2023 IEEE/ASME International Conference on Advanced Intelligent Mechatronics

Conference Booklet

Seattle, Washington, June 28 – July 1, 2023
Welcoming Message

On behalf of the Organizing Committee of IEEE/ASME AIM 2023, we would cordially invite you to the 2023 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), being held on June 27-July 1 (Tue-Sat), 2023, in Seattle, Washington, USA. The conference will highlight advanced intelligent mechatronics systems expecting their promising contribution to our society. As the 26th AIM conference, AIM 2023 is co-sponsored by IEEE Robotics and Automation Society (RAS), IEEE Industrial Electronics Society (IES), and ASME Dynamic Systems and Control Division (DSCD). Our goal is to provide a platform to discuss, stimulate, and celebrate the state-of-art, frontier developments, discovery, and innovations in mechatronics, robotics, automation, and related areas. We look forward to your participation and seeing you in Seattle in June 2023!

Santosh Devasia, University of Washington
General Chair

Garret Clayton, Villanova University
Program Chair (NOC Co-Chair)
General Information

Registration
Registration will be located at the St. Helens, located on the 2nd floor (i.e., Mezzanine Level) of the hotel. The hours are as follows:
Tuesday, June 27: 2:30 PM–6:30 PM
Wednesday, June 28: 8:00 AM–5:00 PM
Thursday, June 29: 8:00 AM–5:00 PM
Friday, June 30: 8:00 AM–5:00 PM

Seattle, Washington
If you are looking for a fun and exciting destination to explore in a conference trip, check out the Seattle region! There are so many attractions to enjoy in the area. Whether you are into nature, culture, history, or entertainment, the Seattle region has something for everyone. You can visit the iconic Space Needle and enjoy the panoramic views of the city and the Puget Sound. You can explore the vibrant Pike Place Market and sample the fresh seafood, produce, and crafts. You can immerse yourself in the arts and culture scene at the Seattle Art Museum, the Museum of Pop Culture, or the Chihuly Garden and Glass. You can also take a day trip to the nearby Mount Rainier National Park and marvel at the majestic volcano and its stunning scenery. The Seattle region is a place where you can experience the best of both urban and natural beauty. Come enjoy AIM 2023 in Seattle. Don't miss this opportunity to discover one of the most amazing places in the world!

Hotel
The Westin Seattle, 1900 5th Avenue, Seattle, Washington 98101 USA
One of downtown Seattle's most dynamic destinations, the Westin Seattle offers guests spacious rooms and suites with anticipatory service, signature Heavenly® amenities and stunning views of the Seattle skyline. Seattle's famed Pike Place Market, the Space Needle, Washington State Convention Center and Lumen Field are nearby, offering ample opportunities for adventure and exploration. After a busy day exploring Seattle, enjoy curated local wines and innovative small plates at 1900 FIFTH, or savor elevated casual dining at Relish Burger Bistro. For relaxation, the hotel features a heated indoor pool and wellness-enhancing WestinWORKOUT® Fitness Studio with state-of-the-art gym equipment, including Peloton® bikes. For those seeking modern event space in downtown Seattle, the hotel features 70,000 square feet of versatile venues, as well as delicious catering and expert planning services. Come discover the Emerald City on your own terms at The Westin Seattle.

Transportation
Air access to Seattle is excellent. Seattle-Tacoma International Airport (Sea-Tac) offers direct flights to all major cities throughout North America, Europe, the Middle East, and Asia. It is the primary hub for Alaska Airlines, and a hub and international gateway for Delta Air Lines, which has expanded its operation at Sea-Tac since 2011. Thirty-four airlines serve 91 non-stop domestic and 28 international destinations including Amsterdam, London, Paris, Beijing, Dubai, Tokyo, and many other major cities around the globe.

Name Badges
Please wear your name badge at all times. Admission to all conference functions will be by the badges only (unless noted otherwise). Your badge also provides a helpful introduction to other attendees.

Conference Wi-Fi
Provided at the registration desk.
Sponsors

Silver Sponsor

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The following opportunities for collaboration may be of interest:

Machines 2023 Young Investigator Award (1500 CHF)
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Apply at: https://www.mdpi.com/journal/machines/awards/2200

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Rapid Publication: manuscripts are peer-reviewed and a first decision is provided to authors approximately 14.9 days after submission; acceptance to publication is undertaken in 2.8 days (median values for papers published in this journal in the second half of 2022).

Recognition of Reviewers: reviewers who provide timely, thorough peer-review reports receive vouchers entitling them to a discount on the APC of their next publication in any MDPI journal, in appreciation of the work done.

Testimonials: See what our authors say about Applied Sciences.

Companion journals for Applied Sciences include: Applied Nano, Osteology, AppliedChem, Applied Biosciences, Virtual Worlds, Spectroscopy Journal and JETA.

Impact Factor: 2.838 (2021); 5-Year Impact Factor: 2.921 (2021)
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Program at a Glance
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<td>10:00-12:00 ThTAMT2 Adams Machine Vision in Mobile Robots</td>
<td>10:00-12:00 ThTAMT3 Whidbey Innovations in MR Devices</td>
<td>10:00-12:00 ThTAMT4 Baker Actuators I</td>
<td>10:00-12:00 ThTAMT5 Orcas Sensors I</td>
<td>10:00-12:00 ThTAMT6 Blakely Rehabilitation Robotics</td>
<td>10:00-12:00 ThTAMT7 Vashon I Robotic Hands and Grippers</td>
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<td>15:00-17:00 ThTPMT6 Blakely HMI I</td>
<td>15:00-17:00 ThTPMT7 Vashon I AI Damage Detection</td>
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Plenary Sessions

**Wednesday, June 28**

**Data-Enhanced Mechatronic Systems for Smart Manufacturing**
8:30AM–9:30AM (Cascade Ballroom)

**Speaker:**
Robert X. Gao
Case Western Reserve University

**Abstract:** Driven by the exponential growth of data from widespread deployment of sensors and the continued advancement of computational infrastructure, AI/machine learning has been continually transforming the state of mechanical, electrical, and computer engineering. The transformation has led to a data-driven paradigm that complements and augments model-based techniques in the design and optimization of mechatronic systems for information acquisition, optimization, and control. The outcome is improved functionality, efficiency, and reliability of mechatronic systems to advance the state of smart manufacturing.

This presentation traces the data-enabled pathway towards integrating physics-based and data-driven methods for mechatronic systems in manufacturing. Recent progress in sensing, process monitoring, and process control enabled by this integration is illustrated. New research trends, such as concerted hardware-software co-design, are discussed. The presentation demonstrates the potential of data-driven methods as a key enabler to complement physical science for advancing mechatronics in realizing smart manufacturing.

**Biography:** Robert Gao is the Cady Staley Professor of Engineering and Department Chair of Mechanical and Aerospace Engineering at Case Western Reserve University in Cleveland, Ohio. Since receiving his Ph.D. degree from the Technical University of Berlin, Germany in 1991, he has been working on physics-based signal transduction mechanisms, stochastic modeling, and mechatronic system design, and AI/ML-based data analytics for improving the observability of cyber-physical systems such as manufacturing machines, with the goal to improve process and product quality control.

Professor Gao is a Fellow of the ASME, SME, IEEE, CIRP, and a Distinguished Fellow of the International Institute of Acoustics and Vibration (IIAV). He has published over 400 technical papers, including more than 190 journal articles, three books, and holds 13 patents. He has received several professional awards, including the ASME Milton C. Shaw Manufacturing Research Medal (2023), ASME Blackall Machine Tool and Gage Award (2018), SME Eli Whitney Productivity Award (2019), IEEE Instrumentation and Measurement Society Technical Award (2013), IEEE Best Application in Instrumental and Measurement Award (2019), Hideo Hanafusa Outstanding Investigator Award (2018), and several Best Paper awards.

Prof. Gao is the Chair of the Scientific Committee of the North American Manufacturing Research Institute (NAMRI/SME) and Chair of the Collaborative Working Group on AI in Manufacturing (CWG-AI) of CIRP. He has served as an Associate Editor for several journals, and is currently a Senior Editor for the IEEE/ASME Transactions on Mechatronics.
Wednesday, June 28
From R&D to Production: Challenges in Automation for Aerospace
1:30PM–2:30PM (Cascade Ballroom)

Speaker:
Philip L. Freeman
Boeing

Abstract: Aerospace has always been a challenging environment for automation. Long takt times, low volumes, high variation, and requirements for high precision make it challenging to transition laboratory R&D to qualified production automation. Boeing has a decades long history in developing, advancing, and deploying, automation for aerospace production. As we look into the future of production, we see new opportunities to accelerate the development and transition of new automation from R&D to production ready. In this presentation, we share some examples of automation at Boeing, current work in leveraging autonomy and robotics, and opportunities in simulation and virtual commissioning to accelerate development, qualification, and deployment of production ready systems.

Biography: Dr. Phil Freeman is a Senior Technical Fellow in Boeing Research and Technology (BR&T) focused on Advanced Production Systems, Assembly Automation, & Precision Robotics. As a Senior Technical Fellow in the area of Materials and Manufacturing Technology, Dr. Freeman has expertise in robotics, automation, and control. He works from Boeing’s Research and Technology Center in South Carolina. From 2012 to 2014, Dr. Freeman worked with BR&T South Carolina on 787 production support, helping the program meet production ramp up rate targets. Prior to that, he worked in the Assembly and Integration Technology team in St. Louis where he helped implement many of the automated drilling systems on the F/A-18 and F-15. Previously, he worked as Boeing’s liaison to the Advanced Manufacturing Research Centre in Sheffield, UK where he led the Centre’s development of an automated assembly research team, now the AMRC’s Integrated Manufacturing Group (IMG). Since joining Boeing in 1998, Dr. Freeman’s research work has been primarily focused on improving the accuracy of precision automated drilling and milling systems through accurate kinematics modeling and the use of robust machine vision. He holds over 30 patents covering a range of manufacturing technologies, and is an author on several publications in machine tool volumetric accuracy and machine vision for inspection. His current focus is leveraging simulation and model-based engineering to reduce the startup time of new automation technologies. Dr. Freeman is a member of American Society of Mechanical Engineers (ASME) where he is on the Board of Strategic Initiatives, serves as the vice chairperson for ASME B5.TC52 standards committee on machine tool performance, and is a contributing member to the Subcommittee on Robotic Arms (Manipulators). He is also a member of the Institute of Electrical and Electronic Engineers (IEEE) where he previously served on the industrial advisory board for the Robotics and Automation Society (RAS). Dr. Freeman earned his D.Sc. in System Science and Mathematics (2012), his M.S. in Mechanical Engineering (2003), and his B.S. in Mechanical Engineering (1997) all from Washington University in St. Louis.
**Thursday, June 29**
The New Age of Learning-based Robot Motion Planning

8:30AM–9:30AM (Cascade Ballroom)

**Speaker:**
Michael Yip
University of California, San Diego

**Abstract:** Robots and other autonomous systems need to understand how to move in complex and dynamic environments while avoiding or minimizing unwanted contact. With over 40 years of evolution, classical motion planning solutions have been hitting practical limits in solving many real-world environments due to their unpredictability as well as the curse-of-dimensionality. Even with today's best algorithms, we often experience unsatisfactory behaviors or performance: with robots taking many seconds or even minutes to think before they move, and even then, the movement may appear unusually roundabout and suboptimal. Higher-level considerations, including safety, responsiveness, and accounting for uncertainty can also add significant challenges.

Now, Machine Learning has arrived to the motion planning problem and promises to overcome the current limitations of our classical techniques and provide a transformative leap in autonomous planning and control. How does it manage to achieve this? In this talk, I will introduce our work in motion planning networks that started this path toward neural planners, breaking the mold of how robots should plan for navigation. In both simulation and real-world examples, we show how this research area has grown to solve multi-manipulator coordination, task and motion planning, kinodynamically constrained motion planners, autonomous driving, and more.

**Biography:** Michael Yip is an Associate Professor at the UC San Diego Contextual Robotics Institute, IEEE RAS Distinguished Lecturer, Hellman Fellow, and Director of the Advanced Robotics and Controls Laboratory (ARCLab). His group currently focuses on solving problems in data-efficient and computationally efficient robot control and motion planning through the use of various forms of learning representations, including deep learning and reinforcement learning strategies. These techniques focus on solving problems with robot manipulation and locomotion on novel, dextrous platforms, include surgical robot manipulators, continuum robots, snake-like robots, and vehicular systems. His work has been recognized through several best paper awards and nominations at ICRA and IROS, the 2017 best paper award for IEEE Robot and Automation Letters, and received the NSF CAREER and the NIH Trailblazer awards. Dr. Yip was previously a Research Associate with Disney Research Los Angeles, and Visiting Professors at Stanford University and at Amazon Robotics - Machine Learning and Computer Vision Group. He received a B.Sc. in Mechatronics Engineering from the University of Waterloo, an M.S. in Electrical Engineering from the University of British Columbia, and a Ph.D. in Bioengineering from Stanford University.

