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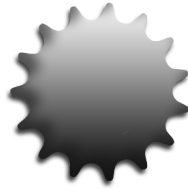
***Recent Advances in  
Mechanical Engineering***

- ***Proceedings of the 5<sup>th</sup> European Conference of  
Mechanical Engineering (ECME '14)***

***Florence, Italy, November 22-24, 2014***

- ***Proceedings of the 5<sup>th</sup> International Conference on  
Fluid Mechanics and Heat & Mass Transfer (FLUIDSHEAT '14)***

***Lisbon, Portugal, October 30 - November 1, 2014***



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Published by WSEAS Press  
[www.wseas.org](http://www.wseas.org)

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All papers of the present volume were peer reviewed by no less than two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.

ISSN: 2227-4596  
ISBN: 978-960-474-402-2

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## Plenary Lecture 1

### Versatile Intelligent Portable Rescue Robot Platform through the Adaptive Networked Control



#### Professor Luige Vladareanu

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**Abstract:** Intelligent heterogeneous robot networks, remotely controlled by humans, do have an increasingly important role in hazardous and challenging environments, where human lives might be at risk. This is in fact the challenge of developing autonomous systems perceptive to human requirements and having the ability of continuous learning, adapting and improving in “real world” complex environments, so as to provide support in natural disasters, fires, or other calamities. The paper presents a VIPRO versatile, intelligent and mobile platform for robots, using an original virtual projection method which involves the representation of modern mobile robots in a 3D virtual environment using a strong robotic simulator, an open architecture system and adaptive networks over the classical control system of the robot, developing intelligent control interfaces that use advanced control technologies adapted to the robot environment such as extended control (Extenics), neutrosophic control, human adaptive mechatronics. The VIPRO innovative platform is competitive with other similar virtual application platforms CDA, CAM, CAE, Solid Works or MatLab, Simulink, COMSOL, Lab View, but in addition to these platforms, it allows researchers to design, test, and experiment intelligent, real time control methods integrating classical control systems in robot modelling and simulation. The obtained results lead to the conclusion that the VIPRO platform is to be integrated on the IT market as a new component alongside the existing ones, allowing a correct evaluation of robot behaviours in hazardous or challenging environments and high level real-time simulation in order to correctly model interactions among the robots and between the robots and the environment.

**Brief Biography of the Speaker:** Luige Vladareanu received Ph.D. degree in electronics field from the Institute of Solid Mechanics of Romanian Academy, in 1998. From 2003, Ministry of Education and Research, executive Department for Financing Superior Education and of Scientific University Research - High Level Expert Consulting for MEC/CNCSIS project, from 2003-2005, member of Engineering Science Committee of Romanian National Research Council, from 2005, Scientific Researcher Gr.I (Professor) of Romanian Academy, from 2009 Head of Robotics and Mechatronics Department of Institute of Solid Mechanics, Romanian Academy. His scientific work is focused on real time control in solid mechanics applied in robot trajectory control, hybrid position – force control, multi-microprocessor systems for robot control, acquisition and processing of experimental physical data, experimental methods and signal processing, nano-micro manipulators, semi-active control of mechanical system vibrations, semi-active control of magnetorheological dissipaters systems, complex industrial automations with programmable logical controllers in distributed and decentralized structure. He has published over 35 books and book chapters, 11 edited books, over 200 papers in journals, proceedings and conferences in the areas. Director and coordinator of over 15 grants of international and national research – development programs in the last 5 years, 15 invention patents, developing 17 advanced work methods resulting from applicative research activities and more than 60 research projects. He is the winner of the two Prize and Gold of Excellence in Research 2000, SIR 2000, of the Romanian Government and the Agency for Science, Technology and Innovation. 9 International Invention and Innovation Competition Awards and Gold of World’s Exhibition of Inventions, Geneva 2007 - 2009, and other 9 International Invention Awards and Gold of the Brussels, Zagreb, Bucharest International Exhibition. He received “Traian Vuia” (2006) award of the Romanian Academy, Romania’s highest scientific research forum, for a group of scientific papers published in the real time control in the solid mechanics. He is a Corresponding Member of the American Romanian Academy and he is a member of the International Institute of Acoustics and Vibration (IIAV), Auburn University, USA (2006), ABI’s Research Board of Advisors, American Biographical Institute (2006), World Scientific and Engineering Academy Society, WSEAS (2005), International Association for Modelling and Simulation Techniques in Enterprises - AMSE, France (2004), National Research Council from Romania (2003-2005), etc. He is a PhD advisor in the field of mechanical engineering at the Romanian Academy. He was an organizer of several international conferences such as the General Chair of four WSEAS International Conferences (<http://www.wseas.org/conferences/>

