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Advanced Robotics, Control and Advanced Manufacturing Systems

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Preface

This year the 10th WSEAS International Conference on ROBOTICS, CONTROL and MANUFACTURING TECHNOLOGY (ROCOM '10) was held in Hangzhou, China, April 11-13, 2010. The conference remains faithful to its original idea of providing a platform to discuss kinematics, dynamics and control of robots, robotics materials, human-robot interfaces, motion and path planning, legged and whiled robots, cellular and biologically inspired robots, telerobotics, robot vision, man-machine systems, cybernetics, intelligent control, failure of systems, unmanned vehicles, artificial man, quintitative methods, transportation systems, power systems 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 indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference 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

Micropattern Fabrication by Masked Excimer Laser Dragging

Professor Hong Hocheng
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Abstract: Micromachining has been successfully achieved by excimer laser machining of various materials. An excimer laser dragging process to ablate a groove pattern on a polymer sheet through a mask opening is presented in this paper. The material PC is used in this study because of its good absorption coefficient for ultraviolet light and the excellent optical properties at the wavelength of 193 nm. A large number of papers have studied the interaction between the laser machining parameters and various materials. However, the prediction of the cross-sectional profile after the laser dragging is rarely reported for the fabrication of micro-patterns. This work predicts the profile made by the excimer laser dragging process with various masks. A mathematical model describing the relationship between laser machining parameters and the produced profile is constructed. The proposed model shows how the machined profile is determined by the machining parameters. To fabricate a complex micro-component, a method with multi-path scanning in different directions is envisioned based on the modeling of the machined profile from single-path dragging. The laser machining parameters include the dragging velocity, pulse repetition rate, pulse number, fluence and the opening dimensions of the mask pattern. The experimental results confirm various machined profiles can be effectively predicted in laser dragging. The analytical approach can be reversely utilized to design and fabricate the micropatterns in proper shapes with desired function.

Brief Biography of the Speaker:
Professor Hong Hocheng has published more than 200 journal/proceedings papers and 20 patents in the area of manufacturing. His research interest lies in the innovative manufacturing processes. He obtained his B. Sc. from National Taiwan University, Taiwan, and later his Diplom-Ingenieur from Technische Hochschule Aachen, Germany. He received Ph. D. from University of California, Berkeley. Presently Dr. Hocheng is Chair Professor at National Tsing Hua University. Prof. Hocheng received Outstanding Research Awards and Special Research Fellow Awards from National Science Council of Taiwan and Outstanding Professor Award from Chinese Institute of Engineers and Chinese Society for Mechanical Engineers. Prof. Hocheng is international renown recognized by Prof. Fryderyk Staub Golden Owl Award from Poland. Prof. Hocheng serves as the regional editor of International Journal of Manufactue & Machine Tools, and the editorial board member of 11 international journals including The Journal of Machining Science and Technology, International Journal of Machining and Machinability of Materials and International Journal of Nanotechnology.

Plenary Lecture 2

Frequency Domain Approach of Sliding Mode Control for Robust Stability

Professor Chingyei Chung
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Abstract: This paper addresses the properties of robust stability for sliding mode control in the frequency domain. Conventionally, the sliding mode control is investigated in the time domain. Here, it can be shown that the sliding mode control can be transformed into a Lur'e problem. When considering the uncertainties of system and input matrices, if these uncertainties satisfies the "matching conditions", then the zero dynamics of sliding surface will not changed; otherwise, the zero dynamics of sliding surfaces will be affected by the un-matched uncertainties and it may becomes unstable. The sliding surface may becomes an unstable manifold. According to circle criterion, a formula is presented here to attain the reaching conditions and the absolute stability of overall system. By the loop transformation and theory, a Linear Matrix Inequality (LMI) is used to determine the reaching conditions and the absolute stability of overall system. Finally, the reaching conditions and the absolute stability of overall system is determined by checking the eigenvalues of a Hamiltonian matrix is also presented here.

Brief Biography of the Speaker:
Chingyei Chung is a professor in the Department of Electronic Engineering, Ming Shin University of Science and Technology, Taiwan Prior to this position, he held various academic positions at Feng Chia University Taiwan and San Francisco State University, USA respectively. He received B.S. from Natl. Chiao Tung University, Taiwan ROC and M.S. degree in electrical engineering from San Jose State University, U.S.A. Also He finished his Ph.D degree in Mechanical Engineering from University of California, Berkeley, USA.
He has four Patents granted by the United State Patent and Trademark Office. In 2003, he is an Distinguished Research Advisor in ABI (American Biographic Institute). His research interests include nonlinear control, nonlinear circuit theory and etc.