論文 / 著書情報
Article / Book Information

題目(和文)	渦電流技術を用いた鋼製デッキの表面下亀裂検出に関する研究
Title(English)	A study on subsurface crack detection in steel decks using eddy current techniques
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出典(和文)	学位:博士(学術), 学位授与機関:東京工業大学, 報告番号:甲第12929号, 授与年月日:2024年9月20日, 学位の種別:課程博士, 審査員:佐々木 栄一,岩波 光保,千々和 伸浩,丸山 泰蔵,松﨑 裕,阿久津 絢子
Citation(English)	Degree:Doctor (Academic), Conferring organization: Tokyo Institute of Technology, Report number:甲第12929号, Conferred date:2024/9/20, Degree Type:Course doctor, Examiner:,,,,,
学位種別(和文)	博士論文
Category(English)	Doctoral Thesis
種別(和文)	要約
Type(English)	Outline

Outline of this Dissertation

Chapter 1: Introduction

Chapter One provides a comprehensive background on the prevalent issue of fatigue cracks in orthotropic steel decks, along with introductions to PECT, SFECT, phase space analysis, and optimal ECT probe configurations. This chapter also addresses the significant challenges in feature extraction within ECT and the ongoing development of ECT probe configurations aimed at enhancing the detection of deep subsurface cracks. A thorough literature review investigates each of these issues in detail. Additionally, the purpose, objectives, and outlines of the research are presented.

Chapter 2: Proposed methods for ECT feature extraction using PECT and SFECT to develop subsurface crack detection and ECT probe configuration.

Chapter two develops methods for extracting and analysing features from PECT and SFECT signals to detect subsurface cracks. It proposes a systematic approach to enhance feature extraction that improves the detection accuracy of such flaws. Additionally, it focuses on optimizing the configuration of coil-based ECT probes using these extracted features, aiming to enhance the probe's sensitivity to deeper and smaller subsurface cracks.

Chapter 3: Proposed Fusion of Features from PECT and SFECT and Study of the Coupled Effects of Crack Geometries for Enhancing Subsurface Crack Detection.

In Chapter three, the thesis introduces a novel methodology by fusing features from PECT and SFECT, aiming to enhance the detection capabilities for subsurface cracks by leveraging the strengths of both methods. This chapter also examines how different crack geometries affect ECT effectiveness, especially in critical infrastructures like steel decks, to tailor ECT applications for specific structural health monitoring requirements.

Chapter 4: Numerical Study of Phase Space Analysis Applied to ECT for Enhanced Sensitivity in Detecting Subsurface Cracks

Chapter four explores the application of phase space analysis to ECT data to enhance the sensitivity and accuracy in detecting subsurface cracks. This numerical approach is proposed to identify subtle patterns and anomalies that traditional methods might miss, with an emphasis on defining an optimal damage index for phase space that can effectively indicate the presence and severity of subsurface cracks.

Chapter 5: Experimental Study on Phase Space Analysis Applied to ECT for Detecting Artificially Induced Damage in Steel Deck Plates

Chapter five conducts experimental validations of phase space analysis using ECT on steel deck plates with artificially induced damage to confirm the method's robustness and precision. This chapter aims to bridge theoretical studies and practical application, verifying the proposed damage index, CPST, and further exploring the use of phase space analysis in conjunction with PECT and SFECT for practical subsurface crack detection.

Chapter 6: Conclusions and Future Works

Conclusions of this dissertation are stated, and future works are discussed.