**Thursday, June 29**
Working from Home is Nice, but Flying to Work is Better

1:30PM–2:30PM (Cascade Ballroom)

**Speaker:**
Celia Oakley
Opener
**Abstract:** How would you like to climb into your personal aircraft, take off, and be whisked away to your destination? For recreation, you could soar over trees, rivers, and hillsides, marvel at the earth’s beauty below, travel to locations not reachable by car, and relish in remote areas of nature. For work, you could dash high above commuter traffic, as the crow flies, arrive well rested and ready to get things done, and interact with colleagues while suppressing a grin. We at Opener are taking steps toward making this dream come true with the personal aerial vehicle called BlackFly. Classified as an ultralight, BlackFly can be flown today in non-congested areas. Taking off and landing vertically eliminates the need for a runway, and no pilot’s license is required. In this talk, I’ll describe what it means to be an ultralight vehicle, discuss the technological advances that came together to enable the creation of BlackFly, share some key considerations in the design and development of personal aerial vehicles, and summarize how far we’ve come. Throughout my talk, I’ll share videos tracing Blackfly’s evolution. So buckle your seat belt and get ready to take off: Watching BlackFly in action, you’ll share in the thrill of three-dimensional freedom.

**Biography:** Celia Oakley is the Chief Information Officer (CIO) of Opener, where she has worked for more than eight years on BlackFly, the company’s groundbreaking electric personal flying eVTOL vehicle. After designing and implementing Opener’s flight testing program, she moved on to oversee the development of Opener’s information systems: internal custom web applications, cloud-to-aircraft communication, website, enterprise software platforms, and IT. Before arriving at Opener, Dr. Oakley was a member of the Stanford Racing Team that created Stanley, the world's first successful self-driving car, which won the DARPA Grand Challenge in 2005. Dr. Oakley received her B.S. in Mechanical Engineering from U.C. Berkeley and her M.S. and Ph.D. in Mechanical Engineering, with a Minor in Computer Science, from Stanford University.

**Friday, June 30**

**Sea Lamprey, E-skin, and Robotic Fish:**
**Mechatronic Solutions to Invasive Species Control**

8:30AM–9:30AM (Cascade Ballroom)

**Speaker:**
Xiaobo Tan
Michigan State University

**Abstract:** The sea lamprey, sometimes known as “vampire fish”, is an invasive species in the Great Lakes region that threatens its ecosystems and billion-dollar fisheries. The parasitic sea lamprey uses suctorial mouth to prey on various host fish by attaching to the fish and draining its body fluids. In this talk we first describe our effort in developing a soft pressure sensor array as an electronic skin (e-skin), for detecting the suction by adult sea lampreys during their upstream migration for spawning. Such e-skins can be mounted at strategically chosen places, such as selective fishways, to facilitate the capture and population assessment of sea lampreys. We discuss regularized least-square algorithms for mitigating the crosstalk in the resistor network of the sensor array, to properly reconstruct the pressure profile under lamprey suction. Machine learning is further adopted to automate the lamprey detection process, as verified with data from animal experiments. In the second part of the talk we explore tracking the movement of fish, such as sea lampreys, with mobile acoustic telemetry, which provides key information about fish migration patterns and habitat uses and is thus critical to decision-making in fishery management. In mobile acoustic telemetry, acoustic tags are implanted in fish and emit pings periodically, which are picked up by acoustic receivers mounted on robots to infer the fish location. We discuss the use of gliding robotic fish and unmanned surface vehicles for tracking acoustic tags, and specifically, we show how distributed filtering by a group of robots can result in localization of a moving target based on the time-difference-of-arrivals (TDOAs) of the emitted signal.
Biography: Dr. Xiaobo Tan is an MSU Foundation Professor and the Richard M. Hong Endowed Chair in Electrical and Computer Engineering at Michigan State University (MSU). He received his bachelor's and master's degrees in automatic control from Tsinghua University, Beijing, China, in 1995, 1998, respectively, and his Ph.D. in electrical and computer engineering (ECE) from the University of Maryland in 2002. His research interests include bio-inspired robots, soft sensors and actuators, and modeling and control of systems with hysteresis. In particular, his group has developed and field-tested autonomous underwater and surface robots for mobile sensing applications. He has published over 300 papers and been awarded four US patents in these areas.

Dr. Tan is a Fellow of IEEE and ASME. He is a recipient of the NSF CAREER Award (2006), MSU Teacher-Scholar Award (2010), MSU College of Engineering Withrow Distinguished Scholar Award (2018), Distinguished Alumni Award from the ECE Department at University of Maryland (2018), MSU William J. Beal Outstanding Faculty Award (2023), and multiple best paper awards. Dr. Tan is keen to integrate his research with educational and outreach activities, and has served as Director of an NSF-funded Research Experiences for Teachers (RET) Site program at MSU from 2009 - 2016 and Curator of a robotic fish exhibit at MSU Museum in 2016-2017.

Friday, June 30
Beyond Conventional Interfaces: Exploring the Intersection of Wearable Technologies, Textiles, and Physical Computing
8:30AM–9:30AM (Cascade Ballroom)

Speaker:
Teddy Seyed
Microsoft

Abstract: How can physical computing and interactive fabrics change the way we engage with everyday objects and environments? In this talk, I delve into the transformative potential of applying physical computing principles to wearable technologies and smart textiles, highlighting different breakthroughs such as pocket-based textile sensors capable of detecting user input and recognizing objects carried in our pockets, as well as new touch-sensitive interfaces that leverage different materials like graphene-based fabrics, among others. These types of advancements tease a new era in human-computer interaction, where the seamless integration of wearable technologies, textiles, and physical computing lead to novel, intuitive, and context-aware interactions with the objects and surroundings in our daily lives. As the field is rapidly progressing from fundamental research to commercialization, this talk will showcase the state-of-the-art in the cross-section of domains, as well as describe future research directions and applications that will reshape the way we experience and interact with the world around us.

Biography: Dr. Teddy Seyed is a Senior Researcher at Microsoft Research, located in Redmond, WA, USA. He holds the distinction of being the first in Canada to receive an Entrepreneurial PhD in Computer Science, earned from the University of Calgary. His PhD dissertation also won the Bill Buxton Award for best Human-Computer Interaction (HCI) dissertation in Canada. Dr. Seyed's research primarily focuses on Human-Computer Interaction (HCI) for the development and exploration of wearables, fashion-technology, physical computing, new devices and modalities. His work has been featured in publications such as Forbes Magazine and Gizmodo.

In addition to his research pursuits, Dr. Seyed has a strong entrepreneurial spirit, co-founding several startups, successfully completing crowdfunding campaigns, shipping products, and participating in
competitive business accelerators. Currently, he leads the Future of Wearables mini-group at Microsoft Research.

Social and Networking Activities

Opening Reception
Tuesday, June 27
6:30 PM–8:30 PM
Cascade Ballroom
All participants are invited to an opening reception on Tuesday, June 27th that will be held at the Cascade Ballroom of the Westin Seattle (conference venue).

Coffee Breaks
Daily (Wednesday, June 28 through Friday, June 30)
9:30 AM–10:00 AM and 2:30 PM–3:00 PM
Cascade Foyer

Conference Lunch
Thursday, June 29
12:00 PM–1:30 PM
Grand 3
Tickets and/or Badges are required.

Award Ceremony
Friday, June 30
8:15 AM–8:30 AM
Cascade Ballroom
All awards will be announced before Friday’s plenary talk. All conference attendees are encouraged to attend! Come celebrate accomplishments in our field!

Closing Reception
Friday, June 30
5:00 PM–7:00 PM
Cascade Ballroom
Tickets and/or Badges are required.

Student Events

Student Best Paper Award Finalists:

Spotlight: Best Student Papers
Wednesday, June 28
3:00 PM – 5:00 PM
Orcase

*Presenting author

“Design and Parametric Analysis of a Magnetic Leadscrew with an Embedded Displacement Sensor,” Li, Wenjin* and Lee, Kok-Meng, Georgia Institute of Technology
“Task-Constrained Motion Planning Considering Uncertainty-Informed Human Motion Prediction for Human-Robot Collaborative Disassembly,” Liu, Wansong*; Liang, Xiao and Zheng, Minghui, University at Buffalo
“Motion Dynamics Modeling and Fault Detection of a Soft Trunk Robot,” Jandaghi, Emadodin*; Chen, Xiaotian and Yuan, Chengzhi, University of Rhode Island
“Spectro-Temporal Recurrent Neural Network for Robotic Slip Detection with Piezoelectric Tactile Sensor,” Ayral, Théo*; ALOUI, Saifeddine and Grossard, Mathieu, CEA-Leti
“Design and Control of a Ground-Aerial Dual Actuator Monocopter (G-ADAM),” Suhadi, Brian Leonard*; Timothy, Wong; Win, Shane Kyi Hla; Win, Luke Soe Thura and Foong, Shaohui, Singapore University of Technology and Design.

**Best Paper Candidates**

**Best Paper Award Finalists:**

*Presenting author

“Development of Orthopedic Haptic Drill for Spinal Surgery with Penetration Detection Scheme Based on Viscosity Estimation”, Takano, Shunya*; Shimono, Tomoyuki; Matsunaga, Takuya; Yagi, Mitsuru; Ohnishi, Kouhei; Nakamura, Masaya; Mima, Yuichiro; Yamanouchi, Kento; Ikeda, Go
“Spectro-Temporal Recurrent Neural Network for Robotic Slip Detection with Piezoelectric Tactile Sensor”, Ayral, Théo*; ALOUI, Saifeddine; Grossard, Mathieu
“Simulation of Particle Motion on Rotating Cone Feeder for a Multihead Weigher Based on Dynamic Friction Modeling”, Hartmann, Julia Isabel*; Olbrich, Michael; Hamann, Marcus; Ament, Christoph
“Low-Cost, Accurate Robotic Harvesting System for Existing Mushroom Farms”, Mavridis, Panagiotis*; Mavrikis, Nikolaos; Mastrogeorgiou, Athanasios; Chatzakos, Panagiotis
“A Fully 3D Printed, Multi-Material, and High Operating Temperature Electromagnetic Actuator”, Mettes, Sebastian*; Bates, Justin; Allen, Kenneth; Mazumdar, Yi
“Strategy for Haptic-Based Guidance of Soft Magnetic Particles in the Cochlea”, CHAH, Ahmed*; Elfakir, Hanaâ; Larbi, Meziane; Belharet, Karim

**Special Session**

**Biologically Inspired Intelligence for Mechatronics and Robotics**
Friday, June 30
3:00 PM-5:00 PM
Vashon 1

**Organizers:** Chaomin Luo, Mississippi State University (USA), Zhuming Bi, Purdue University Fort Wayne (USA)

**Description:** Biologically inspired intelligence technique, an important branchment of series on computational intelligence, plays a crucial role for robotics. The autonomous robot and vehicle industry has had an immense impact on our economy and society, and this trend will continue with biologically inspired intelligence techniques. Biologically inspired intelligence, such as biologically inspired neural networks (BINN), is about learning from nature, which can be applied to the real-world robot and vehicle systems. Recently, the research and development of bio-inspired systems for robotic applications is increasingly expanding worldwide. Biologically inspired algorithms contain emerging sub-topics such as bio-inspired neural network algorithms, brain-inspired neural networks, swarm intelligence with BINN, ant colony optimization algorithms (ACO) with BINN, bee colony optimization algorithms (BCO), particle swarm optimization with BINN, immune systems with BINN, and biologically inspired evolutionary optimization and algorithms, etc. Additionally, it is decomposed of computational aspects of bio-inspired systems such as machine vision, pattern recognition
Innovative Magnetorheological Devices and Applications

Innovative Magnetorheological Devices and Applications
Thursday, June 29th
10:00 AM -12:00 PM
Whidbey
Organizers: Yancheng Li, University of Technology Sydney (Australia), Haiping Du, University of Wollongong (Australia)
Description: The invited session will bring researchers together to share recent advances in applications of magnetorheological (MR) materials in vibration control, vehicle dynamics and related areas. In this session, six invited papers will be presented, covering magnetorheological device development, theoretical and experimental studies on semi-active suspension and haptic devices. This session will cover various applications of magnetorheological materials, including development of semi-active vehicle suspension, new MR device development for haptic apparatus, innovative device for multiple mode vibration isolation, etc. All above research and development represent leading research in the field which underpins the great potential of the MR materials.

