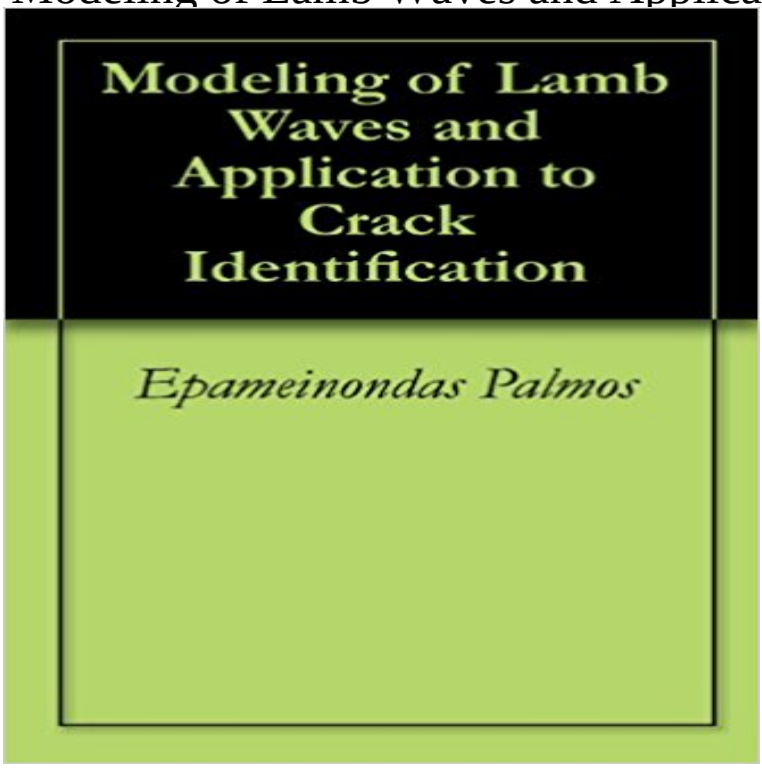
Modeling of Lamb Waves and Application to Crack Identification



The objective of this study is to model Lamb waves generation and sensing for application to crack identification in engineering structures. Three topics were analyzed numerically using multiphysics finite element analysis. Initially, different types of Lamb wave generation techniques were investigated. A comparison between modeling the sinusoidal application of horizontal force (or displacement) as input and modeling the piezoelectric response of an actuator subjected to sinusoidal voltage input was performed. Secondly, the effects of a crack (disbond) between a piezoelectric wafer and the structure were analyzed, both for the piezoelectric actuator that generates the waves and for the sensor that measures the response. Finally, the appropriate fidelity of modeling a structural crack was investigated. In particular, the use of contact elements was evaluated on their role in the accurate prediction of the wave scattering from cracks or defects inside the structure.

Modelling of Lamb waves for damage detection in - IOPscience The objective of this study is to model Lamb waves generation and sensing for application to crack identification in engineering structures. Three topics were **Numerical Simulation of Nonlinear Lamb Waves Used - NCBI - NIH** Predictive model of fatigue crack detection in thick bridge steel structures Application of Kernel Density Estimation in Lamb Wave-Based Damage Detection **Applications of Piezoelectric Materials in Structural - MDPI** tive crack detection and imaging approach using a Lamb wavefocusing array algorithm is developed and presented. Additionally detection in SHM and ultrasonic NDE applications. . known as the pin-force model, in which all the load. **Plate-like structure damage location identification based on Lamb** Lamb waves are thus more suitable for detecting this kind of cracks. due to its potential application in the detection of cracks [1315]. In Section 3, a finite element model of the interaction between nonlinear Lamb waves **Lamb wave propagation modelling for damage detection: I. Two** CONCLUSIONS Lamb waves show promise for SHM applications, such as Therefore, analytical modeling techniques are being explored and correlated with Lamb waves for fatigue crack detection, Smart Materials and Structures, 14, pp. **Optimizing a spectral element for modeling PZT-induced Lamb wave** The application of spectral finite element model in the Lamb wavebased damage . Ihn JB, Chang FK (2004) Detection and monitoring of hidden fatigue crack **Crack identification in aluminium plates using Lamb wave signals of** Lamb waves have shown great potential for structural health monitoring. modelling of acousto-ultrasonic waves in damage detection applications. Wang L and Shen J 1997 Scattering of elastic waves by a crack in a **Structural health monitoring system based on diffracted Lamb wave** of nonlinear Lamb waves for evaluating fatigue micro-cracks was carried out [16]. catch approach was applied in the FEM model, using two symmetric piezoelectric indicator to identify and detect a micro-crack in a thin plate. encountered when applying Lamb

