JC-IFTOMM International Mini-Symposium 2015

http://www.jc-iftomm.org/

DATE: December 1st, 2015

TIME: 15:00-17:30

PLACE: Ishikawadai 3rd Building, Room No. 304, Ookayama Campus,
Tokyo Institute of Technology
http://www.titech.ac.jp/maps/index.html

Program:

15:00-15:10	Opening Address Haruo Houjoh, Chair of Japanese Council of IFTOMM, Professor, Tokyo Institute of Technology
15:10-15:55	Robotherapy: Mechatronic devices for assisting the rehabilitation of human extremities Dr. Eduardo Castillo-Castaneda, Professor, National Polytechnic Institute, Mexico
15:55-16:40	Design and Optimization of Small Rotational Piezoelectric Wind Energy Harvesters for Different Load Types and Working Conditions Dr. Ying Yang, Visiting professor, The University of Tokyo, Professor, Nanjing University of Aeronautics and Astronautics, China
16:40-17:25	Introduction of the Precision Mechatronic Systems Developed at Taiwan Tech Dr. Fang-Jung Shiou, Professor, Department of Mechanical Engineering, National Taiwan University of Science and Technology, Taiwan
17:25-17:30	Closing Address

Contact:

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Secretary General of Japanese Council of IFToMM

Robotherapy: Mechatronic Devices for Assisting the Rehabilitation of Human Extremities

Dr. Eduardo Castillo-Castaneda

Professor, National Polytechnic Institute, Mexico

Abstract

Physical therapy is indicated to solve problems associated with movement disorders caused by injury, disease or other health conditions that reduce the mobility of people. A key component of physical therapy is a therapeutic exercise program designed for each patient. Therapeutic exercise includes body movements that can be developed by the therapist or by external mechanical devices. This lecture intends to venture into the field of Robotherapy, namely the design and manufacture of mechatronic devices that offer support and quantify the patient's performance in conducting therapeutic exercises during rehabilitation of the upper extremities (shoulder, elbow and wrist) and lower extremities (knee). These exercises are characterized in terms of the trajectories; from knowledge of these exercises and, based on anthropometric tables, a rehabilitation workspace is defined to design the device. The work includes dimensional synthesis of mechanisms based on the required workspace, CAD mechanical design and manufacturing including instrumentation.

Biography

He received the degree of Mechanical-Electrical Engineering in 1987 from the National Autonomous University of Mexico. In 1994 he obtained the Ph.D. from Grenoble Institute of Technology, France, in Automatic Control. He was a visiting professor in 1997 at the Mechanical Engineering Laboratory in Tsukuba, Japan, and in 2002 he was visiting professor at the Tokyo Institute of Technology, Japan. He was lecturer at the Autonomous University of Queretaro, Mexico. He is currently full time professor at the National Polytechnic Institute, Mexico. His current research is related to: Precision Engineering, Computer Vision, and Design and Control of Parallel Manipulators.

Design and Optimization of Small Rotational Piezoelectric Wind Energy Harvesters for Different Load Types and Working Conditions

Dr. YANG, Ying　杨　颖

Visiting professor, The University of Tokyo

Professor, Nanjing University of Aeronautics and Astronautics, China

Abstract

In the future, smart devices are expected to operate autonomously and will be self-powering, self-sensing, be able to self-evaluate, and be self-controlling using ambient sources. In this process, the sensors are vital to the system. With the enormous development in sensor miniaturization and in low-power sensors, a self-contained electrical system could be used in practical applications. At the same time, many studies have demonstrated that vibrational energy could be present in the ambient environment. In particular, the vibrational energy produced by combining the mechanical structure and wind energy has been paid more attention recently because wind flow provides a constant source of mechanical energy and this energy can be easily harvested.

Dr. Yang will introduce five different small rotational piezoelectric wind energy harvesters she and her students have been worked on in recent years in her talk named “design and optimization of small rotational piezoelectric wind energy harvesters for different load types and working conditions”.

Firstly, a piezoelectric bimorph cantilever polygon with horizontal shaft has been designed and impact-induced resonance proposed to enable effective excitation of the piezoelectric cantilevers’ vibration modes and obtain optimum deformation, which enhances the mechanical/electrical energy transformation to improve the output power. Secondly, a vertical shaft wind energy harvester has been proposed as an optimized version of the former one. This vertical shaft Darrieus-type windmill may rotate easily in any wind direction and will have a higher mechanical to electrical energy conversion efficiency. The followed design is a bending rod piezoelectric energy harvester, which is deliberately designed for the extremely high wind speed situation.

These small scale piezoelectric wind energy harvesters have been designed, optimized and tested. The output power goes from hundreds microwatts to hundreds milliwatts for different designs. The generated electricity can be stored in a supercapacitor and be used to power small electronic devices or wireless sensor nodes placed in remote locations.

Biography

She graduated from Department of Microelectronics, Beijing Normal University in 1984, received the degree of master of engineering from Northwestern Polytechnic University in 2001 and Ph.D. degree from Nanjing University. She was a lecturer and associate professor at Dept. of Electrical Science and Engineering, Hebei Institute of Mechanical & Electrical Engineering from 1984 to 1999. Since 2005, she has been a professor at the State Key Laboratory of Mechanics and Control for Mechanical Structures, Nanjing University of Aeronautics and Astronautics. Her current research topics are piezoelectric ceramics and its application on actuators and energy harvesting.

Introduction of the Precision Mechatronic Systems Developed at Taiwan Tech

Dr. Fang-Jung Shiou

Professor, National Taiwan University of Science and Technology, Taiwan

Abstract

The Opto-Mechatronics Technology Center (OMTC) was established in National Taiwan University of Science and Technology (Taiwan Tech) in 2003. Main missions of the OMTC are to develop the core technologies to meet the demands of local industries and to promote university-industry collaboration programs. The OMTC has developed some precision automated mechatronic systems in last few years, such as the measuring systems for web thickness of microdrills including destructive and non-destructive methods, the automated optical inspection (AOI) system for the features of a fluteless micro-tap, the AOI system for the assembled accuracy of circular saw blades with insertable cutting teeth, the meso-scale machine tool for micro-structure fabrication, the load-cell embedded tools(the ball burnishing tool and the ball polishing tool, for the surface finishing of mold steel on a machine tool), and the instrument using a line scan CCD camera to generate microscope images from biological tissue slides, etc. The development of the microdrill measurement systems and the meso-scale machine tool are to be presented in detail.

Keywords: mechatronics, microdrill, web thickness, meso-scale machine tool, automated optical inspection (AOI)

Biography

Dr.-Ing. Fang-Jung Shiou , Professor, Mechanical Engineering, Director of Opto-Mechatronics Technology Center, National Taiwan University of Science and Technology (Taiwan Tech). After received his PhD degree from the RWTH Aachen, Germany in 1998, he served as assistant professor in the Department of Mechanical Engineering, Taiwan Tech. He was promoted as full professor in 2009. Dr. Shiou’s research and teaching interests are in precision manufacturing and measurement. Currently, Professor Shiou's research and teaching focus are in mechatronic system design and precision surface finishing processes on a machine tool. He has authored more than 90 papers on those topics, which have been published in refereed technical journals and conference proceedings. He also holds more than 11 patents. From 2011 to 2014, he was the leader of the Resource Center of the Automatic Optical Inspection for Semiconductor and Opto-Electronic Talent Fostering Program for Advanced Industry Equipment, sponsored by the Ministry of Education, Taiwan. From 2012 to 2015, he was the Chairperson of the Department of Mechanical Engineering. He is the Editorial Board Member of International Journal of Automation Technology since 2014.