Damage Detection, Diagnosis and Prognosis of Materials and Structures Using Artificial Intelligence

Thursday, June 29th
15:00 PM -17:00 PM
Vashon I
Organizers: Jing Rao, The University of New South Wales (Australia), Yaguo Lei, Xi’an Jiaotong University (China), Sattar Dorafshan, University of North Dakota (USA)
Description: Damage detection, diagnosis and prognosis of materials and structures play an important role in structural health monitoring (SHM), and condition assessment. The typical components of an SHM system include sensor selection and placement, data acquisition, data transmission, data processing and control, data management, structural health evaluation, decision-making, and inspection and maintenance. Sensing technologies (data acquisition and data transmission) and data processing algorithms are two critical factors for the success of SHM of materials and structures. Damage diagnosis using artificial intelligence algorithms can provide important information for assessing current conditions and predicting the future performance of materials and structures. Damage prognosis methods and performance assessment techniques can ensure the safe operation of structures and help determine cost effective maintenance strategies. The objective of the invited session is to share and discuss recent advances in the development and application of artificial intelligence for damage detection, diagnosis and prognosis of materials and structures. Topics covered in this invited session include, but are not limited to, the latest ideas and advances in theories, techniques, and methods used to advance knowledge in different aspects of artificial intelligence, such as smart sensors, data mining and processing, structural damage diagnosis and prognosis, and artificial intelligence algorithms, as well as case studies that demonstrate the practical application of advanced artificial intelligence techniques.
Intelligent Human-Machine Collaboration for Advanced Mechatronics and Robotics
Thursday, June 29th
15:00 PM -17:00 PM
Vashon II
Organizers: Chen Lv, Nanyang Technological University (Singapore), Yifan Wang, Nanyang Technological University (Singapore), Yang Xing, Cranfield University (UK), Huang Chao, The Hong Kong Polytechnic University (China)
Description: Before realizing full autonomy, human-machine collaboration with multi-modal human-machine interface (HMI) will play a significant role in the development of advanced robotics, mechatronics, and machine intelligence. Multi-modal HMI consists of a class of artificial interfaces that connect a person to a machine, system, or device. They can record varying human inputs and provides feedback through tactile, visual, auditory, olfactory, and gustatory signals, and enables safe, smart and smooth human-machine interactions and collaboration. As the cornerstone of HMI, a broad range of sensors have been developed to monitor mechanical (e.g., strain, pressure, torque), biological (e.g., electrophysiology and metabolic biomarkers), and other input signals. In the past decades, this field has gained remarkable progress due to the advances in soft materials, intelligent structures, flexible electronics as well as data-driven machine learning technologies, which may support and lead to a new era of smart robotics. In the meantime, however, new challenges, for example how to ensure a safe, intelligent, and comfortable interactions and collaboration between humans and automation functionalities, remain opening. In this context, novel human-machine interfaces are expected to be designed and developed to make full use of the great potentials and advantages of both humans and automation systems. Therefore, novel interface design, efficient interaction and collaboration approaches between human and machine for increasing the mutual understanding, trust, and bilateral acceptance are of great importance for the development of advanced robotics and mechatronics. This special session aims to provide up-to-date research concepts, and practical solutions that could help advance the human-machine collaboration for advanced mechatronics and robotics.

Workshops

Workshop on Mechatronics Education
Wednesday, June 28th, 2023, 10:00 AM - 12:00 PM, Vashon 2
Organizers: Vishesh Vikas, University of Alabama, USA; Sandipan Mishra, Rensselaer Polytechnic Institute, USA
Abstract: The purpose of this workshop is to provide a forum to discuss recent advances and challenges in the field of mechatronics education. The multi-disciplinary nature of the field includes topics from controls theory, mechanism design, microprocessor programming and system integration, to name a few. Furthermore, the wide application of mechatronic systems does allow for increased interest in the field, however, has resulted in education challenges - what, why and how to teach the topics in a limited time-frame? The timeline typically being one (or two) semester course(s). It would be safe to say that almost every university offers a course in mechatronics that is being taught by extremely passionate and creative educators. Some of these pedagogies are communicated to the public through research papers at conferences, however, most remain with the educators, while being fine-tuned over multiple years. This workshop will provide participants with an opportunity to present and discuss the pedagogies for mechatronics education and their perspective of what is fundamental knowledge with the focus on curating resources (including experiments, projects) that encompass multi-disciplinary education. This will be done through a series of invited talks, a solicited poster session, and an interactive panel discussion.
Workshop website: https://arl.ua.edu/mechatronics-education-workshop-at-aim-2023.html
Abstract: Longitudinal cruise control with small inter-vehicle distances, for improved fuel efficiency, and increased traffic throughput, requires each vehicle in the network to move similarly, such as during speed transitions at traffic intersections. Likewise, a network of robots transporting a flexible object need to maintain distance-based formation to avoid object deformation during transport. Therefore, cohesive transitions of networked multi agent systems, where each agent in the network responds similarly, is essential for multi-agent systems. A challenge is that current neighbor-based network control approaches mainly focus on achieving cohesion at the end but not during the transition, e.g., by improving the convergence rate of network responses to the final cohesive state. Increasing the response speed of each agent in the network helps achieve this transition in a shorter amount of time, but cohesion can still be lost during the transition. Cohesion in networks can be achieved through a centralized controller to ensure each agent performs similar actions, for instance using wireless communication. However, such centralized approaches require explicit inter-agent communication, which incurs additional infrastructure cost, and can be susceptible to cybersecurity threats where intruder agents obtain access to the network information. This workshop presents recent research developing decentralized network control strategies for cohesive network transitions, for achieving cohesion not just at the end of the transition but also during the transition.

Workshop website: https://sites.google.com/view/anujtiwariuw/aim-2023-workshop
Technical Sessions
Technical Program for Wednesday June 28, 2023

WePAMP Cascade Ballroom

**Plenary: Data-Enhanced Mechatronic Systems for Smart Manufacturing** (Plenary Session)

08:30-09:30 WePAMP.1

Data-Enhanced Mechatronic Systems for Smart Manufacturing*.
Gao, Robert X. (Case Western Reserve University)

09:30-10:00 WeCAMC.1

Aerodynamic Effect for Collision-Free Reactive Navigation of a Small Quadcopter*.
Ding, Runze (City University of Hong Kong); Dong, Kaixu (City University of Hong Kong); Bai, Songnan (City University of Hong Kong); Chirarattananon, Pakpong (City University of Hong Kong)

09:30-10:00 WeCAMC.2

Exploration of Aerial Torsional Work Using an Add-On Thrust Vectoring Device*.
Rosales Martinez, Ricardo (Ritsumeikan University); Paul, Hannibal (Ritsumeikan University); Shimonomura, Kazuhiro (Ritsumeikan University)

09:30-10:00 WeCAMC.3

Kwak, Taehoon (Chung-Ang University); Kim, Yeongjae (Chung-Ang University); Kim, Tae-Hyung (Chung-Ang University)

09:30-10:00 WeCAMC.4

Improving Human-Led Multi-Robot Platoon Using Decentralized DSR*.
Chang, Henry (University of Washington); Lin, Yudong (University of Washington)

09:30-10:00 WeCAMC.5

Design and Control of a Solar Panel Cleaning Robot*.
Lee, Beom Jin (Chungnam National University); Kwon, Dong Wook (Chungnam National University); Jung, Seul (Chungnam National University)

09:30-10:00 WeCAMC.6

Buried Snow Avalanche Victim Search: An Ergodic-Based Approach*.
Lapins, Chantel K. (University of Utah); Leang, Kam K. (University of Utah)

09:30-10:00 WeCAMC.7

Reduced Deformation Transport of Flexible Objects Using Decentralized Robot Networks, pp. 2-2.
Gombo, Yoshua (University of Washington); Tiwari, Anuj (University of Washington); Devasia, Santosh (University of Washington)

09:30-10:00 WeCAMC.8

Trajectory Planning and Motion Control of Unmanned Forklift for Efficient Operation in Automated Warehouse*.
Vorasawad, Konchanok (Pukyong National University); Kim, Hyunjung (Samsung Heavy Industry); Lee, Juhyun (Samsung Heavy Industry); Kim, Mooseok (Samsung Heavy Industry); Kim, Changwon (Pukyong National University)

09:30-10:00 WeCAMC.9

Dynamic Inversion for Wheeled Inverted Pendulum with Extra Joint Using Singular Perturbation Technique*.
Kim, Munyu (Korea University); Cheong, Joono (Korea University)

09:30-10:00 WeCAMC.10

Robust Quadrupedal Locomotion through Asymptotic Stabilization of H-LIP on Dynamic Rigid Surfaces with General Vertical Motion*.
Iqbal, Amir (University of Massachusetts, Lowell, MA)

10:00-10:20 WeTAMT1.1

A Multi-Modal Deformable Land-Air Robot for Complex Environments*.
Zhang, Xinyu (Tsinghua University); Huang, Yuanhao (Inner Mongolia University of Technology); Huang, Kangyao (Tsinghua University); Wang, Xiaoyu (School of Vehicle and Mobility, Tsinghua University); Dafeng, Jin (National Automotive Research Institute, Tsinghua University, Suzhou); Liu, Huaping (Tsinghua University); Li, Jun (The School of Vehicle and Mobility, Tsinghua University, Beijing); Lu, Pingping (University of Michigan)

10:20-10:40 WeTAMT1.2

Martynov, Mikhail (Skolkovo Institute of Science and Technology); Darush, Zhanibek (Skolkovo Institute of Science and Technology); Fedoseev, Aleksey (Skolkovo Institute of Science and Technology); Tsetsenko, Dzmitry (Skolkovo Institute of Science and Technology)

10:40-11:00 WeTAMT1.3

Wauters, Johan (Ghent University); Lefebvre, Tom (Ghent University); Crevecoeur, Guillaume (Ghent University)

11:00-11:20 WeTAMT1.4

Design and Control of a Ground-Aerial Dual Actuator Monocopter (G-ADAM), pp. 17-24.
Suhadi, Brian Leonard (Singapore University of Technology and Design); Timothy, Wong (Singapore University of Technology & Design); Win, Shane Kyi Hla (Singapore University of Technology & Design); Win, Luke Soe Thura (Singapore University of Technology & Design); Foong, Shaohui (Singapore University of Technology and Design)

11:20-11:40 WeTAMT1.5

Vertical Take-Off and Landing Fixed Wing Designed for Autonomous Missions, pp. 25-30.
Lewandowski, Krzysztof (Silesian University of Technology); Tomczak, Jakub Łukasz (Silesian University of Technology); Zeifert, Jakub (Silesian University of Technology); Nowacki, Szymon (Silesian University of Technology); Król, Marcin (High Flyers); Grzybowska, Jacek (Silesian University of Technology, High Flyers); Rudy, Dawid (Silesian University of Technology); Czyba, Roman (Silesian University of Technology); Lemanowicz, Marcin (Silesian University of Technology); Czekalski, Piotr (Silesian University of Technology); Piorkowski, Pawel (Silesian University of Technology)

11:40-12:00 WeTAMT1.6

Investigating the Effects of Polynomial Trajectories on Energy Consumption of Quadrotors, pp. 31-31.
Alkomy, Hassan (York University); Shan, Jinjun (York University)

12:00-12:20 WeTAMT2.1

Adams,...

Carlier, Remy (Dynamical Systems & Control Group (DySC), Ghent University and F); Gillis, Jonas (KU Leuven); Rademakers, Erwin (Flanders Make); Bonghesan, Gianni (KU Leuven); De Clercq, Pieter (Flanders Make); Ganseman, Chris (Flanders Make); Stockman, Kurt (Universiteit Gent); De Kooning, Jeroen D. M. (Dynamical Systems & Control Group (DySC), Ghent University and F)


Mahmoodi Nasrabadi, Hazhir (The University of Texas at Dallas); Nikooinejad, Nastaran (University of Texas at Dallas); Kumar, Singh, Vikrant (The University of Texas at Dallas); Moheimani, S. O. Reza (The University of Texas at Dallas)

Data-Driven Robust Optimal Acoustic Noise Filtering of Atomic Force Microscope Image, pp. 91-96.

Chen, Jiaron (Rutgers, the State University of New Jersey); Zou, Qingze (Rutgers, the State University of New Jersey)

Transfer of Soft Robots by Learning - Independent Tendons Increase Stiffness of Continuum Robots without Actuator Coupling, pp. 64-70.

Molaei, Parsa (Louisiana State University); Pitts, Nekita A. (Louisiana State University Agricultural and Mechanical College); Gilbert, Hunter B. (Louisiana State University)


Song, Longgang (Shaanxi University of Science & Technology); Chang, Bo (Shaanxi University of Science and Technology); Feng, Yuhang (Shaanxi University of Science & Technology); Jin, Jialong (Shaanxi University of Science & Technology); Zhou, Quan (Aalto University)

WeTAMT3

Micro and Nano Systems (Regular Session)

10:00-10:20 WeTAMT3.1

A High-Bandwidth Closed-Loop MEMS Force Sensor with System Dynamics Adjustment, pp. 71-76.

Dadkhah, Diyako (University of Texas at Dallas); Moheimani, S. O. Reza (The University of Texas at Dallas)

10:20-10:40 WeTAMT3.2

AFM SMILER: A Scale Model Interactive Learning Extended Reality Toolkit for Atomic Force Microscopy Created with Digital Twin Technology, pp. 77-84.

