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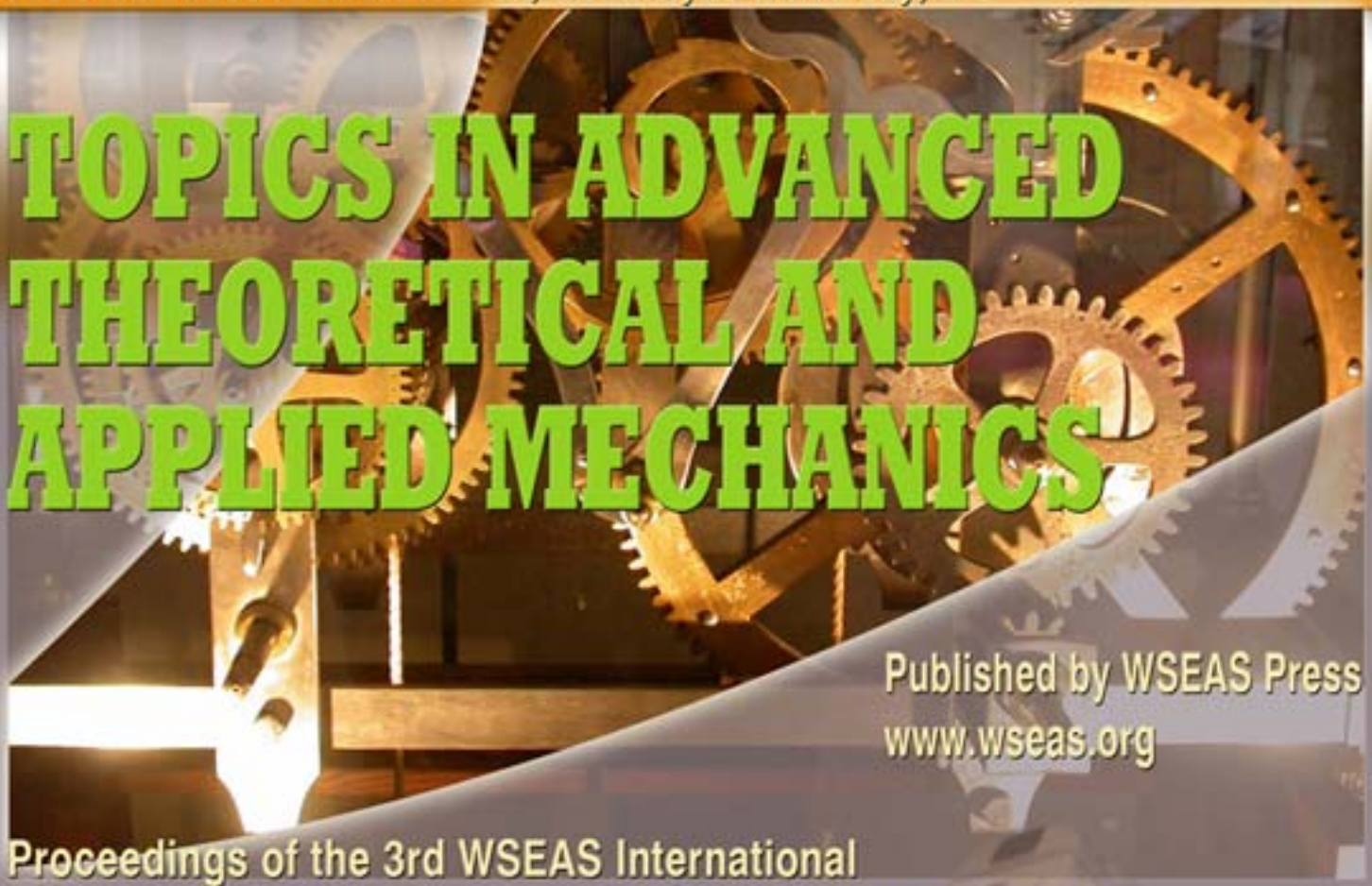

TOPICS IN ADVANCED THEORETICAL AND APPLIED MECHANICS

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Proceedings of the 3rd WSEAS International Conference on APPLIED and THEORETICAL MECHANICS (MECHANICS '07)

