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Recent Advances in Mathematical and Computational Methods

Proceedings of the 17th International Conference on Mathematical and Computational Methods in Science and Engineering (MACMESE '15)

Kuala Lumpur, Malaysia, April 23-25, 2015

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Preface

This year the 17th International Conference on Mathematical and Computational Methods in Science and Engineering (MACMESE '15) was held in Kuala Lumpur, Malaysia, April 23-25, 2015. The conference provided a platform to discuss mathematical methods and computational techniques or applications of known mathematical methods and computational techniques 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 conferences 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

Signaling Problem of Wave Evolution

Professor Edi Cahyono
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Abstract: We consider surface wave evolution. At an initial point the wave profile is given as a prescribed signal. For practical needs in hydrodynamics laboratories, the waves are usually measured downstream at several points. In the case of traveling waves, the signals downstream are merely translated temporally from the ones at the initial points. In general, this does not occur. Waves may provide much different signal profiles at different points.
We focus on waves governed by a KdV type equation. We present the changes of the wave profiles at several points. The waves which are the solutions of KdV type equation are computed analytically by applying perturbation method. The solution is in a series expansion of two parameters, i. e. amplitude and frequency difference. We show that these parameters are responsible for the profile change of the solution at several points. The profile change is mainly due to the so-called side band interactions.

Brief Biography of the Speaker: He was awarded a Doctor in Applied Analysis and Mathematical Physics University of Twente, the Netherlands in 2002. Upon completion of his PhD degree, he was appointed as a Lecturer in the Department of Mathematics, Universitas Halu Oleo, Kendari Indonesia. In 2010 he was promoted to Professor of Industrial and Applied Mathematics. His main research areas are focused on Partial Differential Equations and applications. For the case of diffusion equation, he has applied it for modeling of wood drying in an industry. Currently, he has been working on the relation of fundamental solution type with temporal probability density function of stock, currency and index dynamics.

Plenary Lecture 2

Several Equivalent Relations about Variational Inequality Problems

Professor Zili Wu
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Xi'an Jiaotong-Liverpool University
CHINA
E-mail: ziliwu@email.com

Abstract: We consider equivalent relations between the Gateaux differentiabilities of two gap functions of variational inequality problems. Some equivalent conditions for their locally Lipschitz property are also presented. Equivalent condition for the relevant mapping to be pseudomonotone+ on relevant solutions sets are obtained. Based on the above results, we characterize the weak sharpness of the solutions of variational inequality problems in terms of error bounds of two gap functions. Furthermore we show that some algorithms for solving variational inequality problems possess finite convergence property.

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Plenary Lecture 3

Big Data Algebra: A Rigorous Approach to Big Data Analytics and Engineering

Professor Yingxu Wang
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Abstract: Data are an abstract representation of the quantity of real-world entities and mental objects. Big data are extremely large-scaled heterogeneous data in terms of quantity, complexity, semantics, distribution, and processing costs in computer science, information science, cognitive informatics, web-based computing, cloud computing, and computational intelligence. Big data science studies the properties, theories, mathematical means, and methodologies of big data. Big data engineering is systematical analytic technologies for efficiently dealing with the inherent complexity and exponentially increasing demands in big data representation, acquisition, storage, organization, manipulation, searching, retrieval, distribution, standardization, consistency, and security.
This keynote lecture presents a big data algebra as a novel denotational mathematics for formal big data analytics in big data science and engineering. The cognitive foundations of data, information, knowledge, and intelligence are explored. A mathematical model of big data is formally introduced. Based on it, a set of algebraic operators on formal big data models, such as the formal big data analysis, inference, mining, induction, and fusion operators, is rigorously elaborated. This leads to the algebra for big data modeling, analyses, mining, information elicitation, knowledge representation, and intelligence inference. A wide range of applications of big data algebra are identified in the contemporary fields of big data science/engineering, cognitive informatics, knowledge mining, neurocomputing, human memory mechanisms, cognitive computing, machine learning, semantic computing, cognitive linguistics, cognitive systems, computational intelligence, artificial intelligence, cloud computing, and intelligent systems.

Brief Biography of the Speaker: Yingxu Wang is professor of cognitive computing, brain science, and denotational mathematics, President of International Institute of Cognitive Informatics and Cognitive Computing (ICIC, http://www.ucalgary.ca/icic/) at the University of Calgary. He is a Fellow of ICIC, a Fellow of WIF (UK), a P.Eng of Canada, and a Senior Member of IEEE and ACM. He received a PhD in computer science from the Nottingham Trent University, UK. He was visiting professors (on sabbatical leave) at Oxford University (1995), Stanford University (2008), UC Berkeley (2008), and MIT (2012), respectively. He is the founder and steering committee chair of the annual IEEE International Conference on Cognitive Informatics and Cognitive Computing (ICCI*CC) since 2002. He is founding Editor-in-Chief of Int. Journal of Cognitive Informatics & Natural Intelligence (IJCINI), founding Editor-in-Chief of Int. Journal of Software Science & Computational Intelligence (IJSSCI), Associate Editor of IEEE Trans. on SMC (Systems), and Editor-in-Chief of Journal of Advanced Mathematics & Applications (JAMA). Dr. Wang is the initiator of a few cutting-edge research fields such as cognitive informatics, denotational mathematics (concept algebra, process algebra, system algebra, semantic algebra, and inference algebra), abstract intelligence (αI), cognitive computing, cognitive learning engines, cognitive knowledge base theory, and basic studies in software science, neuroinformatics, fuzzy mathematics, cognitive linguistics, and computational intelligence. He has published 400+ peer reviewed papers and 28 books in cognitive informatics, denotational mathematics, cognitive computing, software science, and computational intelligence. He is the recipient of dozens international awards on academic leadership, outstanding contributions, best papers, and teaching in the last three decades.

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