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STATISTICAL ANALYSIS FOR PIEZO-BASED STRUCTURAL DAMAGE DETECTION USING ENHANCED NONLINEAR CRACK-WAVE INTERACTIONS

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Summary: The paper presents statistical analysis of damage index used to detect structural damage in the recently developed enhanced nonlinear crack-wave interaction technique. Considered damage detection technique combines Lamb waves propagation with nonlinear acoustics. Low-frequency excitation is used to modulate propagating Lamb waves in the presence of fatigue cracks. Analysis of these modulations is used to detect the presence of damage. This method is extremely sensitive to any nonlinearity source present in an inspected object. It is, however, also sensitive to measurement noise. Therefore, currently it is necessary to perform high number of measurements in order to minimize the influence of noise on the results. A possible solution to that problem is the use of statistical resampling techniques. This paper presents a method of measurement data resampling in order to artificially increment the population size and improve the quality of estimates.