



GRADUATE SCHOOL OF
FRONTIER SCIENCES
THE UNIVERSITY OF TOKYO

IEEE ICM 2021

IEEE INTERNATIONAL CONFERENCE
ON MECHATRONICS 2021



KASHIWA, JAPAN
MARCH 7-9, 2021



RSJ

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Welcome Message from the ICM2021 General Co-Chairs

On behalf of the Industrial Electronics Society of the IEEE, we welcome you at the 2021 IEEE International Conference on Mechatronics (ICM2021) on March 7-9, 2021 in Kashiwa, Japan. Since its first door opened in Istanbul, Turkey in 2004, this conference aims at providing a forum for relevant information exchange among engineers and research in the field of mechatronic systems. Following to the last conference in Ilmenau, Germany in 2019, our wish is to have in Kashiwa many chances to engage in enthusiastic discussions on mechatronics-related issues and open research problems. ICM2021 aims at providing a multidisciplinary forum between researchers from industry and academia to discuss state-of-the-art topics in mechatronics and present recent research results and prospects for development in this evolving area.

Kashiwa is chosen to host ICM2021 because Kashiwa-no-ha area is recently developed as "Kashiwa-no-ha smart city" with the concepts of "Environmental Harmony," "Health and Longevity," and "Creation of New Industries." The conference venue, Kashiwa-no-ha conference center, is located at 2 minutes walk from Kashiwanoha-campus Station on the Tsukuba Express Line. This area is attractive and pleasant to discover for visitors because it takes only 30 minutes to visit the center of Tokyo via the Tsukuba Express line. This site can provide convenient and modern facilities for hosting the scientific conferences because it is closed to Kashiwa campus of the University of Tokyo.

We would like to thank the volunteers who spent their time to bring ICM2021 to you. Especially, we want to acknowledge the efforts of the Program Chairs, Technical Program Committee members, reviewers, the Special Sessions Chairs and Organizers, and all those persons in charge of all the conference-related activities, from local arrangements to conference secretariat. We also want to gratefully acknowledge the support provided by the technical sponsors of the conference: The Institute of Electrical and Electronics Engineers (IEEE) and the IEEE Industrial Electronics Society (IES). The conference organization has been also supported by several organizations, foundations, and package sponsors: we deeply thank all of them.

The Technical Program Committee selected 110 papers from 16 countries worldwide among the submitted 124 papers from 17 countries. The three plenary talks, two industrial sessions, technical tours will give opportunities to have stimulating ideas on mechatronics.

Due to COVID-19 developments in January 2021, Japanese government declared a state of emergency for a pandemic in the greater Tokyo area on January 7th, and the on-site conference was cancelled unfortunately. As a result, ICM2021 moved from hybrid to full online conference. Despite this drastic change-over and being no longer able to warmly welcome our authors and guests in person in Kashiwa, all originally planned sessions, social events, and technical tours of ICM2021 have been converted into digital space.

We hope that the conference will satisfy your highest intellectual and cultural expectations and wish you to enjoy all technical and social aspects of ICM2021.



Prof. Hiroshi Fujimoto
The University of Tokyo



Prof. Valentin Ivanov
TU Ilmenau

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SS1: Intelligent Sensing Applications for Human Assistive Systems

Naoki Motoi, Kobe University
Chowarit Mitsantisuk, Kasetsart University
Hiroshi Igarashi, Tokyo Denki University
Sota Shimizu, Shibaura Institute of Technology

SS2: Nonlinear Adaptive Robust Control of Mechatronic Systems

Zheng Chen, Zhejiang University
Chuxiong Hu, Tsinghua University
Yan Gu, University of Massachusetts Lowell
Bin Yao, Purdue University

SS3: Motion Control Technologies for Future Scientific Satellite and Spacecraft Missions

Susumu Hara, Nagoya University
Kenta Seki, Nagoya Institute of Technology

SS4: Disturbance Modelling, Estimation and Active Compensation Control

Dapeng Tian, Chinese Academy of Sciences
Jinhua She, Tokyo University of Technology
Lei Guo, Beihang University

SS5: Robot Environment Interaction

Emre Sariyildiz, University of Wollongong
Barkan Ugurlu, Ozyegin University
Tomoyuki Shimono, Yokohama National University
Takahiro Nozaki, Keio University

SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems

Johann Reger, Technische Universität Ilmenau
Michael Ruderman, Universitetet i Agder
Valentin Ivanov, Technische Universität Ilmenau

SS7: Smart Precision Motion Control in Mechatronic Systems

Kazuaki Ito, Gifu University
Kenta Seki, Nagoya Institute of Technology
Wataru Ohnishi, The University of Tokyo
Tom Oomen, Eindhoven University of Technology

SS8: Power Electronics for Enhancing Mechatronics Control

Kenji Natori, Chiba University
Yuki Yokokura, Nagaoka University of Technology
Hiroshi Fujimoto, The University of Tokyo
Tomoki Yokoyama, Tokyo Denki University

SS9: Perception and Control of Automated Vehicles

Yafei Wang, Shanghai Jiao Tong University
Kanghyun Nam, Yeungnam University
Binh Minh Nguyen, Toyota Tech. Institute