Mathematics and Computers in Science and Engineering
A Series of Reference Books and Textbooks

Puerto De La Cruz, Tenerife, Canary Islands, Spain,
December 14-16, 2007

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Preface

The book you are currently holding contains the Proceedings of the 3rd WSEAS International Conference on APPLIED and THEORETICAL MECHANICS (MECHANICS'07) which was held in Puerto De La Cruz, Tenerife, Canary Islands, Spain, December 14-16, 2007

Mechanics is an "old science" with great history and with impact in all the other scientists. However, nowadays Mechanics is one of the most important and modern disciplines. New theories, new theoretical problems together with several modern fascinating applications in Eleasticity, Plasticity, Fracture, and Damage Mechanics, Mechanics of Nanomaterials, Fluid-Structure Interaction, Geomechanics and Mechanics of Granular Materials, Damage Identification and Non Destructive Evaluation (NDE), Micro Electromechanically Systems, Transport Phenomena in Micro/Nanoscale, Biomechanics and Biomaterials, Aerodynamics and Aeroelasticity, Advanced Materials and Smart Structures, Heat and Mass Transfer, Flows in Porous Media, Mechatronics etc is now of fundamental importance to our civilization.

The WSEAS Working Group on Mechanics initiated several conferences on Applied and Theoretical Mechanics during last years. Also, the WSEAS WG on Mechanics sponsors the conference: CONTINUUM MECHANICS, that will be organized in the famous University of Cambridge (UK) in February of 2008 and also in February of 2009. You are invited to contribute to these events. For those that their research is more applied, we strongly recommend: the conference on ENGINEERING MECHANICS, STRUCTURES, ENGINEERING GEOLOGY (EMESEG '08) Crete Island, Greece, July 22-24, 2008 www.wseas.org/conferences/2008/greece/emeseg

Some other conferences on Fluid Mechanics, Aerodynamics, Heat and Mass Transfer can be found on the WSEAS Site: www.wseas.org

The Plenary Speeches of MECHANICS'07 were:

Upon modeling and testing of hand-arm system vibrations in the view of professional diseases prevention A systematic approach

Professor Simona Lache
University Transilvania of Brasov
Faculty of Mechanical Engineering
Dept. of Precision Mechanics and Mechatronics
29 B-dul Eroilor, 500036 Brasov, Romania

Abstract: The paper presents the systematic approach regarding the modeling and testing methods used for hand-arm system vibrations in the view of professional diseases prevention. It aims to evaluating preventive strategies to reduce worker exposures to hand-arm transmitted vibration and to decrease the occurrence of Hand-Arm Vibration Syndrome (HAVS) in workers.
Special emphasis is given to preventive measures and to the transfer of knowledge from the research results to tool manufacturers, and occupational health physicians in

fields related to medical, ergonomic, testing, engineering and legal aspects of HAVS. Due to the importance of the subject, the European Directive 2002/44/EC has been implemented into the national legislation of Member States.

Brief Biography of the Speaker:
Born at Targu Mures, Romania, in February 9, 1968. Gratuate of Transilvania University of Brasov, Faculty of Mechanics, Precision Mechanics specialization, in 1991. Master in Energy Management and Mechanical Engineering, Technical University of Cluj-Napoca, in 1994-1995. Specialization stage in structural dynamics at Katholieke Universiteit Leuven, Belgium, in 1995. PhD in Engineering Sciences – Mechanical Engineering, since 2001.
Presently, professor at Transilvania University of Brasov, Department of Precision Mechanics and Mechatronics (B-dul Eroilor No. 29, 500036, Brasov, Romania, tel./fax: +40 268 413921, e-mail: slache@unitbv.ro).
Research fields of interest: Structural Dynamics, Modeling and Analysis of Mechanical and Mechatronic Systems, Flexible Manufacturing Systems.
Author/ co-author of 96 scientific papers, published in scientific journals and/or presented at international/ national conferences. Coordinator/ member of the executive team of over 20 research and education grants, at European/ national level. Author/ co-author of 4 books published in Romania. Expert Evaluator of research grants and study programs, at national level.

