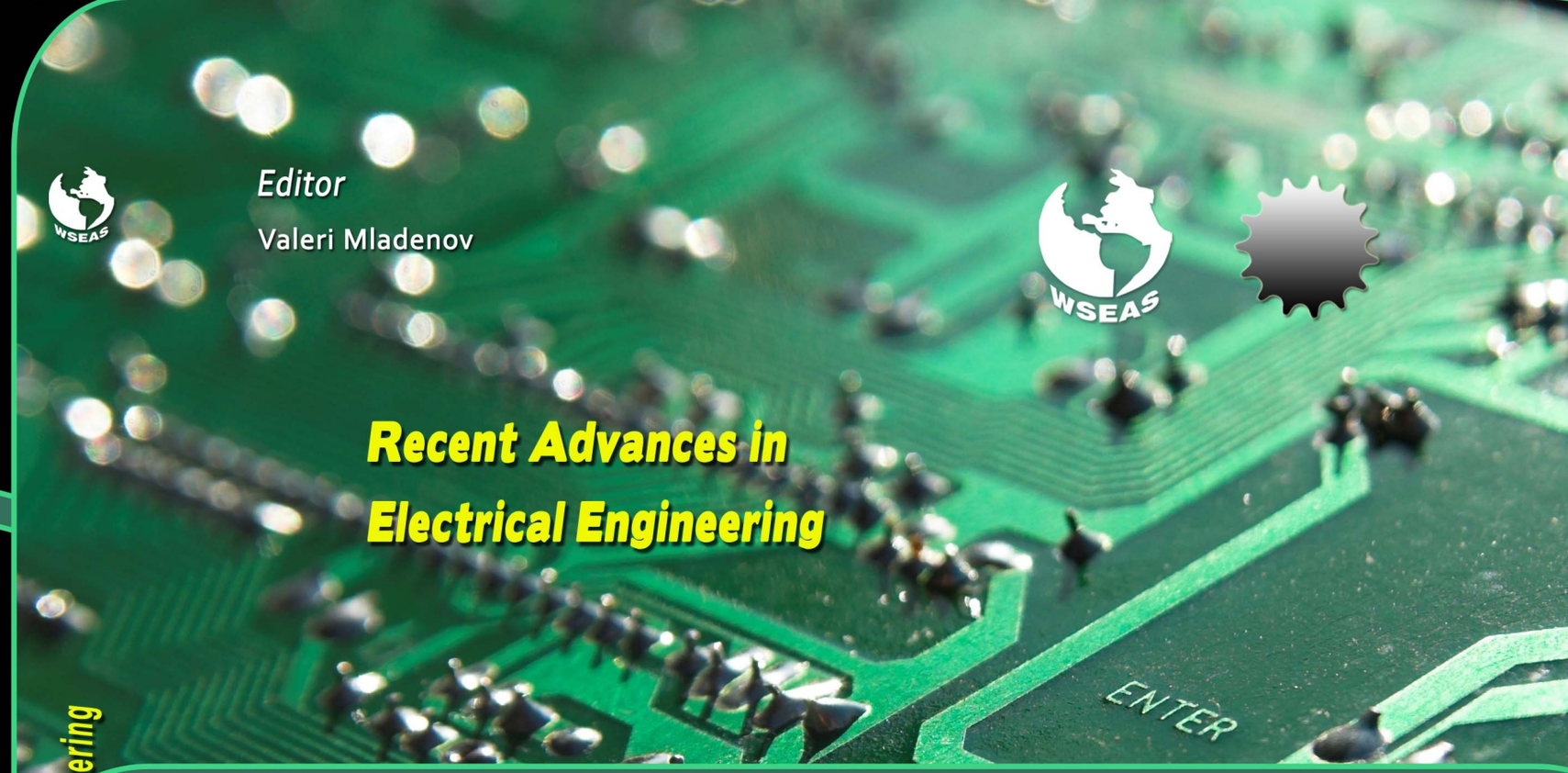

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Plenary Lecture 1

Inherent Characteristics of Control Systems Featured by Smart Material Actuators

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Abstract: In this plenary talk, current status of scientific and engineering technologies of smart material actuators; piezoeleteic materials, shape memory alloys, electrorheological (ER) fluid and magnetorheological (MR) fluid is presented. Since these smart material actuators have been defined as one of academic branch in 1980s, a tremendous development of new actuating materials which can be responded by an external stimuli is made and various engineering applications are devised.A most significant merit of smart material actuators is the fast response time and reversible property in dynamic motion. These inherent features have triggered future-oriented engineering technologies in various industrial fields including automotive engineering. This plenary talk is divided into two parts. The first part emphasizes on the material characterization of the smart materials. For example, Bingham behavior featuring the field-dependent yield stress of ER and MR fluids is to be discussed in terms of microscopic and macroscopic manners. The second part of this talk concentrates on the application devices or systems utilizing smart material actuators. For example, a commercially available shock absorber for automotive vehicles using MR fluid is introduced in terms of working principle and dynamic motion on the road. In addition, an active mount system utilizing the piezostack actuators is shown by presenting its superior vibration control performance in wide frequency bandwidth. And other applications such as controllable haptic master for robotic surgery and damper system for railway vehicle to ensure high stability at high speed are presented focusing on control performance and practical feasibility. Finally, a new formula to make success business in control systems featuring smart material actuators is mentioned as a new concept in research and development for future-oriented creative things.

Brief Biography of the Speaker: Professor Seung-Bok Choi received the B.Sc. degree in mechanical engineering from Inha University, South Korea, 1979. He received the M.Sc. and the Ph.D. degrees from the Michigan State University, U.S.A in 1986 and 1990, respectively. He is currently a Distinguished Inha Fellow Professor of Mechanical Engineering at Inha University, Incheon, South Korea.
He is serving as a chief-editor of Frontiers in Materials – Smart Materials, and also serving as an associate editor for many international journals including Smart Materials and Structures, and Journal of Intelligent Material Systems and Structures. He has received numerous awards regarding smart materials research field including Best Paper Award from Institute of Mechanical Engineers, UK., and Distinguished Young Engineers Award from National Academy of Korea Engineers. His research interests are control applications using smart materials such as electrorheological fluids, magnetorheological fluids, piezoelectric materials and shape memory alloys. He has published more than 350 refereed international journal papers and two books in the area of smart materials and their applications; Piezoelectric Actuators : 1) Control Applications of Smart Materials(ISBN : 978-1-4398-1808-4) , April 2010, Taylor & Francis Group CRC Press, 2)Magnetorheological Fluid Technology : Applications in Vehicle Systems (ISBN : 978-1-4398-5673-4) , November 2012, Taylor & Francis Group CRC Press. He has also served as program committee and co-chairman for many international conferences including the SPIE Smart Structures Conference and the International Conference on ER Suspension and MR Fluid.

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