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Workshop Program

March 7			
	Room 1	Room 2	Room 3
09:45-10:00	Opening Ceremony (Room 1)		
10:00-10:55	Plenary Session 1: Iterative Control for Networked Heterogeneous Multi-Agent Systems with Uncertainties Prof. Santosh Devasia (Room 1)		
11:00-11:55	Plenary Session 2: Motion Control of EV and Paradigm Shift to Motor/Capacitor/Wireless Prof. Yoichi Hori (Room 1)		
12:00-13:00			
13:00-14:20	Machine Learning (1)	Mobile Robots (1)	SS3: Motion Control Technologies for Future Scientific Satellite and Spacecraft Missions (1)
14:30-15:50	Emergning Topics in Mechatronics (1)	Mobile Robots (2)	SS3: Motion Control Technologies for Future Scientific Satellite and Spacecraft Missions (2)
16:00-16:55	Plenary Session 3: Digital Twins entering Power Systems Prof. Peter Palensky (Room 1)		
17:00-18:20	Haptics (1)	Mobile Robots (3)	Sensors Actuators and Motordrives

Japan Standard Time (UTC +9)

Each session has discussion time after three 15 minutes presentations.

March 8

	Room 1	Room 2	Room 3
9:00-10:20		SS2: Nonlinear Adaptive Robust Control of Mechatronic Systems (1)	SS8: Power Electronics for Enhancing Mechatronics Control (1)
10:30-11:50	Aircraft Control	SS2: Nonlinear Adaptive Robust Control of Mechatronic Systems (2)	SS8: Power Electronics for Enhancing Mechatronics Control (2)
12:00-12:55	Industry Lunch Session (Room 1)		
13:00-14:20		Precision Control	SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems (1)
14:30-15:50	SS1: Intelligent Sensing Applications for Human Assistive Systems (1)	SS7: Smart Precision Motion Control in Mechatronic Systems (1)	SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems (2)
16:00-17:20	SS1: Intelligent Sensing Applications for Human Assistive Systems (2)	SS7: Smart Precision Motion Control in Mechatronic Systems (2)	SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems (3)
17:30-18:50	SS1: Intelligent Sensing Applications for Human Assistive Systems (3)	SS7: Smart Precision Motion Control in Mechatronic Systems (3)	SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems (4)
19:10-19:40	Award Ceremony (Spatial Chat)		
19:40-21:00	Online Networking (Spatial Chat)		

Japan Standard Time (UTC +9)

March 9

	Room 1	Room 2	Room 3
9:00-10:20	Machine Learning (2)	SS4: Disturbance Modelling, Estimation and Active Compensation Control (1)	SS9: Perception and Control of Automated Vehicles (1)
10:30-11:50	Haptics (2)	SS4: Disturbance Modelling, Estimation and Active Compensation Control (2)	SS9: Perception and Control of Automated Vehicles (2)
12:00-12:55	Industry Lunch Session (Room 1)		
13:00-14:20		SS4: Disturbance Modelling, Estimation and Active Compensation Control (3)	SS5: Robot Environment Interaction (1)
14:30-15:50		SS7: Smart Precision Motion Control in Mechatronic Systems (4)	SS5: Robot Environment Interaction (2)
16:00-17:20	Emerging Topics in Mechatronics (2)	SS7: Smart Precision Motion Control in Mechatronic Systems (5)	SS5: Robot Environment Interaction (3)
17:30-17:50	Closing Ceremony (Room 1)		
18:00-20:00	Technical Tour (Room 1)		

Japan Standard Time (UTC +9)

Plenary Sessions

(Japan Standard Time (UTC +9))

Sunday, 7 March: 10:00-10:55

Plenary Session 1

Plenary Speaker:

Professor Santosh Devasia, University of Washington, United States of America

Presenter:

Toshiaki Tsuji, Saitama University, Japan

Title:

Iterative Control for Networked Heterogeneous Multi-Agent Systems with Uncertainties

Abstract:

This talk discusses the convergence of iterative control for networked, heterogeneous multi-agent systems, where each agent has potentially different dynamics and uncertainties. Such control can be important in adhesively bonding for manufacturing or repair of large high-strength (carbon-fiber) composite structures such as aircraft wing or wind turbines. Substructures near the bonding area tend to change the thermal dynamics, and iterative control of the distributed heaters offers a potential solution to achieve the desired temperature profiles in the bondline. However, the challenge is to ensure convergence of such iterative control especially since convergence of iterative control for each individual sub-system (heaters) does not guarantee convergence under a networked setting. Towards addressing such problems, this talk will review convergence conditions for a single linear system, and then quantify the acceptable modeling uncertainty for ensuring convergence of the proposed iterative approach for collaborative tracking. Convergence conditions are also established for the case when inversion-based iterative control of each individual agent are conjoined using a network graph structure.