Xia, Fangzhou (Massachusetts Institute of Technology); Lovett, Shane (Massachusetts Institute of Technology); Forsythe, Eyan (Massachusetts Institute of Technology); Ibrahim, Malek (Massachusetts Institute of Technology); Youcef-Toumi, Kamal (Massachusetts Institute of Technology)

10:40-11:00 WeTAMT3.3


Song, Longgang (Shaanxi University of Science & Technology); Chang, Bo (Shaanxi University of Science and Technology); Feng, Yuhang (Shaanxi University of Science & Technology); Jin, Jialong (Shaanxi University of Science & Technology); Zhou, Quan (Aalto University)

WeTAMT4

Control Applications I (Regular Session)

10:00-10:20 WeTAMT4.1

Admittance-Based Non-Singular Terminal Sliding Mode Control of Multiple Cooperative Manipulators, pp. 103-108.

Wan, Lucas (Dalhousie University); Pan, Ya-Jun (Dalhousie University); Chen, Qiguang (Dalhousie University)

10:20-10:40 WeTAMT4.2


Wang, Jie (Purdue University); Chiu, George (Purdue University)

10:40-11:00 WeTAMT4.3


Busetto, Riccardo (Politecnico Di Milano); Lucchini, Alberto (Politecnico Di Milano); Formentin, Simone (Politecnico Di Milano); Savarese, Sergio (Politecnico Di Milano)

11:00-11:20 WeTAMT4.4


Carlier, Remy (Dynamical Systems & Control Group (DySC), Ghent University and F); Gillis, Jonas (KU Leuven); Rademakers, Erwin (Flanders Make); Bonghesan, Gianni (KU Leuven); De Clercq, Pieter (Flanders Make); Ganseman, Chris (Flanders Make); Stockman, Kurt (Universiteit Gent); De Kooning, Jeroen D. M. (Dynamical Systems & Control Group (DySC), Ghent University and F)

11:20-11:40 WeTAMT4.5

Error Diffusion Based Feedforward Height Control for Inkjet 3D Printing, pp. 117-123.

Wu, Yumeng (Cruise LLC); Chiu, George (Purdue University)

11:40-12:00 WeTAMT4.6

Flatness-Based MPC Using B-Splines Transcription with Application to a Pusher-Slider System, pp. 124-129.

Neve, Thomas (Ghent University); Lefebvre, Tom (Ghent University); De Witte, Sander (Ghent University); Crevecoeur, Guillaume (Ghent University)
**Simulation of Particle Motion on Rotating Cone Feeder for a Multithread Weigher Based on Dynamic Friction Modeling**, pp. 130-135.
Hartmann, Julia Isabel (Augsburg University); Olbrich, Michael (Augsburg University); Hamann, Marcus (Augsburg University); Ament, Christoph (Augsburg University)

Mavridis, Panagiotis (TWI-Hellas); Mavrikis, Nikolaos (TWI-Hellas); Mastrogiorgettu, Athanasios (National Technical University of Athens); Chatzakos, Panagiotis (University of Essex AI Innovation Centre)

Seino, Akira (Centre for Transformative Garment Production); Terayama, Junya (Tohoku University); Tokuda, Fuyuki (Centre for Transformative Garment Production); Kobayashi, Akinari (Centre for Transformative Garment Production); Kosuge, Kazuhiro (The University of Hong Kong)

Lakhal, Othman (University Lille, CRISTAL, CNRS-UMR 9189); Belarouci, Abdelkader (University of Lille - CRISTAL Lab); Yang, Xinrui (University of Lille); Chettibi, Taha (Laboratoire Structures, Département Mécanique, Faculté De Techno); Merzouki, Rochdi (CRISTAL, CNRS UMR 9189, University of Lille)

Sallam, Mohamed Abdelghany Abdelghany (University of Naples Federico II); Fontanelli, Giuseppe Andrea (University of Naples Federico II); Ficuciello, Fanny (Università Di Napoli Federico II)

**Haptic Interface Design for a New Wheelchair Locomotion Simulator Based on a Linear Time-Varying MPC Framework**, pp. 164-170.
Ait Ghezala, Amel (LAMMI UMR CNRS 8201, Université Politechnique Hauts-De-France); Bentaleb, Toufik (Univ. Valenciennes, CNRS, Valenciennes); Podil, Philippe (Université Politechnique Hauts-De-France); Poulain, Thierry (Lamih, Umr Cnrs 8201, Uphp); Conreau, Gerald (Lamih, Umr Cnrs 8201, Uphp)

Li, Teng (University of Alberta); Badre, Armin (University of Alberta); Taghirdar, Hamid D. (K.N.Toosi University of Technology); Tavakoli, Mahdi (University of Alberta)

Xiong, Jing (Shenzhen Institute of Advanced Technology, Chinese Academy of Sc); Li, Qiangyun (Shenzhen Institute of Advanced Technology, Chinese Academy of Sc); Ahmad, Faizan (Shenzhen Institute of Advanced Technology, Chinese Academy of Sc); Xu, Changfu (Chinese Academy of Sciences); Deng, Hao (Shenzhen Institutes of Advanced Technology, CAS); Xia, Zeyang (Chinese Academy of Sciences)

Takano, Shunya (Kanagawa Institute of Industrial Science and Technology); Shimono, Tomoyuki (Yokohama National University); Matsuura, Takuya (Kanagawa Institute of Industrial Science and Technology); Yagi, Mitsuji (Keio University School of Medicine); Ohnishi, Kouhei (Keio Univ); Nakamura, Masaya (Keio University School of Medicine); Mima, Yuichiro (Keio University School of Medicine); Yamanouchi, Kento (Keio University School of Medicine); Ikeda, Go (Japan Medtronic Company Ltd)

Chah, Ahmed (JUNIA / HEI Campus Centre); Elsayar, Hanaa (Junia); Larbi, Meziane (Automatic Laboratory of Skikda); Belharet, Karim (Hautes Etudes d'Ingénieur - HEI Campus Centre)

Huang, Ching Hung (National Cheng Kung University); Chiao, Kuan-Wei (National Cheng Kung University); Yu, Chen-Pin (National Cheng Kung University); Guo, Yen-chien (National Cheng Kung University); Lam, Cho-chieh (National Cheng Kung University)

**Mitigate Inertia for Wrist and Forearm towards Safe Interaction in 5-DOF Cable-Driven Robot Arm**, pp. 207-212.
Nguyen, Pho (Nanyang Technological University); Sunil Bohra, Dhyan (Nanyang Technological University); Hoang, Chi Cuong (Schaeffler Singapore Pte Ltd); Han, Boon Siew (Institute for Infocomm Research (I2R)); Tan, Jinyuang (Schaeffler Singapore Pte Ltd); Chow, Wai Tuck (Nanyang Technological University)

**Kinodynamic Motion Planning for Robotic Arms Based on Learned Motion Primitives from Demonstrations**, pp. 213-219.
Ashley, Joshua (University of Kentucky); Kennedy, Daniel (University of Kentucky); Xie, Biyun (University of Kentucky)

Kwon, Bin (Georgia Institute of Technology); Kosieradzki, Shane (Georgia Institution of Technology); Blevins, Jacob (Georgia Institute of Technology); Blevins, Jacob (Georgia Institute of Technology)
WeCPMC
Poster Session - Wednesday II
14:30-15:00 WeCPMC.1
**Aerodynamic Effect for Collision-Free Reactive Navigation of a Small Quadcopter**.
- Ding, Runze (Georgia Institute of Technology); Lee, Kok-Meng (Georgia Institute of Technology)

14:30-15:00 WeCPMC.2
**Exploration of Aerial Torsional Work Using an Add-On Thrust Vectoring Device**.
- Rosales Martinez, Ricardo (Ritsumeikan University); Paul, Hannibal (Ritsumeikan University); Shironomura, Kazuhiro (Ritsumeikan University)

14:30-15:00 WeCPMC.3
**Formation Analysis of Dynamic Multi-Agent Systems Controlled by a Generalized Cyclic Pursuit Mechanism**.
- Kwak, Taehoon (Chung-Ang University); Kim, Yeongjae (Chung-Ang University); Kim, Tae-Hyoun (Chung-Ang University)

14:30-15:00 WeCPMC.4
**Improving Human-Led Multi-Robot Platoon Using Decentralized DSP**.
- Chang, Henry (University of Washington); Lin, Yudong (University of Washington)

14:30-15:00 WeCPMC.5
**Design and Control of a Solar Panel Cleaning Robot**.
- Lee, Beom Jin (Chungnam National University); Kwon, Dong Wook (Chungnam National University); Jung, Seul (Chungnam National University)

14:30-15:00 WeCPMC.6
**Buried Snow Avalanche Victim Search: An Ergodic-Based Approach**.
- Lapins, Chantel K. (University of Utah); Leang, Kam K. (University of Utah)

14:30-15:00 WeCPMC.7
**Reduced Deformation Transport of Flexible Objects Using Decentralized Robot Networks**.
- Gombo, Yoshua (University of Washington); Tiwari, Anuj (University of Washington)
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>15:40-16:00</td>
<td>WeTPMT6.3</td>
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<tr>
<td>15:40-16:00</td>
<td>Design and Validation of a Versatile High Torque Quasi-Direct Drive Hip Exoskeleton, pp. 342-349.</td>
</tr>
<tr>
<td>Bajpai, Aakash (Georgia Institute of Technology); Carraquillo, Carlos (Georgia Institute of Technology); Carlson, Jessica (University of Michigan); Park, Julian (Georgia Institute of Technology); Iyengar, Divya (Georgia Institute of Technology); Herrin, Kinsey (Georgia Institute of Technology); Young, Aaron (Georgia Tech); Mazumdar, Anirban (Georgia Institute of Technology)</td>
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<td>16:00-17:00</td>
<td>WeTPMT6.4</td>
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<tr>
<td>16:00-17:00</td>
<td>Origami-Inspired Wearable Robot for Trunk Support, pp. 350-350.</td>
</tr>
<tr>
<td>Li, Dongting (Arizona State University); Quiñones Yumbla, Emiliano (Arizona State University); Vanderlinden, Alyssa (Arizona State University); Sugar, Thomas (Arizona State University); Ben Amor, Heni (Arizona State University); Lee, Hyunglae (Arizona State University); Zhang, Wenlong (Arizona State University); Aukes, Daniel (Arizona State University)</td>
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<td>16:20-16:40</td>
<td>WeTPMT6.5</td>
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<tr>
<td>16:20-16:40</td>
<td>Development of Soft Pneumatic Actuator Based Wrist Exoskeleton for Assitive Motion, pp. 351-358.</td>
</tr>
<tr>
<td>Singh, Inderjeet (University of Texas at Arlington); Erel, Veyssel (The University of Texas at Arlington); Gu, Yixin (University of Texas at Arlington); Lindsay, Alexandra (University of Texas at Arlington); Patterson, Rita (UNT Health Science Center); Swank, Chad (Baylor Scott &amp; White Institute for Rehabilitation); Wijesundara, Muthu B. J. (The University of Texas at Arlington)</td>
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<td>Esquivel Patricio, Jose (San Jose State University); Sharifi, Mojtaba (San Jose State University); Shrestha, Dhubra (San Jose State University); Thu, Sai Hein Si (San José State University)</td>
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<td>15:00-15:20</td>
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<td>15:00-15:20</td>
<td>Flexible Manipulators (Regular Session)</td>
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<tr>
<td>15:20-15:40</td>
<td>WeTPMT7.2</td>
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<td>Wan, Hongyu (Ningbo Institute of Materials Technology and Engineering, Chiness); Chen, Silu (Ningbo Institute of Materials Technology and Engineering, CAS); Zhang, Chi (Ningbo Institute of Material Technology and Engineering, CAS); Chen, Chin-Yin (Ningbo Institute of Material Technology and Engineering, Chiness); Yang, Guiliun (Ningbo Institute of Material Technology and Engineering, Chiness)</td>
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<td>Sun, Yilun (Technical University of Munich); Lueth, Tim C. (Technical University of Munich)</td>
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<td>16:00-16:20</td>
<td>WeTPMT7.4</td>
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<td>16:00-16:20</td>
<td>Optimal Cosserat-Based Deformation Control for Robotic Manipulation of Linear Objects, pp. 373-380.</td>
</tr>
<tr>
<td>Artinian, Azad (ISIR - Sorbonne Université); Huet, Quentin (Sorbonne ISIR); Ben Amar, Faiz (Université Pierre Et Marie Curie, Paris 6); Perdereau, Véronique (Sorbonne Université)</td>
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<td>Shimegi, Shotaro (Waseda University); Iishibashi, Keitaro (Waseda University); Usami, Toshihiro (Waseda University); Ishii, Hiroyuki (Waseda University)</td>
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<td>16:40-17:00</td>
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<td>16:40-17:00</td>
<td>Six-Bar Pulley-Guided Node Based Prismatic Tensegrity Robot Form-Finding Analysis and Experiment, pp. 387-392.</td>
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<td>Yeshmukhametov, Azamat (Nazarbayev University); Tileukulova, Asulu (Al-Farabi Kazakh National University); Koganezawa, Koichi (Tokai University)</td>
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<td>Hua, Lingyun (Michigan State University); Tang, Jian (Michigan State University); Dourra, Hussein (Magna International); Zhu, Guoming George (Michigan State University)</td>
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<td>Zhang, Yisheng (Shanghai Jiao Tong University); Zhang, Hengwei (Shanghai Jiao Tong University); Wang, Zhigang (Intel Labs China); Zhang, Shengmin (Shanghai Jiao Tong University); Li, Huacheng (Central South University of Forestry and Technology); Chen, Ming (Shanghai Jiao Tong University)</td>
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<td>15:40-16:00</td>
<td>Stability and Intervariable Distance Analysis of Heterogeneous Platoons in Look-Ahead Topologies, pp. 407-407.</td>
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<td>Zakerimanesh, Amir (University of Alberta); Z. Qiu, Tony (University of Alberta); Tavakoli, Mahdi (University of Alberta)</td>
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<td>16:00-16:20</td>
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<td>16:00-16:20</td>
<td>Optimal and Adaptive Engine Switch Control for a Parallel Hybrid Electric Vehicle Using a Computationally Efficient Actor-Critic Method, pp. 408-415.</td>
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<tr>
<td>Liu, Tong (KTH Royal Institute of Technology); Tan, Kaige (KTH Royal Institute of Technology); Zhu, Wenyao (KTH Royal Institute of Technology); Feng, Lei (KTH Royal Institute of Technology)</td>
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<td>Ueno, Takumi (The University of Tokyo); Poussier, Hugo (Université De Technologique De Compiègne, France); Nguyen, Binh Minh (The University of Tokyo); Victorino, Alessandro Correa (Sorbonne Universités - Université De Technologie De Compiègne He); Fujimoto, Hiroshi (The University of Tokyo)</td>
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<td>16:40-17:00</td>
<td>An Efficient Hybrid Deep Learning Approach for Accurate Remaining EV Range Prediction, pp. 422-427.</td>
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<td>Eissa, Magdy (Tennessee Technological University); Chen, Pingen (Tennessee Technological University)</td>
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</tbody>
</table>
### Technical Program for Thursday June 29, 2023

