real implementation.

Keywords: Lamb Waves; Damage Detection; Finite Element Method; Structural Health Monitoring.

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