Accepted Manuscript

Wavelet transformation induced multi-time scaling (WATMUS) model for coupled transient electro-magnetic and structural dynamics finite element analysis

Reza Yaghmaie, Shu Guo, Somnath Ghosh

PII: S0045-7825(16)30009-3
DOI: http://dx.doi.org/10.1016/j.cma.2016.01.016
Reference: CMA 10825

To appear in: *Comput. Methods Appl. Mech. Engrg.*

Received date: 7 July 2015
Revised date: 9 January 2016
Accepted date: 21 January 2016

Please cite this article as: R. Yaghmaie, S. Guo, S. Ghosh, Wavelet transformation induced multi-time scaling (WATMUS) model for coupled transient electro-magnetic and structural dynamics finite element analysis, *Comput. Methods Appl. Mech. Engrg.* (2016), http://dx.doi.org/10.1016/j.cma.2016.01.016

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

*Manuscript
Click here to download Manuscript: yagh-guo-ghosh_revised.pdf
Click here to view linked Referenc

Wavelet transformation induced multi-time scaling (WATMUS) model for coupled transient electro-magnetic and structural dynamics finite element analysis

Reza Yaghmaie[a,1], Shu Guo[a,1], Somnath Ghosh [a,2,]

[a]*Department of Civil and Mechanical Engineering, Johns Hopkins University, 3400 N. Charles Street, Baltimore, MD 21218*

Abstract

Multi-functional devices that integrate electromagnetic and mechanical fields are gaining importance in a wide variety of applications. The combined mechanical and electromagnetic regimes, encompassed in these structures, make it necessary to develop e ective multi-physics analysis tools at a range of temporal scales. An important consideration is that the di erent fields governing multi-physics response may have large frequency discrepancies, e.g. the ultra-high electromagnetic frequencies and moderate vibration frequencies. Computational analyses of these discrepant frequency problems using conventional time integration schemes can become intractable. This paper develops a framework for coupling transient electromagnetic and dynamic fields to predict the evolution of electric and magnetic fields and their fluxes in a vibrating substrate undergoing finite deformation. It addresses the issue of time integration with large frequency ratios, by introducing a novel wavelet transformation induced multi-time scaling (WATMUS) method in the finite element framework. The method significantly enhances the computational e ciency in comparison with conventional single time scale integration methods. An adaptive enhancement of WATMUS scheme allows for the optimal wavelet bases in the transformation and integration step sizes. The accuracy and e ciency of the proposed WATMUS scheme is verified by comparing

Corresponding author: Tel: 1-410-516-7833; fax: 1-410-516-7473
Email address: (Somnath Ghosh)
[1]Graduate Research Associate
[2]M. G. Callas Professor

Download English Version:

https://daneshyari.com/en/article/6916355

Download Persian Version:

https://daneshyari.com/article/6916355

Daneshyari.com