#### ThPAMP  
**Cascade Ballroom**

**Plenary: The New Age of Learning-Based Robot Motion Planning (Plenary Session)**

*09:30-09:30 ThPAMP.1*

**The New Age of Learning-Based Robot Motion Planning***

Yip, Michael C. (University of California, San Diego)

#### ThCAMC  
**Cascade Foyer**

**Posters - Thursday I (Poster Session)**

*09:30-10:00 ThCAMC.1*

**ActTer: Actuated Tensegrity Revolute Joint***

Woods, Cole (The University of Alabama); Vikas, Vishesh (University of Alabama)

*09:30-10:00 ThCAMC.2*

**Design of Knee Joint Support with Fabric-Type Artificial Muscles, pp. 428-428.**

Park, Cheol Hoon (Korea Institute of Machinery & Materials); Choi, Kyungjun (Korea Institute of Machinery and Materials); Park, Seong Jun (Korea Institute of Machinery and Materials); Jung, Hyun-Mok (Korea Institute of Machinery and Materials); Bak, Jeongae (Korea Institute of Machinery & Materials)

*09:30-10:00 ThCAMC.3*

**Designing Comfortable Robotic System with Human Comfort Analysis and Modeling in Human-Robot Collaboration (HRC).**

Yan, Yuchen (Clemson University); Su, Haotian (Clemson University); Jia, Yunyi (Clemson University)

*09:30-10:00 ThCAMC.4*

**Quantification of Social Behavior in Robot-Agent-Based Animal-Assisted Activity and Comparison of Its Psychological and Physiological Effects***

Sato, Shoma (Chuo university); Niitsu, Mihoko (Chuo University)

*09:30-10:00 ThCAMC.5*

**Orientation Estimation for Instrumented Helmet Using Neural Networks**

Zaheer, Muhammad Hamad (University of New Hampshire); Yoon, Se Young (Pablo) (University of New Hampshire)

*09:30-10:00 ThCAMC.6*

**MIMO ILC for Precision SEA Robots Using Input-Weighted Complex-Kernel Regression, pp. 429-429.**

Yan, Leon (University of Washington); Banka, Nathan (University of Washington); Owan, Parker (University of Washington); Piaskowy, W. Tony (University of Washington); Garbini, Joseph (U. of Washington); Devasia, Santosh (University of Washington)

*09:30-10:00 ThCAMC.7*

**Information-Based Mobile Sensor Behavior Classification for Anomaly Detection***

McKee, Sasha M. (University of Utah); Haddadin, Osama (L3-Harris); Leang, Kam K. (University of Utah)

*09:30-10:00 ThCAMC.8*

**Concept Design of Multi-Winding Type Gravity Compensation Mechanism for High Torque Compensation***

Bak, Jeongae (Korea institute of machinery & materials); Yoo, Sungkeun (Seoul National University); Park, Chanhun (KIMM); Park, Cheol Hoon (Korea Institute of Machinery & Materials)

*09:30-10:00 ThCAMC.9*

**A Compact Lockable Module for a Modular Wearable Robot System***

Li, Dongting (Arizona State University); Aukes, Daniel (Arizona State University)

#### ThTAMT  
**Cascade Foyer**

**Aerial Robotics - Manipulation (Regular Session)**

*10:00-10:40 ThTAMT1.1*

**Aerial Manipulation Via Modular Quadrotors with Passively Foldable Airframes, pp. 430-430.**

Jia, Huaiyuan (City University of Hong Kong); Bai, Songnan (City University of Hong Kong); Chirarattananon, Pakpong (City University of Hong Kong)

*10:20-10:40 ThTAMT1.2*

**Contact-Prioritized Planning of Impact-Resilient Aerial Robots with an Integrated Compliant Arm, pp. 431-431.**

Liu, Zhichao (University of California, Riverside); Lu, Zhouyu (University of California, Riverside); Agha-mohammadi, Ali-akbar (NASA-JPL, Caltech); Karydis, Konstantinos (University of California, Riverside)

*10:40-11:00 ThTAMT1.3*

**A Linkage-Based Gripper Design with Optimized Data Transmission for Aerial Pick-And-Place Tasks, pp. 432-437.**

Smith, Sean (Dalhousie University); Buchanan, Scott (Dalhousie University); Pan, Ya-Jun (Dalhousie University)

*11:00-11:20 ThTAMT1.4*

**Static-Equilibrium Oriented Interaction Force Modeling and Control of Aerial Manipulation with Unidirectional Thrust Multicopters, pp. 438-445.**

Hui, Tong (Technical University of Denmark); Fumagalli, Matteo (Danish Technical University)

*11:20-11:40 ThTAMT1.5*

**A Tiltable Airframe Multicopter UAV Designed for Omnidirectional Aerial Manipulation, pp. 446-451.**

Paul, Hannibal (Ritsumeikan University); Rosales Martinez, Ricardo (Ritsumeikan University); Sumetheeprasit, Borwonpob (Ritsumeikan University); Shimonomura, Kazuhiro (Ritsumeikan University)

*11:40-12:00 ThTAMT1.6*

**Null-Space-Based Adaptive Control for Aerial Manipulators on Cooperatively Transporting Cable-Suspended Objects, pp. 452-458.**

Hung, Te-Kang (National Cheng Kung University); Liu, Yen-Chen (National Cheng Kung University); Lee, Chen-En (National Cheng Kung University)

**Machine Vision in Mobile Robots (Regular Session)**

*10:00-10:20 ThTAMT2.1*

**IR-VIO: Illumination-Robust Visual-Inertial Odometry Based on Adaptive Weighting Algorithm with Two-Layer Confidence Maximization, pp. 459-459.**

Song, Zhixing (Nankai University); Zhang, Xuebo (Nankai University); Li, Tianyi (Nankai University); Zhang, Shiyong (Nankai University); Wang, Youwei (Nankai University); Yuan, Jing (College of Computer and Control Engineering, Nankai University)

*10:20-10:40 ThTAMT2.2*

**Kinematic Analysis and Robust Control of a Spherical Motor Based Visual Tracking System, pp. 460-460.**

Wen, Shengxiong (Huazhong University of Science and Technology); Ding, Yaowu (Huazhong University of Science and Technology); Wu, Xuan (Huazhong University of Science and Technology); Bai, Kun (Huazhong University of Science and Technology)

*10:40-11:00 ThTAMT2.3*

Zhang, Tong (University of Windsor); Tan, Ying (The University of Melbourne); Lei, Zike (Wuhan University of Science and Technology); Chen, Xiang (University of Windsor)

11:00-11:20 ThTAMT2.4


Bildstein, Hugo (LAAS-CNRS); Durand-Petitville, Adrien (Federal University of Pernambuco UFPE); Cadena, Viviane (University of Toulouse)

11:20-11:40 ThTAMT2.5

Enhancing Indoor Auto-Steering for AMRs through RGB and Depth Fusion, pp. 469-474.

Lee, Chi Hsuan (National Taipei University of Technology); Li, Chih-Hung G. (National Taipei University of Technology)

11:40-12:00 ThTAMT2.6


Chang, Ho Feng (National Taipei University of Technology); Li, Chih-Hung G. (National Taipei University of Technology)

ThTAMT3 Whidbey Innovations in MR Devices (Invited Session)

Organizer: Li, Yancheng University of Technology Sydney
Organizer: Du, Haiping University of Wollongong

10:00-10:20 ThTAMT3.1

Experimental Investigation of Semi-Active Vehicle Suspension Equipped with Magnetorheological Dampers (II), pp. 481-486.

Xu, Tiancheng (Shenzhen Upward Tech Co. Ltd); Wang, Huixing (Nanjing University of Science and Technology); Li, Yancheng (University of Technology Sydney); Leng, Dingxin (Ocean University of China); XU, Hanou (Shenzhen Upward Tech Co. Ltd)

10:20-10:40 ThTAMT3.2

Semi-Active Magnetorheological Suspension of a Full-Vehicle Model Based on Combined Vertical and Attitude Control (II), pp. 487-492.

Lyv, Peng (Ocean University of China); Leng, Dingxin (Ocean University of China); Li, Yancheng (University of Technology Sydney); Xu, Tiancheng (Shenzhen Upward Tech Co. Ltd); Wang, Huixing (Nanjing University of Science and Technology); Xu, Hanou (Shenzhen Upward Tech Co. Ltd)

10:40-11:00 ThTAMT3.3

Development of a Magnetorheological Elastomer Actuator for a Mixed Reality Haptic Glove (I), pp. 493-496.

Christie, Matthew Daniel (University of Wollongong); Fredericksen, Taine (University of Wollongong); Li, Weihua (University of Wollongong)

11:00-11:20 ThTAMT3.4

Semi-Active Vibration Control of a Curved Surface Contacting-Based Nonlinear Stiffness System (I), pp. 497-502.

Cai, Zehua (Ocean University of China); Ning, Donghong (Ocean University of China)

ThTAMT4 Baker Actuators I (Regular Session)

10:00-10:20 ThTAMT4.1

A Fully 3D Printed, Multi-Material, and High Operating Temperature Electromagnetic Actuator, pp. 503-510.

Mettes, Sebastian (Georgia Institute of Technology); Bates, Justin (Georgia Institute of Technology); Allen, Kenneth (Georgia Tech Research Institute); Mazumdar, Yi (Georgia Institute of Technology)

10:20-10:40 ThTAMT4.2

Design and Control of 3-DOF Reluctance-Force-Type Magnetic Levitator Module for Fine-Positioning Short-Stroke Stage, pp. 511-516.

Yoon, Hyeong Min (Yonsei University); Jung, Jae Woo (Yonsei University); Kim, Eun Kyu (Yonsei University); Park, Jeong Min (Yonsei University); Sung, Jong Min (Yonsei University); Yoon, Jun Young (Yonsei University)

10:40-11:00 ThTAMT4.3

Design, Simulation, and Experiment of a Novel Electromagnetic Launcher with a Permanent Magnet, pp. 517-522.

Cheng, Bingxuan (AIAA); Cheng, Shanbao (CSU Long Beach)

11:00-11:20 ThTAMT4.4

Multiple Magnet Independent Levitation and Motion Control Using a Single Coil Array, pp. 523-528.

Berkelman, Peter (University of Hawaii-Manoa); Kang, Steven (University of Hawaii)

11:20-11:40 ThTAMT4.5

Analytical Design Methodology Based on Distributed Current Source Models for Parametric Study of a Three-DOF Planar Motor, pp. 529-534.

Que, Zixin (Huazhong University of Science and Technology); Lee, Kok-Meng (Georgia Institute of Technology)

11:40-12:00 ThTAMT4.6

Design and Control of PM-Biased Bi-Stable Latching Actuator for Low-Power Micropump, pp. 535-540.