Application of boundary element method to mixed boundary-value problems of linear elastostatics

Professor Necla Kadioglu
Division of Mechanics, Civil Engineeering Department
Faculty of Civil Engineeering
Istanbul Technical University
TURKEY

Abstract: In this lecture, a summary will be introduced to solve the plane problems of linear elasticity by reciprocal theorem for linear elastic materials. This method gives an integral equation which will be solved numerically. This integral equation is the starting point of the boundary element method. Here, both first boundary value problems and mixed boundary value problems will be considered. Instead of classical application of reciprocal theorem, and artificial boundary will be defined to eliminate the singularities of the integral equation. Besides, an algorithm is added to calculate multi-valued arctan function which arises during the integration of the kernels of the integral equation mentioned above. The solution of a first boundary-value problem with a multiply connected region has also been explained using this method. The main goal is to calculate the unknowns of the problem on the boundary. For a first boundary-value problem these unknowns are the displacement components on the boundary. For a mixed boundaryvalue problem, unknowns are the displacements components one part of the boundary and surface traction components on a second part of the boundary. After finding boundary values for any problem the inner values of displacement and stress components can be calculated using reciprocal theorem without any singularity problem. But, to find the unknown stress component is also possible with some restrictions on the boundary.

Brief Biography of the Speaker:
Employment Record
1986 - Assoc. Prof., Istanbul Technical University, Dept. Civil Engineering
1985 - 1986 Assist. Prof., Istanbul Technical University, Dept. Civil Engineering
1967 - 1982 Teaching Assist., Istanbul Technical University, Dept. Civil Engineering
Education
M.Sc. : Istanbul Technical University
Ph.D. : Istanbul Technical University
Post-Doc. : Winconsin University
Research Interest
Boundary Element Method, Elastodynamics, Elasticity, Linear Viscoelasticity, Fluid Mechanics, Dynamic Reciprocal Theorem

Control Solutions against Nonlinearities and Uncertainties in MEMS

Professor Ahmet Kuzu
TUBITAK (Turkish Scientific and Technological Research Council)
MAM (Maramara Research Center)
BTE (Institute of Information Technologies)
TURKEY

Abstract: In this paper, a summary of nonlinearities and uncertainties common in most MEMS systems is discussed and control solutions are suggested against such problems. MEMS structures have some nonlinearities because of the nature of electrostatic force, couloumb friction and elasticity. Moreover, MEMS processes also include high tolerances which cause high uncertainties in structural parameters, such as dimension of beams, and physical parameters, such as viscosity friction coefficients, which all affect system response. Hence, robust control techniques, i.e. sliding mode control and nonlinear H-inf control, could be quite effective in the control of MEMS devices, by providing rejection against matched nonlinearities and uncertainties. In this study, firstly nonlinearity sources and tolerance effects in MEMS are discussed. Next, the system performance with classical control techniques is studied. Finally, several robust nonlinear techniques are developed to this aim, and system performance under robust methods are compared with that obtained with classical control methods.

Brief Biography of the Speaker:
Ahmet Kuzu has received his B.Sc. degree in electronics and telecommunication engineering in 2003, M,Sc. Degree in mechatronic engineering in 2006 from Istanbul Technical University, and has been a Ph.D candidate in electrical and control engineering at the same university. He is a Senior Researcher at Turkish Scientific and Technological Research Council, where he has worked since 2004.
His research interests are design and control of multidisciplinary systems such as MEMS, NEMS, avionics and biomedical systems. He has authored 8 journal and conference and 3 patent and utility model application. He is PI to several government funded research grants.

Scaled boundary finite element method and soil-structure interaction: coupled consolidation dynamic analysis of fully saturated soils

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Director of the Undergraduate Studies
Architectural Engineering Programme Manager
Department of Civil Engineering,
Strathclyde University,
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United Kingdom

Abstract: Biot's three-dimensional (3D) coupled consolidation theory can be incorporated into the scaled boundary finite element method to enable dynamic soil-structure interaction in fully saturated poroelastic media to be modelled. The detailed formulation governing the general 3D time-dependent soil-structure interaction case is considered for both bounded and unbounded media, in static and dynamic situations.

We would like to thank all members of the organizing laboratories for their contribution to the organization of the conference.
The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: www.worldses.org/indexes.

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in these conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal).

We cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

The Editors

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