

ABSTRACT

Title of Document: THE HILBERT-HUANG TRANSFORM
FOR DAMAGE DETECTION IN PLATE
STRUCTURES

Arnaud I. Zemmour, Master of Science, 2006

Directed By: Professor Darryll Pines
Department of Aerospace Engineering

This thesis investigates the detection of structural damage in plate structures using the empirical mode decomposition method along with the Hilbert spectral analysis. In recent years there have been an extensive amount of research associated with the development of health monitoring methods for aerospace systems, such as aging aircraft and Health and Usage Monitoring Systems (HUMS) for rotorcraft. The method developed here exploits a new time-frequency signal processing analysis tool, the Hilbert-Huang transform, along with the Lamb wave propagation for thin plates. With the use of the wave reflections from discontinuities, damage identification methods were developed to determine the presence, location and extent of damage in isotropic and composite plate structures.

The ability of the empirical mode decomposition to extract embedded oscillations, to reveal hidden reflections in the data and to provide a high-resolution energy-time-frequency spectrum is used to describe the Lamb waves interactions with various damaged regions.

THE HILBERT-HUANG TRANSFORM FOR DAMAGE DETECTION IN PLATE
STRUCTURES

By

Arnaud I. Zemmour

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Advisory Committee:
Professor Darryll Pines, Chair
Professor Sung Lee
Professor Norman Wereley

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Dedication

To my parents and my brother Nicolas

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