Sunday, 7 March: 11:00-11:55

Plenary Session 2

Plenary Speaker:

Professor Yoichi Hori, The University of Tokyo, Japan

Presenter:

Kouhei Ohnishi, Keio University, Japan

Title:

Motion Control of EV and Paradigm Shift to Motor/Capacitor/Wireless

Abstract:

The most distinct advantage of the electric vehicle is electric motor's quick and precise torque generation. However, most electric vehicles developed to date have not yet utilized it. I named this technique "Motion Control of EV" and have been demonstrating its basic effectiveness of various proposed methods like adhesion control by using some really made experimental EVs. On the other hand, "Motor", "Capacitor" and "Wireless" will be the key technologies for cars 100 years later, instead of "Engine", "Battery" and "Quick charge". Future cars must be driven by electric motors, but we still have lots of problems in energy supply. Why are electric vehicles supposed to be charged with "stopped", in a "short time", and by "big energy", even though the energy form of electricity is completely different from that of gasoline. Super-capacitors and wireless power transfer to EVs in motion will play an important role in the future EV world by drastically reducing too big usage of recent high-capacity batteries.



Sunday, 7 March: 16:00-16:55

Plenary Session 3

Plenary Speaker:

Professor Peter Palensky, TU Delft, The Netherlands

Presenter:

Makoto Iwasaki, Nagoya Institute of Technology, Japan
Kiyoshi Ohishi, Nagaoka University of Technology, Japan

Title:

Digital Twins entering Power Systems

Abstract:

Digital Twins are an established tool in avionics and automotive industry. A digital model is created for all components and systems in order to create a virtual "mockup" of the vehicle or the aircraft. Doing so allows for early interoperability testing of components, or the analysis of oscillation modes long before the real prototype is built. This technique now enters other sectors, with the power sector being one of the more conservative ones. Power systems are planned and operated using models already, with a large variety in model fidelity, workflow, and stakeholders involved. They are typically used in an off-line fashion, to support design decisions or to validate post-mortem analysis in case of faults. The recent introduction of digital controls and the trend of integrated energy systems, however, makes models complex and modeling complicated. So the goal is to overcome the static use of numerical models, and to use them in an on-line way. Real-time cyber-physical digital twins, that are synchronized with the real system and that receive updated model parameters have the promise to begin power system operations a step further. In this talk I will explain how hybrid models can be developed, how they can be used, and show examples where power system digital twins are used already.



Technical Sessions

(Japan Standard Time (UTC +9))

Sunday, 7 March 2021

09:45-10:00	Room 1 Opening Ceremony
10:00-10:55	Room 1 Plenary 1, (Prof. Santosh Devasia) Time: 10:00-10:55 Title: Iterative Control for Networked Heterogeneous Multi-Agent Systems with Uncertainties Chairs: Toshiaki Tsuji
11:00-11:55	Room 1 Plenary 2, (Prof. Yoichi Hori) Time: 11:00-11:55 Title: Motion Control of EV and Paradigm Shift to Motor/Capacitor/Wireless Chairs: Kouhei Ohnishi
13:00-14:20	Room 3 SS3: Motion Control Technologies for Future Scientific Satellite and Spacecraft Missions (1) Time: 13:00-14:20 Chairs: Susumu Hara, Junichi Asama Modeling and Control Performance Evaluation for Testbed of Asteroid Flyby Observation System <i>Kenji Hayashi, Kenta Seki, Makoto Iwasaki</i> Vision-Based Rapid Target Tracking Method for Trajectories Estimation and Actuator Parameter Uncertainties for Asteroid Flyby Problem <i>Koya Hashizume, Kikuko Miyata, Susumu Hara</i> High-precision Visual Servoing in Asteroid Flyby with Multirate Feedforward Control and Trajectory Estimation <i>Yusuke Ogata, Hiroshi Fujimoto, Yoichi Hori</i>
	Room 2 Mobile Robots (1) Time: 13:00-14:20 Chairs: Satoshi Suzuki, Philipp Braun Modeling and Control of Stable Limit Cycle Walking on Floating Island <i>Fumihiko Asano</i> Algorithm to Improve the Predictability for Auto-vehicles' Behaviors and Avoid Risk Accumulation during Driving <i>Ricky Yuen-Tan Hou</i> Detection of Reduced Magnetic Attraction Force Using a Disturbance Observer for Crawler Robots <i>Natsuki Kageyama, Takeshi Nishimura, Takahiro Itoh, Takenori Atsumi, Shigeyuki Nakadai</i>
	Room 1 Machine Learning (1) Time: 13:00-13:55 Chairs: Sho Sakaino, Yu Zhu GBDT Modeling of Deep Reinforcement Learning Agents Using Distillation <i>Toshiki Hatano, Toi Tsuneda, Yuta Suzuki, Kuniyasu Imade, Kazuki Shesimo, Satoshi Yamane</i> Remarks on Octonion-valued Neural Networks with Application to Robot Manipulator Control <i>Kazuhiko Takahashi, Miyabi Fujita, Masafumi</i>

Sunday, 7 March 2021

Hashimoto

14:30-15:50

Room 3

SS3: Motion Control Technologies for Future Scientific Satellite and Spacecraft Missions (2)

Time: 14:30-15:25

Chairs: Kenta Seki, Kikuko Miyata

Localization of Wheeled Mobile Robots from Slip Ratio Estimation with Simple Model *Urara Kono, Hiroshi Fujimoto, Yoichi Hori*

Development of a Slotless Permanent Magnet Motor with Two-Layer Toroidal Winding for Minimization of Torque Ripple *Junichi Asama, Jun Watanabe, Tek Kee Tai*

