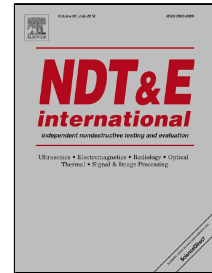


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# Quantitative Evaluation of Surface Crack Depth with a Scanning Laser Source Based on Particle Swarm Optimization-Neural Network

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## Abstract

In this study, laser-generated surface acoustic wave (SAW) interaction with surface-breaking cracks is numerically investigated to identify the relationship between crack depth and features of SAWs. The Scanning Laser Source (SLS) technique is utilized to detect and quantify cracks by monitoring the changes of the SAWs as a laser source scans over the uniform and defective area. The simulation results show that crack depth can be described by several important features of the transmitted waves and reflected waves. These features are used as inputs to a quantitative machine learning approach for crack-depth evaluation based on a Neural Network (NN) optimized with Particle Swarm Optimization (PSO) algorithm. The results show the feasibility of the proposed machine learning method to estimate the crack depth rapidly and accurately using SLS data.

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