Kim, Eun Kyu (Yonsei University); Kang, Bo Min (Yonsei University); Lee, Hye Geon (YONSEI UNIVERSITY); Yoon, Hyeong Min (Yonsei University); Kim, Jae Hyun (Yonsei University); Jung, Jae Woo (Yonsei University); Yoon, Jun Young (Yonsei University)

ThTAMT5 Orcas Sensors I (Regular Session)

10:00-10:20 ThTAMT5.1

A Review of Optomechatronic Ecosystem, pp. 541-544.

Zhang, Sam (Excilitas Technologies Corporation)

10:20-10:40 ThTAMT5.2


Cheng, Qilong (University of Toronto); Wise, Emmett (University of Toronto); Kelly, Jonathan (University of Toronto)

10:40-11:00 ThTAMT5.3

Development of a Magnetic/Eddy-Current Sensing System for Simultaneous Estimation of Electrical Conductivity and Thickness in Non-Ferrous Metal Plates, pp. 552-552.

Lin, Chun-Yeon (National Taiwan University); Wu, Yi-Chin (National Taiwan University); Teng, Megan (National Taiwan University)

11:00-11:20 ThTAMT5.4

A Self-Organized Maps Ground Extract Method Based on Principal Component Analysis, pp. 553-558.

Yao, Yu (Beihang University); Li, Yunhua (Beihang University); Qin, Tao (Beihang University)

11:20-11:40 ThTAMT5.5


Ayral, Théo (Université Paris-Saclay, CEA, Leti); Aloui, Saifeddine (Université Grenoble Alpes, CEA, Leti); Grossard, Mathieu
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<tr>
<td>10:00-10:20</td>
<td>ThTAMT6.1</td>
<td>A Reliable Kinematic Measurement of Upper Limb Exoskeleton for VR Therapy with Visual-Inertial Sensors</td>
<td>Kwok, Thomas M. (National University of Singapore); Li, Tong (National University of Singapore); Yu, Haoyong (National University of Singapore)</td>
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<tr>
<td>10:20-10:40</td>
<td>ThTAMT6.2</td>
<td>Neural Network Learning of Robot Dynamic Uncertainties and Observer-Based External Disturbance Estimation for Impedance Control</td>
<td>Li, Teng (University of Alberta); Badre, Armin (University of Alberta); Taghirad, Hamid D. (K.N.Toosi University of Technology); Tavakoli, Mahdi (University of Alberta)</td>
</tr>
<tr>
<td>10:40-11:00</td>
<td>ThTAMT6.3</td>
<td>Modulation of Joint Stiffness for Controlling the Cartesian Stiffness of a 2-DOF Planar Robotic Arm for Rehabilitation</td>
<td>Tantagunnarat, Thanapol (Chulalongkorn University); Wongkaewcharoen, Narakorn (Chulalongkorn University); Pornpipatsakul, Kermwutta (Chulalongkorn University); Chuenphichanwanchan, Rada (Chulalongkorn University); Chaichaowarat, Ronnaepe (Chulalongkorn University)</td>
</tr>
<tr>
<td>11:00-11:20</td>
<td>ThTAMT6.4</td>
<td>Precise Torque Control in High Temperature with Heat Transfer Model Based Torque Constant Compensation Algorithm</td>
<td>Youn, Jimin (KAIST); Kim, Hyoongjun (Korea Advanced Institute of Science and Technology); Kim, Taeyeon (Korea Advanced Institute of Science and Technology); Kong, Kyoungchul (Korea Advanced Institute of Science and Technology)</td>
</tr>
<tr>
<td>11:40-12:00</td>
<td>ThTAMT6.6</td>
<td>Prediction Accuracy and Model Robustness of Neural Network-Based Ground Reaction Force Estimators</td>
<td>Abdelhady, Mohamed (NIH); Bulea, Thomas (National Institutes of Health); Abouelwafa, Wael (Minia University); Simon, Dan (Cleveland State University)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00-11:20</td>
<td>ThTAMT7.1</td>
<td>Design and Validation of a Push-Latch Gripper Made in Additive Manufacturing</td>
<td>Ottonello, Emilio (Istituto Italiano Di Tecnologia); Baggetta, Mario (University of Genoa); Berselli, Giovanni (Università Di Genova); Parmiggiani, Alberto (Fondazione Istituto Italiano Di Tecnologia)</td>
</tr>
<tr>
<td>10:20-10:40</td>
<td>ThTAMT7.2</td>
<td>A Methodology for Early Design Specifications of Robotic Grippers, pp. 602-608</td>
<td>Escorcia Hernandez, Jonatan Martin (Université Paris-Saclay, CEA, List); Grossard, Mathieu (Université Paris-Saclay, CEA, List); Gosselin, Florian (CEA LIST)</td>
</tr>
</tbody>
</table>


Escorcia Hernandez, Jonatan Martin (Université Paris-Saclay, CEA, List); Grossard, Mathieu (Université Paris-Saclay, CEA, List); Gosselin, Florian (CEA LIST); Dubois, Clemence (Université Paris-Saclay, CEA List)
Structural Diagnosis for Drones: Quadrotor UAVs
Perception Aerial Robotics

A Compact Lockable Module for a Modular Wearable Robot System

Concept Design of Multi-Winding Type Gravity Compensation Mechanism for High Torque Compensation*

A Compact Lockable Module for a Modular Wearable Robot System*

A Shape-Changing Wheeling and Jumping Robot Using Tensegrity Wheels and Bistable Mechanism
Spiegel, Sydney (Colorado State University); Sun, Jiefeng (Yale); Zhao, Jianguo (Colorado State University)

A Supervisory Learning Control Framework for Autonomous & Real-Time Task Planning for an Underactuated Cooperative Robotic Task
De Witte, Sander (Ghent University); Lefebvre, Tom (Ghent University); Van Hauwermeiren, Thijs (Ghent University); Crevecoeur, Guillaume (Ghent University)

Panoramic Image-Based Aerial Localization Using Synthetic Data Via Photogrammetric Reconstruction
Sufiyan, Danial (Singapore University of Technology & Design); Pheh, Ying Hong (Singapore University of Technology & Design); Win, Luke Soe Thura (Singapore University of Technology & Design); Lim, Kristabel (Singapore University of Technology & Design); Suhadi, Brian Leonard (Singapore University of Technology & Design); Sufiyan, Danial (Singapore University of Technology & Design); Foong, Shao Hui (Singapore University of Technology & Design)

Wind Vector Estimation Considering Difference of Propeller Model Characteristics for Fully Actuated Drone
Kamiya, Manto (The University of Tokyo); Nagai, Sakahisa (The University of Tokyo); Fujimoto, Hiroshi (The University of Tokyo)

A Feasible Study on the Model Predictive Control for Docking Approach of Small Spacecraft Using Thrusters and a Control Moment Gyro
Wada, Masayoshi (Tokyo University)

A Feasible Study on the Model Predictive Control for Docking Approach of Small Spacecraft Using Thrusters and a Control Moment Gyro
Wada, Masayoshi (Tokyo University)
<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>ThTPMT3</td>
<td>Machine Vision (Regular Session)</td>
<td>Zuo, Guoyu (Beijing University of Technology); Ma, Yuxiang (Beihang University); Pan, Lihua (Beihang University); Wu, Yidong (Beihang University)</td>
</tr>
<tr>
<td>15:00-15:20</td>
<td>Pose Estimation Based on Point Pair Features with Optimized Voting and Verification Strategies, pp. 689-694.</td>
<td>Chen, Gaoming (Shanghai Jiao Tong University); Gao, Ao (Shanghai Jiao Tong University); Liu, Wenhang (Shanghai Jiao Tong University); Li, Nenghao (Shanghai Jiao Tong University); Liu, Chao (Shanghai Jiao Tong University); Xiong, Zhenhua (Shanghai Jiao Tong University)</td>
</tr>
<tr>
<td>15:20-15:40</td>
<td>BiSPD-YOLO: Surface Defect Detection Method for Small Features and Low-Resolution Images, pp. 695-700.</td>
<td>Yan, Sixu (Shanghai Jiao Tong University); Chen, Gaoming (Shanghai Jiao Tong University); Gao, Ao (Shanghai Jiao Tong University); Liu, Chao (Shanghai Jiao Tong University); Xiong, Zhenhua (Shanghai Jiao Tong University)</td>
</tr>
<tr>
<td>15:40-16:00</td>
<td>Image Foreground Segmentation Based on Small Data Set for Visual Servo Applications, pp. 701-706.</td>
<td>Luo, Yan (Shanghai Jiao Tong University); Chen, Gaoming (Shanghai Jiao Tong University); Li, Chao (Shanghai Jiao Tong University); Xiong, Zhenhua (Shanghai Jiao Tong University)</td>
</tr>
<tr>
<td>16:00-16:20</td>
<td>Copy and Paste Augmentation for Deformable Wiring Harness Bags Segmentation, pp. 707-712.</td>
<td>Zagor, Bare Luka (Technical University Munich); Caporali, Alessio (University of Bologna); Szymko, Amadeusz (Poznan University of Technology); Kicki, Piotr (Poznan University of Technology); Walas, Krzysztof, Tadeusz (Poznan University of Technology); Palli, Gianluca (University of Bologna); Knoll, Alois (Tech. Univ. Muenchen TUM)</td>
</tr>
<tr>
<td>16:20-16:40</td>
<td>Convolutional Neural Network Based Denoising for Digital Image Correlation Reconstructing High-Fidelity Deformation Field, pp. 713-718.</td>
<td>Niu, Bangyan (Huazhong University of Science and Technology); Ji, Jingjing (Huazhong University of Science and Technology)</td>
</tr>
<tr>
<td>16:40-17:00</td>
<td>A Vision-Based Shared Autonomy Framework for Deformable Linear Objects Manipulation, pp. 719-724.</td>
<td>Chiaramalli, Davide (Alma Mater Studiorum, University of Bologna); Caporali, Alessio (University of Bologna); Friz, Anna (Alma Mater Studiorum, University of Bologna); Meattini, Roberto (University of Bologna); Palli, Gianluca (University of Bologna)</td>
</tr>
<tr>
<td>ThTPMT4</td>
<td>Actuators II (Regular Session)</td>
<td>Baker</td>
</tr>
<tr>
<td>15:00-15:20</td>
<td>Motion Decoupling for Cable-Driven Serial Robots Based on a Noncircular Pulley, pp. 725-731.</td>
<td>Cheng, Jinsai (Kent State University); Shen, Tao (Kent State University)</td>
</tr>
<tr>
<td>15:20-15:40</td>
<td>Adaptive Extended State Observer-Based Terminal Sliding Mode Control for PMM System with Uncertainties, pp. 732-737.</td>
<td>Ma, Yuxiang (Beihang University); Li, Yunhua (Beihang University); Qin, Tao (Beihang University)</td>
</tr>
<tr>
<td>15:40-16:00</td>
<td>Intelligent Servo Control Strategy for Robot Joints with Incremental Bayesian Fuzzy Broad Learning System, pp. 738-745.</td>
<td>Zuo, Guoyu (Beijing University of Technology); Zhou, Jiyong (Beijing University of Technology); Gong, Daoxiong (Beijing University of Technology); Huang, Gao (Beijing University of Technology)</td>
</tr>
<tr>
<td>ThTPMT5</td>
<td>Sensors II (Regular Session)</td>
<td>Orcas</td>
</tr>
<tr>
<td>15:00-15:20</td>
<td>A Study of Hand Function in Stroke Patients Using Kinematic Metrics, pp. 763-768.</td>
<td>Sheng, Bo (Shanghai University); Zhao, Jianyu (Shanghai University); Zheng, Junjun (EAW-Volkswagen Automotive Co., LTD. Foshan Branch); Duan, Chaoqun (Shanghai University); Xie, Sheng Quan (University of Lees); Tao, Jing (Shanghai University)</td>
</tr>
<tr>
<td>15:20-15:40</td>
<td>Understanding and Controlling the Sensitivity of Event Cameras in Responding to Static Objects, pp. 769-772.</td>
<td>Qiyao, Gao (University of Washington); Xiaoyang, Sun (University of Washington); Yu, Zhitao (University of Washington); Chen, Xu (University of Washington)</td>
</tr>
<tr>
<td>15:40-16:00</td>
<td>Design, Fabrication, and Characterisation of a Novel Piezoeомpedal Tactile Sensor for Use in Soft-Prosthetic Devices, pp. 773-777.</td>
<td>Searle, Thomas (University of Wollongong); Sencadas, Vitor (School of Mechanical, Materials and Mechatronics and Biomedical); Ali, Gursei (University of Wollongong)</td>
</tr>
<tr>
<td>16:00-16:20</td>
<td>Modeling of Interface Loads for EOD Suit Wearers, pp. 779-785.</td>
<td>Gao, Yuan (Uml); Epstein, Stephanie (UMass Lowell); Inapolt, Murat (UMass Lowell); Wu, Yi-Ning (University of Massachusetts Lowell); Gu, Yan (Purdue University)</td>
</tr>
<tr>
<td>16:20-16:40</td>
<td>Comparison Analysis of Thermistor and RTD for Energy Transfer Station Application, pp. 786-791.</td>
<td>Mashhood, Zafar (Texas A&amp;M University Kingsville); Wei, Bin (Texas a &amp; M University - Kingsville)</td>
</tr>
<tr>
<td>ThTPMT6</td>
<td>HMI I (Regular Session)</td>
<td>Blakely</td>
</tr>
</tbody>
</table>
15:00-15:20
HAPSEA: Hydraulically Amplified Soft Electromagnetic Actuator for Haptics, pp. 792-800.
Kohls, Noah (Georgia Institute of Technology); Colonnesi, Nicholas (Facebook Reality Labs); Mazumdar, Yi (Georgia Institute of Technology); Agarwal, Priyanshu (Facebook Inc)

