

1. Record Nr.	UNINA9910817906403321
Autore	Stepinski Tadeusz
Titolo	Advanced structural damage detection : from theory to engineering applications // Tadeusz Stepinski, Tadeusz Uhl, Wieslaw Staszewski
Pubbl/distr/stampa	Chichester, West Sussex, U.K., : John Wiley & Sons, 2013
ISBN	9781118536124 1118536126 9781118536148 1118536142 9781118536117 1118536118
Edizione	[1st ed.]
Descrizione fisica	1 online resource (348 p.)
Classificazione	TEC009070
Altri autori (Persone)	UhlTadeusz StaszewskiW. J
Disciplina	624.1/76
Soggetti	Structural health monitoring Structural failures Materials - Testing
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Advanced Structural Damage Detection: From Theory to Engineering Applications; Copyright; Contents; List of Contributors; Preface; Acknowledgments; 1 Introduction; 1.1 Introduction; 1.2 Structural Damage and Structural Damage Detection; 1.3 SHM as an Evolutionary Step of NDT; 1.4 Interdisciplinary Nature of SHM; 1.5 Structure of SHM Systems; 1.5.1 Local SHM Methods; 1.5.2 Global SHM Methods; 1.6 Aspects Related to SHM Systems Design; 1.6.1 Design Principles; References; 2 Numerical Simulation of Elastic Wave Propagation; 2.1 Introduction; 2.2 Modelling Methods; 2.2.1 Finite Difference Method 2.2.2 Finite Element Method 2.2.3 Spectral Element Method; 2.2.4 Boundary Element Method; 2.2.5 Finite Volume Method; 2.2.6 Other Numerical Methods; 2.2.7 Time Discretization; 2.3 Hybrid and Multiscale Modelling; 2.4 The LISA Method; 2.4.1 GPU Implementation; 2.4.2 Developed GPU-Based LISA Software Package; 2.4.3 cuLISA3D Solver's Performance; 2.5 Coupling Scheme; 2.6 Damage Modelling; 2.7

Absorbing Boundary Conditions for Wave Propagation; 2.8 Conclusions; References; 3 Model Assisted Probability of Detection in Structural Health Monitoring; 3.1 Introduction; 3.2 Probability of Detection 3.3 Theoretical Aspects of POD 3.3.1 Hit/Miss Analysis; 3.3.2 Signal Response Analysis; 3.3.3 Confidence Bounds; 3.3.4 Probability of False Alarm; 3.4 From POD to MAPOD; 3.5 POD for SHM; 3.6 MAPOD of an SHM System Considering Flaw Geometry Uncertainty; 3.6.1 SHM System; 3.6.2 Simulation Framework; 3.6.3 Reliability Assessment; 3.7 Conclusions; References; 4 Nonlinear Acoustics; 4.1 Introduction; 4.2 Theoretical Background; 4.2.1 Contact Acoustics Nonlinearity; 4.2.2 Nonlinear Resonance; 4.2.3 Frequency Mixing; 4.3 Damage Detection Methods and Applications 4.3.1 Nonlinear Acoustics for Damage Detection 4.4 Conclusions; References; 5 Piezocomposite Transducers for Guided Waves; 5.1 Introduction; 5.2 Piezoelectric Transducers for Guided Waves; 5.2.1 Piezoelectric Patches; 5.2.2 Piezocomposite Based Transducers; 5.2.3 Interdigital Transducers; 5.3 Novel Type of IDT-DS Based on MFC; 5.4 Generation of Lamb Waves using Piezocomposite Transducers; 5.4.1 Numerical Simulations; 5.4.2 Experimental Verification; 5.4.3 Numerical and Experimental Results; 5.4.4 Discussion; 5.5 Lamb Wave Sensing Characteristics of the IDT-DS4; 5.5.1 Numerical Simulations 5.5.2 Experimental Verification 5.6 Conclusions; Appendix; References; 6 Electromechanical Impedance Method; 6.1 Introduction; 6.2 Theoretical Background; 6.2.1 Definition of the Electromechanical Impedance; 6.2.2 Measurement Techniques; 6.2.3 Damage Detection Algorithms; 6.3 Numerical Simulations; 6.3.1 Modelling Electromechanical Impedance with the use of FEM; 6.3.2 Uncertainty and Sensitivity Analyses; 6.3.3 Discussion; 6.4 The Developed SHM System; 6.5 Laboratory Tests; 6.5.1 Experiments Performed for Plate Structures; 6.5.2 Condition Monitoring of a Pipeline Section; 6.5.3 Discussion 6.6 Verification of the Method on Aircraft Structures

Sommario/riassunto

"Structural Health Monitoring (SHM) is the interdisciplinary engineering field devoted to the monitoring and assessment of structural health and integrity. SHM technology integrates non-destructive evaluation techniques using remote sensing and smart materials to create smart self-monitoring structures characterized by increased reliability and long life. Its applications are primarily systems with critical demands concerning performance where classical onsite assessment is both difficult and expensive. Advanced Structural Damage Detection: From Theory to Engineering Applications is written by academic experts in the field and provides students, engineers and other technical specialists with a comprehensive review of recent developments in various monitoring techniques and their applications to SHM. Contributing to an area which is the subject of intensive research and development, this book offers both theoretical principles and feasibility studies for a number of SHM techniques. Key features: Takes a multidisciplinary approach and provides a comprehensive review of main SHM techniques Presents real case studies and practical application of techniques for damage detection in different types of structures Presents a number of new/novel data processing algorithms Demonstrates real operating prototypes Advanced Structural Damage Detection: From Theory to Engineering Applications is a comprehensive reference for researchers and engineers and is a useful source of information for graduate students in mechanical and civil engineering"

--