



Proposal for ISIE 2021 Tutorial

Title of Tutorial:

New Emerging Technologies in Motion Control Systems

Contact Information of Speakers:

Kiyoshi Ohishi

Department of Electrical Engineering, Nagaoka University of Technology, Japan
1603-1 Kamitomioka-machi, Nagaoka, Niigata, Japan 940-2188
TEL: +81-258-47-9525, FAX: +81-258-47-9500
e-mail: kiyoshiohishi@ieee.org

Makoto Iwasaki

Department of Computer Science and Engineering, Nagoya Institute of Technology, Japan
Gokiso-cho, Showa, Nagoya, Aichi, Japan 466-8555
TEL: +81-52-735-5455, FAX : +81-52-735-5442
e-mail: iwasaki@nitech.ac.jp

Hiroshi Fujimoto (corresponding speaker)

Department of Advanced Energy, The University of Tokyo, Japan
Transdisciplinary Sciences Bldg. 613, 5-1-5 Kashiwanoha, Kashiwa, Chiba, Japan 277-8561
TEL: +81-4-7136-4131, FAX: +81-4-7136-4132
e-mail: fujimoto@k.u-tokyo.ac.jp

Toshiaki Tsuji

Department of Electrical and Electronic Systems, University of Saitama, Japan
255 Shimo-ohkubo, Sakura, Saitama, Japan 338-8570
TEL/FAX: +81-48-858-3467
e-mail: tsuji@ees.saitama-u.ac.jp

Background of Speakers:

Kiyoshi Ohishi

- development of haptic devices
- anti-slip/skid re-adhesion control on electric train
- motion control for industrial robots

Makoto Iwasaki

- development of intelligent motion control
- application of soft computing techniques to motion control
- high performance positioning methodology in mechatronic products

Hiroshi Fujimoto

- high precision servo control for hard disk drives
- nano-scale servo systems of precision stage and atomic force microscope,
- motion control of electrical vehicles and wireless in-wheel motor

Toshiaki Tsuji

- bio-inspired motion control
- rehabilitation robotics
- haptic signal processing

Brief description of the tutorial (500 words max):

A huge number of recent electronic products introduce Motion Control technologies. The achievements in Motion Control studies indicate that innovation in this area has been supporting the development of industrial electronics. For example, mass storage systems, fruits of efforts in nano-scale servo technology, have been serving as a basis for the information-oriented society. In production area, precision control has improved the performance of manufacturing machines. Assist devices enable people to handle heavy loads easily. In hospitals and nursing homes, assist lifts can transfer patients with mobility problems between a bed and a wheelchair. Force control is one of the most important issues for such systems. For accomplishing proper force control, some recent studies on motion control and biomechanics indicate that principles of statics and dynamics should be primitively considered to design robots.

Owing to these backgrounds, the Technical Committee on Motion Control has organized a special section “New Emerging Technologies in Motion Control Systems” for Transactions of Industrial Electronics, which will be published in July 2013. Many cutting-edge studies presented in this special section will be a good example to see the recent technological trends in Motion Control. As a collaborative event of the special section, this tutorial is introducing such studies in Motion Control area to show a comprehensive, panoramic view of the area especially to students and young researchers. Following the background and introduction on the principles and practice, the promising techniques of motion control are presented on the basis of mechatronics as listed below.

- Recent advancement in motion control
- Introduction of precision control
- Introduction of electric vehicle control
- Introduction of haptics
- Introduction of bio-inspired motion control
- Conclusions and Future Challenges

Biography:

Kiyoshi Ohishi graduated from the Department of Electrical Engineering of Keio University in 1981, and received his Ph.D. degree in 1986. In 1993, after serving as a lecturer and an associate professor at Osaka Institute of Technology, he was appointed an associate professor in the Department of Electrical Systems at Nagaoka University of Technology, and has been a professor there since 2003. His research interests are focused mostly on motion control, power electronics, robotics, etc. He holds a D.Sc. (Eng.), and is an AdCom member of IEEE/IES, a senior member of IEEE, a senior member of the Institute of Electrical Engineers of Japan and so on. He was the recipient of the Outstanding Paper Awards at the 1985 IEEE International Conference on Industrial Electronics, Control, and Instrumentation (IECON) and the Best Paper Awards at IECON 2002 and IECON 2004 from the IEEE Industrial Electronics Society. He was also the recipient of the Best Paper Award of IEEJ Tran. on IA from the Institute of Electrical Engineers of Japan in 2002 and 2009.

Makoto Iwasaki received the B.S., M.S., and Dr.Eng. degrees in electrical and computer engineering from Nagoya Institute of Technology, Nagoya, Japan, in 1986, 1988, and 1991, respectively. He joined the Department of Electrical and Computer Engineering, Nagoya Institute of Technology in 1991, where he is currently a Professor. From 1997 to 1998, he was a Japanese government research fellow at the Technical University of Chemnitz and the Technical University of Munich. And also from 2002 to 2003, he was a Japanese government research fellow at the Technical University of Chemnitz. He is a senior member of IEEE and an AdCom member of IEEE/IES, while he has contributed technical activities for IEEE as a chair of the Technical Committee on Motion Control of IEEE/IES in 2009-2011, e.g. technical program co-chairs at AMC2008 and ICM2013, special session organizers at IECONs, ISIEs, AMCs, and ICMs, tutorial speakers at ICM2009, 2010, 2011, and 2012 on motion control techniques. He received the Best Paper Award from the IEE of Japan Industry Application Society in 2010 and the Best Paper Award from the Fanuc FA Robot Foundation in 2010.

Hiroshi Fujimoto received the Ph.D. degree in the Department of Electrical Engineering from the University of Tokyo in 2001. In 2001, he joined the Department of Electrical Engineering, Nagaoka University of Technology, Niigata, Japan, as a research associate. From 2002 to 2003, he was a visiting scholar in the School of Mechanical Engineering, Purdue University, U.S.A. In 2004, he joined the Department of Electrical and Computer Engineering, Yokohama National University, Yokohama, Japan, as a lecturer and he became an associate professor in 2005. He is currently an associate professor of the University of Tokyo since 2010. He received the Best Paper Awards from the IEEE Transactions on Industrial Electronics in 2001 and 2013, Isao Takahashi Power Electronics Award in 2010 Best Author Prize of SICE in 2010, the Nagamori Grand Award in 2016, and First Prize Paper Award IEEE Transactions on Power Electronics in 2016. He is currently an AdCOM member of IEEE/IES and a senior member of IEEE and IEE Japan.

Toshiaki Tsuji received the B.E. degree in system design engineering and the M.E. and Ph. D degrees in integrated design engineering from Keio University, Yokohama, Japan, in 2001, 2003, and 2006, respectively. He was a research associate in Department of Mechanical Engineering, Tokyo University of Science from 2006 to 2007. Since 2007, he has been working with Department of Electrical and Electronic Systems, Saitama University, while he became an associate professor in

2012. He is also a research fellow in Japan Science and Technology Agency PRESTO projects. He was a program co-chair of AMC2012, tutorial speaker of IECON2011 and IECON2012. He received the Best Paper Award from the Fanuc FA Robot Foundation in 2007 and 2008.

Brief description of the intended audience

The intended audiences are control engineers in academia and industry. Among them, the tutorial especially intends to lead students and young researchers to obtain a comprehensive, panoramic view of the Motion Control studies.

Support technical committee in IES (if any)

IEEE/IES Technical committee on motion control,

Name of chair: Prof. Michael Ruderman (University of Agder, Norway),

Email address of chair: michael.ruderman@uia.no