Room 2

Mobile Robots (2)

Time: 14:30-15:50

Chairs: Fumihiko Asano, Ricky Yuen-Tan Hou

Study on how to remove the rope traction device on the overhead distribution lines *Jumpei Takemoto, Kenichi Oho, Ryoichi Kobayashi, Takeshi Ootawa, Takashi Tsubouchi*

Remote-controlled Rust Assessment System for Weathering Steel *Hiromi Watanabe, Tsutomu Tanzawa, Shinji Kotani, Tsuyoshi Shimizu*

A modular architecture for mobile robots equipped with continuous-discrete observers *Gian Marco Vinco, Philipp Braun, Luca Zaccarian*

Room 1

Emerging Topics in Mechatronics (1)

Time: 14:30-15:50

Chairs: Shota Yabui, Takuya Matsunaga

Underwater Suction Gripper for Object Manipulation with an Underwater Robot *Hikaru Kumamoto, Naoki Shirakura, Jun Takamatsu, Tsukasa Ogasawara*

Prototype of 32-Joint Robot Hand Using Shape Memory Gel and Tendon-Driven Mechanism *Mitsuhiro Yamano, Akira Okamoto, Ryuhei Miyoshi, Toshihiko Yasuda, Yasutaka Nishioka, MD Nahin Islam Shiblee, Kazunari Yoshida, Hidemitsu Furukawa, Riichiro Tadakuma*

Modular Drivetrains for Increased Performance and Reliability *Thomas Vandenhove, Reginald Diltoer, Bert Lenaerts, David van Os, Kurt Stockman, Stephan Schlimpert*

16:00-16:55

Room 1

Plenary 3, (Prof. Peter Palensky)

Time: 16:00-16:55

Title: Digital Twins entering Power Systems

Chairs: Makoto Iwasaki, Kiyoshi Oishi

17:00-18:20

Room 3

Sensors Actuators and Motordrives

Time: 17:00-18:20

Chairs: Paolo Righettini, Tomoyuki Shimono

Effect of insulating liquid on thrust force of a synchronous electrostatic film actuator *Masahiko Osada, Fernando Carneiro, Guangwei Zhang, Shunsuke Yoshimoto, Akio Yamamoto*

Sunday, 7 March 2021

Achieving Resonance with Piezoelectric Transducers on 2-4 Phase Resonant Electrostatic Induction Motors *Fernando Carneiro, Masahiko Osada, Guangwei Zhang, Shunsuke Yoshimoto, Akio Yamamoto*
Diagnosis of Sensor Faults in PMSM and Drive System Based on Structural Analysis *Saeed Hasan Ebrahimi, Martin Choux, Van Khang Huynh*

Room 2

Mobile Robots (3)

Time: 17:00-18:20

Chairs: Alessandro Victorino, Yasutaka Fujimoto

Experimental performance analysis of an electromagnetic impact-drive microrobot *Aurélien Quelin, Laurent Petit, Christine Prelle, Nicolas Damay*

Design of Acceleration Control for Center of Mass on Sliding Robot *Masatsugu Nishihara, Fumihiko Asano*

Stable Gait Generation on a Low Friction Road Surface by Making Impact Posture Asymmetric *Donggyun Jung, Fumihiko Asano*

Room 1

Haptics (1)

Time: 17:00-18:20

Chairs: Seiichiro Katsura, Fumitake Fujii

Periodic/Aperiodic Hybrid Position/Impedance Control Using Periodic/Aperiodic Separation Filter *Masaki Hino, Hisayoshi Muramatsu*

Force restrained control to extend flexibility of trajectory planning *Toshihiro Ueki, Sho Sakaino, Toshiaki Tsuji*

Challenges of Linearization-based Control of Industrial Robots with Cycloidal Drives *Patrick Mesmer, Michael Neubauer, Armin Lechler, Alexander Verl*

Monday, 8 March 2021

09:00-10:20

Room 3

SS8: Power Electronics for Enhancing Mechatronics Control (1)

Time: 9:00-10:20

Chairs: Kenji Natori, Yuki Yokokura

Wideband Backforward-Drivability Motor Drive Based on Fast Current Control of Geared SPMSM *Yuki Yokokura, Kiyoshi Ohishi*

On-line Estimation of Current Harmonics for Status Monitoring and Diagnosis of High-Speed Permanent Magnet Synchronous

Motors *Yansong Lu, Xi Zhang, Chong Zhu, Jingxuan Li, Kundi Sun, Tenghui Dong*

A Study of Multisampling Deadbeat Control for Low Carrier Frequency PMSM Drive System Used in EVs and HEVs *Kazuya Ito, Ryosuke Suzuki, Kanta Yoshimoto, Tomoki Yokoyama*

Room 2

SS2: Nonlinear Adaptive Robust Control of Mechatronic Systems (1)