15:20-15:40
Model-Based Estimation of Mental Workload in Drivers Using Pupil Size Measurements, pp. 801-807.
Pillai, Prahartha (University of Windsor); Balasingam, Balakumar (University of Windsor); Biondi, Francesco (University of Windsor)

15:40-16:00
The Pinch Sensor: An Input Device for In-Hand Manipulation with the Index Finger and Thumb, pp. 808-813.
Wang, Cong (New Jersey Institute of Technology); Vungarala, Durga Lakshmi Venkata Deepak (New Jersey Institute of Technology); Navarro, Kevin (New Jersey Institute of Technology); Advani, Neel (University of Petroleum and Energy Studies); Han, Tao (New Jersey Institute of Technology)

16:00-16:20
Zhuwawu, Sudhir Solomon (Egypt Japan University of Science and Technology); Zaki, Ahmed Biaoumy (Egypt Japan University of Science and Technology); Elsamanty, Mahmoud (Egypt Japan University of Science and Technology (EJUS)); Parque, Victor (Waseda University); El-Hussieny, Hatham (Faculty of Engineering)(Shoubra), Benha University

16:40-17:00
Biometric Signature Authentication with Low Cost Embedded Stylus, pp. 820-825.
Subedi, Divas (Trinity College); Chitrakar, Digesh (Trinity College); Yung, Isabella (Trinity College); Zhu, Yicheng (Trinity College); Su, Yun-Hsuan (Melody) (Mount Holyoke College); Huang, Kevin (Trinity College)

15:00-15:20
Zakeriharandi, Mohammadali (Aalborg University); Li, Chen (Aalborg University); Schou, Casper (Aalborg University, Department of Materials and Production); Lajic Villumsen, Sigurd (Aalborg University); Bagh, Simon (Aalborg University); Madsen, Ole (Aalborg University)

15:20-15:40
A Robust Wavelet-Integrated Residual Network for Fault Diagnosis of Machines with Adversarial Training (I), pp. 833-837.
Li, Xiwei (Xi’an Jiaotong University); Lei, Yaguo (Xi’an Jiaotong University); Li, Xiang (Xi’an Jiaotong University); Yang, Bin (Xi’an Jiaotong University)

15:40-16:00

16:00-16:20
A Framework to Support Failure Cause Identification in Manufacturing Systems through Generalization of past FMEAs, pp. 844-851.
Okazaki, Sho (The University of Tokyo); Shirafuji, Shouhei (The University of Tokyo); Yasui, Toshinori (DENSO Corporation); Ota, Jun (The University of Tokyo)

16:20-16:40
Accelerating Full Waveform Inversion Using Pre-Trained Neural Networks (I), pp. 852-857.
Kollmannsberger, Stefan (Technische Universität München); Singh, Divya (Technische Universität München); Hermann, Leon (Technische Universität München)

16:40-17:00
Segmentation of Fatigue Cracks in Ancillary Steel Structures Using Deep Learning Convolutional Neural Networks (I), pp. 858-863.
Jafari, Faezeh (University of North Dakota); Dorafshan, Sattar (University of North Dakota); Kaabouch, Naima (University of North Dakota)

15:00-15:20
Intelligent Human-Machine Collaboration (Invited Session)
Organizer: Lv, Chen (Nanyang Technological University)
Organizer: Wang, Yifan (Nanyang Technological University)
Organizer: Xing, Yang (Cranfield University)
Organizer: Chao, Huang (The Hong Kong Polytechnic University)

15:20-15:40
Chan, Teng Hooi (Singapore University of Technology and Design); Halim, James (Singapore University of Technology & Design); Tan, Kian Wee (Singapore University of Technology & Design); Tang, Emmanuel (Singapore University of Technology & Design); Ang, Wei Jun (Singapore University of Technology & Design); Tan, Jia Yu (Singapore University of Technology & Design); Cheong, Samuel (Singapore University of Technology & Design); Ho, Hoan-Nghia (Singapore University of Technology & Design); Kuan, Benson (DSO National Laboratories); Bin Othman, Muhammad Shalihan (Singapore University of Technology and Design); Liu, Ran (Southwest University of Science and Technology); Soh, Gim Song (Singapore University of Technology and Design); Yuen, Chau (Nanyang Technological University); Tan, U-Xuan (Singapore University of Technology and Design); Heng, Lionel (DSO National Laboratories); Fooong, Shaohui (Singapore University of Technology and Design)
Inertial Measurement Units (I), pp. 882-887.
Wang, Guohui (Nanyang Technological University); Chen, Yu (Nanyang Technological University); Wang, Minda (Nanyang Technological University); Wang, Yifan (Nanyang Technological University)
### Technical Program for Friday June 30, 2023

**FrPAMP**  
Cascade Ballroom  
**Plenary: Sea Lamprey, E-Skin, and Robotic Fish: Mechatronic Solutions to Invasive Species Control** (Plenary Session)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:30-09:30</td>
<td>FrPAMP.1</td>
<td></td>
<td>Sea Lamprey, E-Skin, and Robotic Fish: Mechatronic Solutions to Invasive Species Control*</td>
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<td></td>
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<td>Tan, Xiaobo (Michigan State University)</td>
</tr>
</tbody>
</table>

**FrCAMC**  
Cascade Foyer  
**Posters - Friday I (Poster Session)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:30-10:00</td>
<td>FrCAMC.1</td>
<td></td>
<td>Development of Bar-Shape Nonlinear Series Elastic Actuator*</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Hirao, Motohiro (University of California, Berkeley); Ghanarpour, Alireza (University of California at Berkeley); Tomizuka, Masayoshi (University of California)</td>
</tr>
<tr>
<td>09:30-10:00</td>
<td>FrCAMC.2</td>
<td></td>
<td>Model-Based Impedance Modulation of Antagonistic Pneumatic Artificial Muscles*</td>
</tr>
<tr>
<td></td>
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<td>Wang, Xinyao (University of California Riverside); Liu, Tuo (University of California Riverside); Realmuto, Jonathan (University of California Riverside)</td>
</tr>
<tr>
<td>09:30-10:00</td>
<td>FrCAMC.3</td>
<td></td>
<td>Development of Mobile Welding Robot Motion Software for Large-Scale Environment Welding*</td>
</tr>
<tr>
<td></td>
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<td>Choi, Taeyong (KIMM); Park, Jongwoo (Korea Institute of Machinery &amp; Materials); Park, Dongil (Korea Institute of Machinery and Materials (KIMM))</td>
</tr>
<tr>
<td>09:30-10:00</td>
<td>FrCAMC.4</td>
<td></td>
<td>Hysteresis Dehunting of a Tendon-Sheath Confined Space Manipulator for Fast and Precise Control, pp. 888-888.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Schultz, Kyle (University of Washington); Marquette, Wade (University of Washington); Devasia, Santosh (University of Washington)</td>
</tr>
<tr>
<td>09:30-10:00</td>
<td>FrCAMC.5</td>
<td></td>
<td>Robot-Based Automation of Charging Process for Electric Vehicle*</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Do, Hyunmin (Korea Institute of Machinery and Materials)</td>
</tr>
<tr>
<td>09:30-10:00</td>
<td>FrCAMC.6</td>
<td></td>
<td>Learning to Detect Slip through Tactile Measures of the Contact Force Field and Its Entropy*</td>
</tr>
<tr>
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<td>Hu, Xiaohai (University of Washington); Venkatesh, Aparajit (University of Washington); Zheng, Guiliang (Carnegie Mellon University); Chen, Xu (University of Washington)</td>
</tr>
<tr>
<td>09:30-10:00</td>
<td>FrCAMC.7</td>
<td></td>
<td>Power Assistance System for Steering Characteristics Classified by Deep Neural Network*</td>
</tr>
<tr>
<td></td>
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<td>Ryu, Ho Ju (Chungnam National University); Kim, Jeong Ju (Hyundai MOBIS); Jung, Seul (Chungnam National University)</td>
</tr>
<tr>
<td>09:30-10:00</td>
<td>FrCAMC.8</td>
<td></td>
<td>Robust Optimal H∞ Control for Active Suspension System Using Input Saturation Function, pp. 889-889.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Kim, Yeongjae (Chung-Ang University); Kim, Mingyu (Chung-Ang University); Kim, Tae-Hyoun (Chung-Ang University)</td>
</tr>
</tbody>
</table>

**FrTAMT1**  
Olympic  
**Mobile Robotics II (Regular Session)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00-10:20</td>
<td>FrTAMT1.1</td>
<td></td>
<td>ARMoR: Amphibious Robot for Mobility in Real-World Applications, pp. 890-895.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Hammond, Matthew (Texas A&amp;M University); Lee, Kiju (Texas A&amp;M University)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Koc, Denizcan (University of Houston); Zuo, Wenyu (University of Houston); Ghorbel, Fathi (Georgia Institute of Technology); Chen, Zheng (University of Houston)</td>
</tr>
<tr>
<td>11:00-11:20</td>
<td>FrTAMT1.3</td>
<td></td>
<td>Amphibious Robot with Self-Rotating Paddle-Wheel Mechanism, pp. 901-909.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Kim, Chaewon (Hanyang University); Lee, Kyungwook (Hanyang University); Ryu, Sijun (Hanyang University); Seo, TaeWon (Hanyang University)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Algethami, Abdullah (Tail University); Sarkar, Rajasree (Indian Institute of Technology Delhi); Amr, Syed Muhammad (Linköping University); Banerjee, Arunava (Indian Institute of Technology Delhi)</td>
</tr>
<tr>
<td>11:40-12:00</td>
<td>FrTAMT1.5</td>
<td></td>
<td>Constrained Model Predictive Control of Variable Buoyancy Device, pp. 916-921.</td>
</tr>
<tr>
<td></td>
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<td>Masood, Muhammad Umar (University of Houston); Kaaya, Theophilus (University of Houston); Chen, Zheng (University of Houston)</td>
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<td>Qiu, Yingxin (Georgia Institute of Technology); Wu, Mengnan (Emory University); Ting, Lena (Emory University and Georgia Tech); Ueda, Jun (Georgia Institute of Technology)</td>
</tr>
<tr>
<td>10:40-11:00</td>
<td>FrTAMT2.2</td>
<td></td>
<td>Multi-Axis Manipulator Kinematic Calibration Using a Novel Linearized Finite Screw Deviation Model, pp. 934-939.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Kim, Jaehyung (Pusan National University); Lee, Min Cheol (Pusan National University)</td>
</tr>
<tr>
<td>11:00-11:20</td>
<td>FrTAMT2.3</td>
<td></td>
<td>Optimal 2nd Order LTI System Identification, pp. 940-945.</td>
</tr>
<tr>
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<td>Stocco, Leo (University of British Columbia)</td>
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<td>Zhang, Yi (University of Augsburg); Mikelsons, Lars (University of Augsburg)</td>
</tr>
</tbody>
</table>

Dai, Junjie (Ningbo Institute of Materials Technology and Engineering, CAS); Yang, Xin (Ningbo Institute of Materials Technology & Engineering, Chinese Aca); Chen, Chinn-Yin (Ningbo Institute of Material Technology and Engineering, CAS); Yang, Guolin (Ningbo Institute of Material Technology and Engineering, Chines); Chen, Han (Zhejiang University of Technology)

11:40-12:00 FrTAMT2.6
Data-Driven Identification of Stochastic System Dynamics under Partial Observability Using Physics-Based Model Prioris with Application to Acrobat, pp. 959-965.

Vantilborgh, Victor (Ghent University); Lefebvre, Tom (Ghent University); Crevecoeur, Guillaume (Ghent University)

FrTAMT3 Manufacturing (Regular Session)

10:00-10:20 FrTAMT3.1
Force Control of a Grinding Robotic Manipulator with Floating Base Via Model Prediction Optimization Control, pp. 966-974.

Seo, Changkook (Hanyang University); Kim, Hanbom (Hanyang University); Jin, Hongjoo (Hanyang University); Kim, Taegyun (Yeungnam University); Seo, TaeWon (Hanyang University)

10:20-10:40 FrTAMT3.2
Concept and Design of a Bearingless Spinfilter, pp. 975-975.

