Cairo University

DAMAGE DETECTION OF BEAMS USING WAVELET TRANSFORM

By

Eng. Sara Abdel Aziz Ibrahim Selmy

A Thesis submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Philosophy
in
Structural Engineering

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Under The Supervision
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Title of Thesis: Damage Detection of Beams Using Wavelet Transform

Keywords: Damage detection, beams, wavelet transform, fundamental mode shape, numerical studies and experimental work

Summary:

This research studies the detection of damages in beams using wavelet transform method. The damage detection is done through two steps. First, detecting the damage location is indicated by either the continuous wavelet transform or the discrete wavelet transform. Second, the damage severity is calculated by a proposed equation which depends on the detail wavelet coefficients. Four finite element beam models (fixed-fixed, hinged-hinged, cantilever, two spans) are studied. Two proposed procedures are used for localizing the damage which is based on the fundamental mode shapes. Some aspects that effect the assessment of damage detection such as wavelet family, signal to noise ratio (SNR) and no. of sensors are studied.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Date:

Signature:

Dedication

I would like to express my deepest gratitude to **my family**: ***Father Prof. Dr.*** *Abdel Aziz Selmy (Zagazig University, Faculty of Engineering)**, Brother Dr.*** *Hossam, **Husband Eng.** Waleed, **Mother** and my lovely **Sons** (Ahmed, Mohammed and Mostafa)* for their encouraging and continuous support to me to complete this work over so many years.

Your encouragements have been greatly appreciating

Acknowledgments

First of all, the most gratitude to ALLAH who has guided me to complete this work. Secondly, I would like to express my sincerest gratitude to my advisors, ***Prof. Dr. Sherif Mourad*** *and* ***Prof. Dr. Atef Eraky*** for giving me this opportunity to finish my thesis under their supervision. Their continuous technical and moral support throughout the work has helped me a lot in this thesis. Without their guidance, support and patience I would not have been able to reach this stage.

Also, I want to thank ***Dr. Ahmed Desoki*** as my advisor. His greet help to make the experimental work. Also, I want to express my sincere gratitude to the moderators of the structural dynamics laboratory at Aerospace Engineering Department, Cairo University for their great support to this research.

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