Time: 9:00-10:20

Chairs: Yan Gu, Zheng Chen

Monday, 8 March 2021

	<p>Adaptive robust fault detection and control for injection machine mold closing process with accurate parameter estimations <i>Jianfeng Liao, Haihui Yuan, Wei Song, Jason Gu</i></p> <p>Adaptive Robust Force Control of an Underactuated Stance Leg Exoskeleton for Human Performance Augmentation <i>Shan Chen, Tenghui Han, Fangfang Dong, Jiang Han, Lei Lu, Haijun Liu</i></p> <p>Adaptive Robust Motion Control of Series Elastic Actuator with Unmatched Uncertainties <i>Yinjie Lin, Zheng Chen, Bin Yao</i></p>
10:30-11:50	<p>Room 3</p> <p>SS8: Power Electronics for Enhancing Mechatronics Control (2)</p> <p>Time: 10:30-11:25 Chairs: Kenji Natori, Yuki Yokokura</p> <p>Torque Ripple Reduction for PMSM based on PWM Pulse Merging Method for High Speed Range <i>Shona Noguchi, Hiroshi Fujimoto</i></p> <p>A Study on Performance and Stability of Current Control Systems by Using Multi-Level Inverters <i>Shota Kuroda, Kenji Natori, Yukihiko Sato</i></p>
	<p>Room 2</p> <p>SS2: Nonlinear Adaptive Robust Control of Mechatronic Systems (2)</p> <p>Time: 10:30-11:50 Chairs: Chuxiong Hu, Zheng Chen</p> <p>Disturbance Rejection Performance of Adaptive Robust Control <i>Mingxing Yuan, Litong Lyu, Xin Liu</i></p> <p>Precision Motion Control of Constrained SISO Nonlinear System via Direct Optimized Compensation <i>Xingyi Liu, Yingqiang Liu, Fuxin Duan, Zheng Chen, Bin Yao</i></p> <p>Model Prediction based Online Feedforward Compensation Control of Maglev Planar Motor with Comparative Investigation <i>Ran Zhou, Chuxiong Hu, Yu Zhu, Ming Zhang</i></p>
	<p>Room 1</p> <p>Aircraft Control</p> <p>Time: 10:30-11:50 Chairs: Yutaka Uchimura, Sakahisa Nagai</p> <p>Observer-based Angle of Attack Estimation for Tilt-Wing eVTOL Aircraft <i>Kentarō Yokota, Hiroshi Fujimoto, Hiroshi Kobayashi</i></p> <p>Development of a low-cost avionics platform for small-scale model airplanes <i>Matheus Maciel</i></p> <p>Estimation and Compensation of Airframe's Disturbance Force using Rotor Angular Velocity for Propeller-driven Systems <i>Yuki Nishii, Daisuke Yashiro, Kazuhiro Yubai, Satoshi Komada</i></p>
12:00-12:55	<p>Room 1</p> <p>Industry Lunch Session</p> <p>Time: 12:00-12:55 Platinum Sponsors: TOYOTA MOTOR CORPORATION, YASKAWA Electric Corporation Gold Sponsors: Mitsubishi Electric Corporation, FANUC CORPORATION</p>

Monday, 8 March 2021

13:00-14:20

Room 3

SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems (1)

Time: 13:00-14:20

Chairs: Michael Ruderman, Johann Reger

High-Bandwidth Suspension Resonance Analysis of In-Wheel Motor Vehicle Using Multibody Dynamics *Tomonori Suzuki, Fabien Chauvicourt, Hiroshi Fujimoto*

Disturbance Observer Based Global Control of Mechatronics Systems: A Passivity Approach *Binh Minh Nguyen, Michihiro Kawanishi, Daichi Hasegawa, Tatsuo Narikiyo*

Feedforward Control Design Methodology for a Crane System with Restrictions on Drive System *Kosuke Matsui, Hidekazu Kajiwara, Shiita Ishigaki*

Room 2

Precision Control

Time: 13:00-14:20

Chairs: Yoshihiro Maeda, Thao Tran Phuong

Vibration Suppression and Tracking Control of a Flexure-Jointed Motion Stage Mechanism Using LTV-FIR Command Filtering *Pongsiri Kuresangsai, Matthew Owen Thomas Cole*

Horizontal Counter Control Method for Suppressing Vibration of Machine Base *Yuichi Kizu, Takashi Kai, Hidetoshi Ikeda*

Basic Study on Analysis and Suppression of Inverse Response Caused by Feedforward Friction Compensation of Ball-screw-driven Stage *Takumi Hayashi, Hiroshi Fujimoto, Yoshihiro Isaoka, Yuki Terada*

14:30-15:50

Room 3

SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems (2)

Time: 14:30-15:50

Chairs: Michael Ruderman, Johann Reger

Autonomous vehicle navigation based in a hybrid methodology: model based and machine learning based *Marcone Santos, Alessandro Victorino*

Pressure-flow dynamics with semi-stable limit cycles in hydraulic cylinder circuits *Michael Ruderman, Stefan Kaltenbacher, Martin Horn*

Contraction Region Estimate for State-Dependent Riccati-Equation-Based Controllers and its Application to a Two-Wheeled Inverted Pendulum *Julio Perez, Susanne Junghans*

Room 2

SS7: Smart Precision Motion Control in Mechatronic Systems (1)

Time: 14:30-15:50

Chairs: Yoshiyuki Urakawa, Kazuaki Ito

Application of Limited Pole Placement Method to State Feedback System *Yoshiyuki Urakawa*