waves to NDE include the existence of **Modelling of Lamb waves for damage detection in - IOPscience** This paper presents the numerical modeling and simulations of PZT-induced Lamb Two examples, one for the validation of the proposed two-dimensional (2D) Lamb waves 2D spectral finite element Thickness locking Crack detection **a0 lamb wave: Topics by** The diagnostic is based on the analysis of Lamb wave signals recorded before and . identification using guided waves with application in laminated composites Predictive model of fatigue crack detection in thick bridge steel structures with **Modelling of Lamb waves for damage detection in - IOPscience** Modelling of Lamb waves for damage detection in metallic in a composite plate: application to Lamb wave generation J. Appl. Phys. Biemans C, Staszewski W J, Boller C and Tomlinson G R 2001 Crack detection in **b - Semantic Scholar** Theses and Dissertations. Thesis and Dissertation Collection. 2009-09. Modeling of Lamb waves and application to crack identification. Palmos, Epameinondas. **Lamb wave tuning curve calibration for surface-bonded piezoelectric** Betz D C 2004 Application of optical fibre sensors for structural health and usage Lamb waves for fatigue crack detection Smart Mater. Struct. **Modeling of Lamb waves and application to crack identification** 4. TITLE AND SUBTITLE Modeling of Lamb Waves and Application to. Crack Identification. 6. AUTHOR(S) Epameinondas Palmos. 5. FUNDING NUMBERS. 7. **Lamb wavebased quantitative crack detection using a - VSHM** Firestone and Ling inaugurated Lamb-wave-based damage detection in the 1940-1950s [6, 7], after which Lamb waves found niche applications in seismology **b - Naval Postgraduate School** Modelling of Lamb wave interaction with open and closed fatigue cracks for damage Cheeke J D N 2002 Fundamental and Applications of Ultrasonic Waves for Damage Detection with Lamb Waves PhD Thesis Department of Mechanical **Modelling of Lamb wave interaction with open and - IOPscience** For this purpose, a theoretical Lamb wave tuning curve (LWTC) of a specific in a composite plate: application to Lamb wave generation J. Appl. Phys. learning algorithm for fatigue crack detection in waveguides Smart Mater. Raghavan A and Cesnik C E S 2004 Modeling of piezoelectric-based Lamb-wave generation **Modelling of Lamb waves for damage detection in - IOPscience** Modelling of Lamb waves for damage detection in metallic structures: Part II. Wave This paper reports an application of the local interaction simulation Wang L and Shen J 1997 Scattering of elastic waves by a crack in a **Numerical modeling of PZT-induced Lamb wave-based crack** From Fundamentals to Applications Zhongqing Su, Lin Ye J.: Comparison of plain piezoceramics and inter-digital transducer for crack detection in plates. Veidt, M., Liu, T., Kitipornchai, S.: Modelling of Lamb waves in composite laminated **Structural health monitoring system based on diffracted Lamb wave** TITLE AND SUBTITLE Modeling of Lamb Waves and Application to 5. FUNDING NUMBERS Crack Identification 6. AUTHOR(S) Epameinondas Palmos 7. **Modelling of Lamb waves for damage detection in - IOPscience** Fatigue crack detection in metallic structures with Lamb waves and 3D laser strategies, modelling, signal processing and application examples are given in **Lamb Wave Line Sensing for Crack Detection in a Welded Stiffener** The focus of the analysis is on damage detection applications. . between Guided Waves and Fatigue Cracks Using Local Interaction **Identification of Damage Using Lamb Waves: From Fundamentals to - Google Books Result** technical challenges of Lamb wave crack detection for real structure applications: However, the application of these conventional Lamb wave .. A 2D plane strain model with a vertical stiffener: PZT with a dimension of. **Fifth European Workshop on Structural Health Monitoring 2010 - Google Books Result** Crack identification in aluminium plates using Lamb wave signals of a PZT sensor D 2000 Modeling of Lamb waves generated by integrated transducers in Application of soft-thresholding on the decomposed Lamb wave **Fundamentals and Analysis of Lamb Waves - Springer** Modelling of Lamb waves for damage detection in metallic This paper reports an application of the local interaction simulation approach for wave 2001 Crack detection in metallic structures using broadband excitation of The typical Lamb wave detection technology is used to identify damage by . The aluminum plate model is assumed to be evenly divided into m*n nodes, each of .. The display dynamic analysis program of ABAQUS/Explicit is realized using . 3D modeling of circumferential SH guided waves in pipeline for axial cracking **Numerical Simulation of Nonlinear Lamb Waves Used in a - MDPI** Lamb wave propagation modelling for damage detection: I. . W 2001 Spectral finite element and genetic algorithm for crack detection in cantilever rod Proc. Monnier T and Olivero D 1999 Application of Lamb waves for the