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Mathematical and Computational Methods in Science and Engineering

Proceedings of the 16th International Conference on Mathematical and Computational Methods in Science and Engineering (MACMESE '14)

Kuala Lumpur, Malaysia, April 23-25, 2014

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Preface

This year the 16th International Conference on Mathematical and Computational Methods in Science and Engineering (MACMESE '14) was held in Kuala Lumpur, Malaysia, April 23-25, 2014. The conference provided a platform to discuss mathematical methods and computational techniques in mechanical engineering, civil engineering, environmental science and engineering, chemistry, material science etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

Conferences such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

Application of Iterative Momentum-Time Element to Nonlinear Dynamics

Professor J. D. Yau
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Abstract: The objective of this study is to present an iterative momentum-time element for nonlinear dynamic analysis of structures. Based on the temporal discretization of time finite element approximation and the principle of momentum, the momentum-time element was developed. Since the moment-time element has an accuracy of fourth order, large time steps are allowed to compute dynamic response of nonlinear dynamic systems using the present algorithm. On the other hand, this technique requires only displacements and velocities to be made available at the start of the current time step for integration in state space, the errors caused by estimation of acceleration by previous finite-difference methods are circumvented. Moreover, using the momentum principle can smooth out the load discontinuity in a time interval so that the proposed momentum-time element is available to the problem of discontinuity caused by impulsive loads. To resolve the nonlinear dynamic system, an iterative procedure is included in the momentum-time element for each time step, involving the three phases of predictor, corrector, and error-checking. The effectiveness and robustness of the proposed algorithm in solving nonlinear dynamic problems is demonstrated in the numerical examples.

Brief Biography of the Speaker: Dr. J. D. Yau got his Ph.D. from National Taiwan University (NTU) in 1996. After serving as a chair-engineer at the Kuan-Tech Engineering Consultants Co. at Taichung in Taiwan (1997-1999), he joined the faculty at TamKang University (1999) where he has served as Assistant Professor (1999-2003), Associate Professor (2003-09), and Chair (2004-2007) in the Department of Architecture and Building Technology. In 2010, Dr. Yau became a Professor of Tamkang University, and an Adjunct Professor of Zhejiang University (2011-2013), a Visiting Professor of East China Jiao Tong University in China (2011-2014). He is also a Managing Supervisor of the Chinese Taiwan Association of Wind Engineering (CTAWE, 2012-2014). Dr. Yau has published over 60 referred journal papers and articles. His research area of interest is centered on:
1. Momentum-time element for structural dynamics
2. Maglev dynamics of vehicle/guideway interaction
3. Vibration problems of high speed rails

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