2008/romania/amta/index.html), chaired Plenary Lectures to Houston 2009, Harvard, Boston 2010 and Penang, Malaysia 2010, Paris 2011 to the WSEAS International Conferences, is team leader of WSEAS scientific research project: Mechanics & Robotics Systems and is serving on various other conferences and academic societies.

## Plenary Lecture 2

### New Models for Wave Energy and Intensive Steel Quenching Processes as Direct and Time Reverse Problems for Non-Homogeneous Hyperbolic Equation



**Professor Andris Buikis**  
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Institute of Mathematics and Computer Science  
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**Abstract:** Intensive quenching processes are one of important branches of modern metallurgical technologies. In new, ecologically clean steel quenching processes important aspect is the heat exchange with the surrounding cold water. In 2005 we proposed the hyperbolic heat equation as mathematical model for intensive steel quenching process.

The idea of the usage of hyperbolic heat equation can be easily transferred to completely different sector of application - to the generation of electricity in sea or ocean by usage of wave energy. It is important to note, that other authors examine the development of the system in time, describing the equipment with ordinary differential equation. Here we describe the equipment in development of both - in time as well as in spatial arrangement of equipment using the three-dimensional hyperbolic heat equation.

In several papers during 2005-2008 we have developed some approaches (Green function method, original conservative averaging method) for the solving the time reverse problems for the parabolic part of the hyperbolic heat equation.

In this lecture we develop some new ideas for the solution of time reverse problems for the non-homogeneous hyperbolic heat equation. We consider one dimensional, two-dimensional and three-dimensional statement for non-homogeneous equation with non-homogeneous boundary conditions. Such statements allow constructing mathematical models for wave power plants in connection with other equipment, for example, with wind power. Boundary conditions could be different types, thus allowing us to use Green function method. We have been able to generalize the Green's function method to areas, which consist of several canonical connected sub-areas. They lead us to well-posed statements for determination of initial heat fluxes instead of ill-posed statements in our previous papers.

**Brief Biography of the Speaker:** Andris Buikis received the M.S. in numerical mathematics from University of Latvia (Faculty of Physics and Mathematics) in 1963 and Dr.math. (Candidate of Science in former USSR), University of Latvia, 1970. He was Junior Researcher, Senior Researcher, Computing Centre, University of Latvia, 1962 – 1972. Assistant Professor and Head of Chair of Applied Mathematics, 1972 – 1976 and Head of Chair of Differential Equations and Numerical Methods, Faculty of Physics and Mathematics, University of Latvia, 1976 – 1984. Dr.habil.math. (Doctor of Science in former USSR), University of Kasan, Russia, 1988. Professor, University of Latvia, 1991. Director, Institute of Mathematics, Latvian Academy of Sciences and Latvian University, 1991 - 1996; 2003 – 2006 and Director, Science and Dialogue Centre of Latvia, 1993 -2007. Head of Laboratory of Mathematical Technologies, Institute of Mathematics and Computer Science, University of Latvia 2006-2010.

In 2010 he was elected as Member of Saeima (Latvian Parliament). Full Member, Latvian Academy of Sciences, 1997. Member, Senate of the Latvian Academy of Sciences, 1994 –2012. The Latvian Academy of Sciences Piers Bohl Prize for a cycle of papers "Method of Conservative Averaging, Theory and Applications", 2005. Member of Editorial Advisory Board, Journal Mathematical Modelling and Analysis (The Baltic Journal on Mathematical Applications, Numerical Analysis and Differential Equations), Lithuania 1999- and Associate Editor of WSEAS Transactions in Heat and Mass Transfer 2007-

<http://scholar.google.com/citations?user=PtoIBY4AAAAJ&hl=en>