Development of Optimal Design Support System of Actuator Position

Monday, 8 March 2021

and Control System Considering Resonant Vibration Suppression in Cantilever *Ryo Ishibashi, Kenta Seki, Makoto Iwasaki*
Assessment of Capacitor-based Charge Estimators for Piezoelectric Actuators *Morteza Mohammadzaheri, Sami AlSulti, Mojtaba Ghodsi, Issam Bahadur, Mohammadreza Emadi*

Room 1

SS1: Intelligent Sensing Applications for Human Assistive Systems (1)

Time: 14:30-15:50

Chairs: Chowarit Mitsantisuk, Sota Shimizu

Skeleton-based visualization of poor body movements in a child's gross-motor assessment using convolutional auto-encoder *Satoshi Suzuki, Yukie Amemiya, Maiko Sato*

Motion Control Method Based on Two-link Manipulator Model with Bi-articular Muscle Considering Planetary Gear *Takumi Nishimura, Naoki Motoi*

Deep Learning Based Singular Spectrum Analysis for Realization of Wideband Force Sensing *Thao Tran Phuong, Kiyoshi Ohishi, Yuki Yokokura*

16:00-17:20

Room 3

SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems (3)

Time: 16:00-17:20

Chairs: Johann Reger, Michael Ruderman

A Model-less Approach for Estimating Vehicles Sideslip Angle by a Neural Network Concept *Bernardo Murta, Alessandro Victorino, José Baêta*

Picometer-Scale Positioning of a Linear Drive System via Feedforward-Feedback Control *Alex S. Huaman, Michael Katzschmann, Steffen Hesse, Christoph Schäffel, Christoph Weise, Denis Dontsov, Eberhard Manske, Johann Reger*

A mechatronic apparatus for shear stress application on endothelial cells: design, development and experimental tests *Paolo Righettini, Roberto Strada, Andrea Remuzzi*

Room 2

SS7: Smart Precision Motion Control in Mechatronic Systems (2)

Time: 16:00-16:55

Chairs: Shota Yabui, Wataru Ohnishi

Feedforward Control for Track-Seeking Control in Hard Disk Drive with Sampled-Data Polynomial Based on First-Order Hold *Kazuho Igarashi, Ryo Igarashi, Takenori Atsumi, Shigeyuki Nakadai*

A study on frequency-shaped PWM-type final-state control with quantization *Masayasu Suzuki, Yuya Takizawa, Mitsuo Hirata*

Room 1

SS1: Intelligent Sensing Applications for Human Assistive Systems (2)

Time: 16:00-17:20

Monday, 8 March 2021

Chairs: Hiroshi Igarashi, Naoki Motoi

Waste object classification with AI on the edge accelerators *Michael Schneider, Chowarit Mitsantisuk, Robert Amann*

Experimental validation of interface aiding human depth prediction on images in terms of usability *Takumi Kawamura, Yasutaka Fujimoto*

Internal Sensor Based Kinematic Parameters Estimation using

Acceleration/Deceleration Motion *Kaiki Fukutoku, Hirotoshi Masuda, Toshiyuki Murakami*

17:30-18:50

Room 3

SS6: Advanced Design Methods for Complex Mechatronic Systems and Systems of Mechatronic Systems (4)

Time: 17:30-18:50

Chairs: Johann Reger, Michael Ruderman

The Robust Exact Differentiator Toolbox revisited: Filtering and Discretization Features *Bendikt Andritsch, Martin Horn, Stefan Koch, Helmut Niederwieser, Maximilian Wetzlinger, Markus Reichhartinger*

Analysis of the Sensitivity of Mechatronic Systems Using the Example of a Light Guide *Peter Gust, Marco Kuhlmeier, Alina Sersch*

MPC-based Path Following Design for Automated Vehicles with Rear Wheel Steering *Chuanyang Yu, Yanggu Zheng, Barys Shyrokau, Valentin Ivanov*

Room 2

SS7: Smart Precision Motion Control in Mechatronic Systems (3)

Time: 17:30-18:50

Chairs: Kenta Seki, Nic Dirkx

Hybrid identification with time-series data and frequency response data for accurate estimation of linear characteristics *Ryohei Kitayoshi, Hiroshi Fujimoto*

Control-Relevant Neural Networks for Intelligent Motion

Feedforward *Leontine Aarnoudse, Wataru Ohnishi, Maurice Poot, Paul Tacx, Nard Strijbosch, Tom Oomen*

A Closed-Loop Perspective on Fault Detection for Precision Motion Control: With Application to an Overactuated System *Koen Classens, Maurice Heemels, Tom Oomen*

Room 1

SS1: Intelligent Sensing Applications for Human Assistive Systems (3)

Time: 17:30-18:50

Chairs: Hiroshi Igarashi, Naoki Motoi

Development of Haptic Feedback Control Stick for Remote Control between Different Structures *Hokuto Kurihara, Sota Shimizu, Rikuta Mazaki, Naoki Motoi, Roberto Oboe, Nobuyuki Hasebe, Tomoyuki Miyashita*

Assessment of Human Walking Stability Using the Gait Sensitivity Norm with Wearable Sensors *Hirotoshi Masuda, Kaiki Fukutoku, Toshiyuki Murakami*

On the Accuracy of IMUs for Human Motion Tracking: a Comparative Evaluation *Mattia Guidolin, Razvan Andrei Budau Petrea, Roberto Oboe, Monica Reggiani, Emanuele Menegatti, Luca Tagliapietra*

Monday, 8 March 2021

19:10-19:40

[Spatial Chat](#)

Award Ceremony

19:40-21:00

[Spatial Chat](#)

Online Networking

Tuesday, 9 March 2021

09:00-10:20

[Room 3](#)

SS9: Perception and Control of Automated Vehicles (1)

Time: 9:00-10:20

Chairs: Yafei Wang, Kanghyun Nam, Binh Minh Nguyen

Passivity Based Hierarchically Decentralized Range Extension Control of In-wheel-motor Vehicles *Binh-Minh Nguyen, Michihiro Kawanishi, Shinji Hara, Hung Nguyen-Van, Minh Ta, João Pedro F. Trovão, Tatsuo Narikiyo*

A Fuzzy Logic-Based Adaptive Dynamic Window Approach for Mining Truck Path Planning *Yubiao Lei, Yafei Wang, Shaoteng Wu, Xuefeng Gu, Xiaoju Qin*

A Deep Learning-based Approach to Line Crossing Prediction for Lane Change Maneuver of Adjacent Target Vehicles *Xulei Liu, Ge Jin, Yafei Wang, Chengliang Yin*

[Room 2](#)

SS4: Disturbance Modelling, Estimation and Active Compensation Control (1)

Time: 9:00-10:20

Chairs: Dapeng Tian, Chowarit Mitsantisuk

A Guide to Design Disturbance Observer-based Motion Control Systems in Discrete-time Domain *Emre Sariyildiz*

Disturbance Rejection Based on Equivalent-Input-Disturbance Approach Using High-Order Filter *Qicheng Mei, Jinhua She, Zhentao Liu, Yonghua Xiong, Wangyong He, Danyun Li*

Adaptive Cutting Force Observer for Machine Tool Considering Stage Parameter Variation *Koh Ohno, Hiroshi Fujimoto, Yoshihiro Isaoka, Yuki Terada*

[Room 1](#)

Machine Learning (2)

Time: 9:00-10:20

Chairs: Toshiaki Tsuji, Maiko Sato

Hierarchical Gait Generation for Modular Robots Using Deep Reinforcement Learning *Jiayu Wang, Chuxiong Hu, Yu Zhu*

Route optimization for autonomous bulldozer by distributed deep reinforcement learning *Yasuhiro Osaka, Naoya Odajima, Yutaka Uchimrua*

Development of a Reference Signal Self-Organizing Control System Based on Deep Reinforcement Learning *Hiromichi Iwasaki, Atsushi Okuyama*

10:30-11:50

[Room 3](#)

SS9: Perception and Control of Automated Vehicles (2)

Time: 10:30-11:50

Chairs: Yafei Wang, Kanghyun Nam, Binh Minh Nguyen

Tuesday, 9 March 2021

Time Series Prediction of Driving Motion Scenarios Using Fuzzy Neural Networks *Mohammad Reza Chalak Qazani, Houshyar Asadi, Mohammed Al-ashmori, Shady Mohamed, Chee Peng Lim, Saeid Nahavandi*

Self-Controlled In-Vehicle Traffic Light Based on The 4th Generation Mobile Communication *Yunshun Zhang, Qishuai Xie, Minglei Gao, Yingfeng Cai, Rencheng Zheng*

In-Vehicle Traffic Light based on Local Area Network *Yunshun Zhang, Minglei Gao, Qishuai Xie, Yingfeng Cai, Rencheng Zheng*

Room 2

SS4: Disturbance Modelling, Estimation and Active Compensation Control (2)

Time: 10:30-11:25

Chairs: Dapeng Tian, Emre Sariyildiz

Active Disturbance Rejection Controller Design for Oxygen Excess Ratio of Proton Exchange Membrane Fuel Cell *Chong Zhang, Yun feng Hu, Jin wu Gao*

Hybrid Reference Governor-Based Adaptive Robust Control of a Linear Motor Driven System *Yingqiang Liu, Xingyi Liu, Bobo Helian, Zheng Chen, Bin Yao*

Room 1

Haptics (2)

Time: 10:30-11:50

Chairs: Takahiro Nozaki, Hisayoshi Muramatsu

Evaluation of Power-Assisted Cart Based on Inherently Safe Control *Yasuhiro Minamiyama, Shingo Katada, Yuta Hirai, Takanori Kiyota, Noboru Sugimoto*

Validation of virtual hug effect under presentation of body contact pressure and HyperMirror image of a hug *Ryo Hattori, Fumitake Fujii, Osamu Morikawa*

A Design of Back-Drivable Tendon-Driven Mechanism on Robotic Finger *Kosuke Egawa, Seiichiro Katsura*

12:00-12:55

Room 1

Industry Lunch Session

Time: 12:00-12:55

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13:00-14:20

Room 3

SS5: Robot Environment Interaction (1)

Time: 13:00-13:55

Chairs: Sehoon Oh, Daisuke Yashiro

Admittance Control-based Bilateral Control System for Haptic Data Reduction *Shuhe Kimura, Takahiro Nozaki, Toshiyuki Murakami*

A New Autoregressive Neural Network Model with Command Compensation for Imitation Learning Based on Bilateral Control *Kazuki Hayashi, Ayumu Sasagawa, Sho Sakaino, Toshiaki Tsuji*

Tuesday, 9 March 2021

Room 2

SS4: Disturbance Modelling, Estimation and Active Compensation Control (3)

Time: 13:00-14:20

Chairs: Zheng Chen, Takenori Atsumi

An improved ant colony optimization for path planning with multiple UAVs *Jing Li, Yonghua Xiong, Jinhua She*
Cascade Terminal Sliding Mode Control for PMSM with Nonlinear Disturbance Observer *Xin Che, Dapeng Tian, Ping Jia*
Fractional-Order Based Resonant Controller for Torque Ripple Suppression of Permanent Magnet Synchronous Motors *Mingfei Huang, Yongting Deng, Hongwen Li*

14:30-15:50

Room 3

SS5: Robot Environment Interaction (2)

Time: 14:30-15:25

Chairs: Sehoon Oh, Daisuke Yashiro

Acceleration Measurement Enhances the Bandwidth of Disturbance Observer in Motion Control Systems *Emre Sariyildiz*
Multi Functional Drill Incorporating Linear Motor for Haptic Surgical Instrument and Simulator *Takuya Matsunaga, Tomoyuki Shimono, Kouhei Ohnishi, Shunya Takano, Hironao Kobayashi, Mitsuru Yagi, Masaya Nakamura*

Room 2

SS7: Smart Precision Motion Control in Mechatronic Systems (4)

Time: 14:30-15:50

Chairs: Takenori Atsumi, Masayasu Suzuki

Excitation System with Active Magnetic Bearing Control Performance Improvement for Rotordynamic Force Measurement *Shota Yabui, Hideyuki Inoue, Tsuyoshi Inoue*
Multirate Feedforward Control based on Modal Form with Mode Selection Applied to Multi-Modal High-Precision Positioning Stage *Masahiro Mae, Wataru Ohnishi, Hiroshi Fujimoto*
Double-Disturbance Compensation Design for Full-Closed Cascade Control of Flexible Robots *Vu Trung Tran, Makoto Iwasaki*

16:00-17:20

Room 3

SS5: Robot Environment Interaction (3)

Time: 16:00-17:20

Chairs: Emre Sariyildiz, Sho Sakaino

Force Disturbance Observer-based Force Control for Compliant Interaction with Dynamic Environment *Kangwagye Samuel, Dasol Cheon, Sehoon Oh*
Load Torque Control of an Electromagnetic Motor with a Reduction Gear, a Spring, and Motor/Load-Side Encoders *Daichi Kondo, Daisuke Yashiro, Kazuhiro Yubai, Satoshi Komada*
Improvement of McKibben Type Artificial Rubber Muscle Model Based on End Shape Deformation *Jun Kadowaki, Daisuke Sasaki, Hayato Yase, Ryutaro Kusaka*

Tuesday, 9 March 2021

	<p>Room 2</p> <p>SS7: Smart Precision Motion Control in Mechatronic Systems (5)</p> <p>Time: 16:00-17:20 Chairs: Kazuaki Ito, Tom Oomen</p> <p>Development of Reluctance Actuator for High-Precision Positioning and Scanning Motion <i>Ines Burgstaller, Shingo Ito, Hiroshi Fujimoto, Georg Schitter</i></p> <p>Suppressing spatially distributed disturbances by exploiting additional sensors and actuators in inferential motion control <i>Nic Dirkx, Tom Oomen</i></p> <p>Multirate State Tracking for Improving Intersample Behavior in Iterative Learning Control <i>Wataru Ohnishi, Nard Strijbosch, Tom Oomen</i></p>
	<p>Room 1</p> <p>Emerging Topics in Mechatronics (2)</p> <p>Time: 16:00-17:20 Chairs: Tomomasa Miyazaki, Kikuko Miyata</p> <p>Load Balancing Method Using Server Temperature Prediction Considering Multiple Internal Heat Sources in Data Centers <i>Xin Yao, Minato Omori, Hiroaki Nishi</i></p> <p>Frequency-domain experimental setup for mechatronic and suspension system components <i>Rafael Tavares, Michael Ruderman</i></p> <p>Smart Adaptronic Thermal Management System Designs for The Li-ion Battery Packs <i>Mohammad Joula, Savas Dilibal, Josiah Owusu Danquah</i></p>
17:30-17:50	<p>Room 1</p> <p>Closing Ceremony</p>
18:00-20:00	<p>Room 1</p> <p>Technical Tour</p>

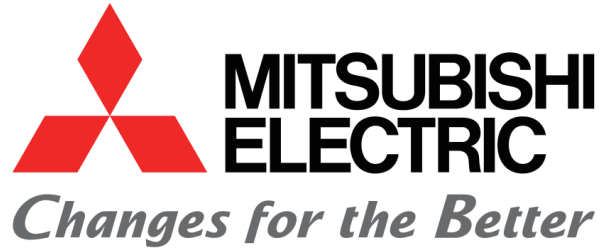
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