Beglinger, Lars (ETH Zurich); Steinert, Daniel (Levitronix GmbH); Nussbaumer, Thomas (Levitronix GmbH); Biela, Juergen (ETH Zurich)

10:40-11:00 FrTAMT3.3
Developing a Two-Roll Wire Straightener, pp. 976-981.

Lee, Wei-chen (National Taiwan University of Science and Technology); Huang, Kun-Chung (National Taiwan University of Science and Technology)

11:00-11:20 FrTAMT3.4
Tension Ripple-Free Dancer Control of a Web Processing Machine, pp. 982-987.

De Viaene, Jasper (University of Gent); Thielemans, Yenti (Ghent University); Mathivanan, Arul K. (Ghent University); De Kooning, Jeroen D. M. (Dynamical Systems & Control Group (DYSC), Ghent University and F); Stockman, Kurt (Universiteit Gent)

11:20-11:40 FrTAMT3.5

Hsiao, Shang-ya (National Taiwan University); Chu, Yu-Lin (National Taiwan University); Lin, Pei-Chun (National Taiwan University)

11:40-12:00 FrTAMT3.6
Geometry-Agnostic Melt-Pool Homogenization of Laser Powder Bed Fusion through Reinforcement Learning, pp. 994-999.

Park, Bumsoo (RPI); Mishra, Sandipan (RPI)

FrTAMT5 Optimization (Regular Session)

10:00-10:20 FrTAMT5.1

Ben yahya, Abdelmajid (University of Antwerp); Van Oosterwyck, Nick (University of Antwerp); Herregodts, Jan (University of Ghent); Herregodts, Stijn (University of Ghent); Houwen, Simon Janos (University of Ghent); Vanwalleghem, Bart (University of Ghent); Derammelaere, Stijn (University of Antwerp, Faculty of Applied Engineering)

10:20-10:40 FrTAMT5.2

van Os, David (Ghent University); Tuerlinckx, Theo (Flanders Make); Vansompel, Hendrik (Ghent University); Sergeant, Peter (Ghent University); Laurissen, Koen (Flanders Make); Stockman, Kurt (Universiteit Gent)

10:40-11:00 FrTAMT5.3

Lefebvre, Tom (Ghent University); Wauters, Jolan (Ghent University); Ostyn, Frederik (Ghent University); Crevecoeur, Guillaume (Ghent University)

11:00-11:20 FrTAMT5.4

Clemen, Layne (Eleclty); Rupp, Cory (ATA Engineering, Inc)

11:20-11:40 FrTAMT5.5

Lee, Chen-En (National Cheng Kung University); Lin, Sheng-Feng (National Cheng Kung University); Liu, Yen-Chen (National Cheng Kung University)

11:40-12:00 FrTAMT5.6

Friz, Fabian (University of Stuttgart); Zeller, Amelie (University of Stuttgart); Böhm, Michael (University of Stuttgart); Sawodny, Oliver (University of Stuttgart)

FrTAMT6 HMI II (Regular Session)

10:00-10:20 FrTAMT6.1
Interactive Task Encoding System for Learning-From-Observation, pp. 1041-1046.

Wake, Naoki (Microsoft); Kanehira, Atsushi (Microsoft); Sasabuchi, Kazuhiro (Microsoft); Takamatsu, Jun (Microsoft); Ikuechi, Katsushi (Microsoft)

10:20-10:40 FrTAMT6.2
Brain Computer Interfaces for Supervisory Controls of Unmanned Aerial Vehicles, pp. 1047-1052.

Bi, Zhuming (Purdue University Fort Wayne); Liu, Yanfei (Purdue University Fort Wayne); Emmanuel, Quay (Purdue University Fort Wayne); Luo, Chaomin (Mississippi State University)

10:40-11:00 FrTAMT6.3
Predictive Assistive Motion Generation Based on Human Intent for Human-Collaborative Robots, pp. 1053-1059.

Ichimura, Naoki (Tokyo Denki University); Ishikawa, Jun (Tokyo Denki University)

11:00-11:20 FrTAMT6.4
Improving Human Positioning Control of Oscillatory Systems, pp. 1060-1065.

Lui, Man Wo (Georgia Institute of Technology); Kotten, Daniel (Georgia Institute of Technology); Dushaj, Enea (Georgia Institute of Technology); Singhose, William (Georgia Tech)

11:40-12:00 FrTAMT6.5
Generating Synthetic Data Using a Knowledge-Based Framework for
Autonomous Productions, pp. 1066-1073.

Petrovic, Oliver (Laboratory for Machine Tools and Production Engineering (WZL), RWTH Aachen University); Herfs, Werner (WZL, RWTH Aachen)
14:30-15:00 FrCPMC.6

Dynamics Identification and Amplitude Control of a Wireless Axial Torque Estimation Based on Backlash Detection for Reduction

Do, Hyunmin (Korea Institute of Machinery and Materials)

14:30-15:00 FrCPMC.7

Power Assistance System for Steering Characteristics Classified by Deep Neural Network*.

Hu, Xiaohai (University of Washington); Venkatesh, Aparajit (University of Washington); Zheng, Guiliang (Carnegie Mellon University); Chen, Xu (University of Washington)

14:30-15:00 FrCPMC.8

Robust Optimal H∞ Control for Active Suspension System Using Input Saturation Function, pp. 889-889.

Kim, Yeongjae (Chung-Ang University); Kim, Mungyu (Chung-Ang University); Kim, Tae-Hyoung (Chung-Ang University)

FrTPMT1

15:00-15:20 FrTPMT1.1

Joint Optimization for Transport and Bucket Loading Phases of Automated Wheel Loaders, pp. 1145-1145.

Edson, Connor (University of Minnesota); Yao, Jie (University of Minnesota at Twin Cities); Zhao, Gaonan (University of Minnesota); Sun, Zongxuan (University of Minnesota)

15:20-15:40 FrTPMT1.2


Arend Tatsch, Christopher Alexander (West Virginia University); Bredu, Jonas Amoama (West Virginia University); Covel, Dylan (West Virginia University); Tulu, Ishan Berk (West Virginia University); Gu, Yu (West Virginia University)

15:40-16:00 FrTPMT1.3

Increasing Mobile Robot Tethered Payload Transport Capacity through Multipurpose Manipulation, pp. 1154-1161.

Kim, Raymond (Georgia Institute of Technology); Diller, Edward (Stanford University); Harkonen, Emil (Georgia Institute of Technology); Mazumdar, Anirban (Georgia Institute of Technology)

16:00-16:20 FrTPMT1.4

Modeling Solid-State LiDAR Sensor for Optimization of Area Coverage Deployment, pp. 1162-1167.

Farzadpour, Farsam (University of Windsor); Zhang, Tong (University of Windsor); Chen, Xiang (University of Windsor)

16:20-16:40 FrTPMT1.5

Rollover Prevention by Quadruped Tracked Mobile Robot, pp. 1168-1173.

Fujita, Toyomi (Tohoku Institute of Technology); Sato, Shun (SWS East Japan, Ltd)

FrTPMT2

15:00-15:20 FrTPMT2.1

Axial Torque Estimation Based on Backlash Detection for Reduction Gear Using Encoder Information*.

Tsui, Toshiaki (Saitama University); Kiuchi, Masato (Saitama University); Fujimoto, Yasutaka (Yokohama National University)

15:20-15:40 FrTPMT2.2

Dynamics Identification and Amplitude Control of a Wireless Axial Torque Estimation Based on Backlash Detection

Yau, Her-Terng (National Chung Cheng University, Department of Mechanical Engineering); Kuo, Ping-Huan (National Chung Cheng University); Ting-Chung Tseng, Ting-Chung Tseng (National Chung Cheng University); Lin, Hao-Yang (National Chung Cheng University)

15:40-16:00 FrTPMT2.3

Estimation of the Electrostatic Effects in the LISA-Pathfinder Critical Test Mass Dynamics Via the Method of Moments, pp. 1175-1175.

Zanoni, Carlo (INFN); Bertoluzzi, Daniele (University of Trento); Vignotto, Davide (University of Trento)

16:00-16:20 FrTPMT2.4

Parameter Identification Related to Vertical Dynamic of a Self-Stabilizing Monorail Vehicle, pp. 1176-1181.

Griese, Martin (OWL University of Applied Sciences and Arts); Mousavi, Seyed Davood (Ostwestfalen-Lippe University of Applied Sciences and Arts); Schulte, Thomas (TH OWL)

16:20-16:40 FrTPMT2.5

Automated Backlash Determination on Rack-And-Pinion Drives, pp. 1182-1187.

Zenn, Wiebke Salome (TRUMPF Machine Tools); Keck, Alexander (TRUMPF Lasersystems for Semiconductor Manufacturing); Beck, Marcus (WITTENSTEIN SE); Herold, Sven (Fraunhofer Institute for Structural Durability and System Reliability); Melz, Tobias (Fraunhofer LBF)

FrTPMT3

15:00-15:20 FrTPMT3.1


Samak, Chummay (Clemson University International Center for Automotive Research); Samak, Tanmay (Clemson University International Center for Automotive Research); Krovi, Venkat (Clemson University)

15:20-15:40 FrTPMT3.2


Takeuchi, Hiroki (The University of Tokyo); Takamido, Ryota (Research into Artifacts, Center for Engineering (RACE), School of Letters, Arts and Science); Kanda, Shinji (University of Tokyo); Oka, Yasushi (The University of Tokyo); Kato, Shinji (Tokyo Ariake University of Medical and Health Sciences); Kame, Hajime (The University of Tokyo); Masahiro, Koji (The University of Tokyo); Kasahara, Seiji (ENEOS Corporation); Fujimoto, Seigo (ENEOS Corporation); Takamura, Sunao (ENEOS Corporation); Kato, Toshiya (ENEOS Corporation); Korenaga, Masahiro (ENEOS Corporation); Sazama, Akinobu (ENEOS Corporation); Hoshii, Misaki (ENEOS Corporation); Ota, Jun (The University of Tokyo)

15:40-16:00 FrTPMT3.3

Prototype of Ball-Like Jumping Robot for Playful Learning, pp. 1200-1205.

Sango, Yuto (Waseda University); Ishii, Hiroyuki (Waseda University)

16:00-16:20 FrTPMT3.4

Development of a Nursing Skill Training System Based on Manipulator Variable Admittance Control, pp. 1206-1211.

Zhou, Yu Hao (The University of Tokyo); Takamido, Ryota (Research into Artifacts, Center for Engineering (RACE), School of Letters, Arts and Science); Kanai, Pak, Masako (Tokyo Aitake University of Medical and Health Sciences); Mae, Jukai (Tokyo Aitake University of Medical and Health Sciences); Kitajima, Yasuko (Tokyo Aitake University of Medical and Health Sciences); Nakamura, Mitsuhiro (Tokyo Aitake University of Medical and Health Sciences); Kuwahara, Noriaki (Graduate School of Science and Technology,
Efficient Trajectory Planning and Control for USV with Vessel Ionized Non-holonomic Path Planning, pp. 1246-1250.

Fei, Zifan (Dalhousie University); Pan, Ya-Jun (Dalhousie University)

Huang, Tao (Zhejiang University); Xue, Zhenfeng (Zhejiang University)


Christos, Andreanidia (KTH Royal Institute of Technology); Bergsten, Johanna (KTH Royal Institute of Technology); Brümmer, Marcel (KTH Royal Institute of Technology); Fröberg, Joel (KTH Royal Institute of Technology); Lindestam, Algot (KTH Royal Institute of Technology); Persson, Annie (KTH Royal Institute of Technology); Pirmohamed, Fahim (KTH Royal Institute of Technology); Sandhal, Maria (KTH Royal Institute of Technology); Thorapalli Muralidharan, Seshagopalan (KTH Royal Institute of Technology); Andriopoulos, Georgios (KTH Royal Institute of Technology)


Huang, Lei (Shanghai Jiao Tong University); Ming, Hengjiang (Shanghai Jiao Tong University); Yin, Yh (Shanghai Jiao Tong University)


Li, Wenjing (Georgia Institute of Technology); Lee, Kok-Meng (Georgia Institute of Technology)

Non-Linear Friction Characterisation of the Unwinding Group in a Web Processing Machine, pp. 1240-1245.

Mathivanan, Arul K. (Ghent University); De Vlaene, Jasper (University of Gent); Thielemans, Yentl (Ghent University); De Koning, Jeroen D. M. (Dynamic Systems & Control Group (DYSC), Ghent University and F); Stockman, Kurt (Universiteit Gent)


Zhu, Junxi (North Carolina State University); Jiao, Chunhai (City College of New York); Dominguez, Israel (Rensselaer Polytechnic Institute); Wen, Yunshi (Rensselaer Polytechnic Institute); He, Honglu (North Carolina State University); Yu, Shuangyue (City University of New York, City College); Su, Hao (North Carolina State University)


Fei, Zifan (Dalhousie University); Pan, Ya-Jun (Dalhousie University)

Huang, Tao (Zhejiang University); Xue, Zhenfeng (Zhejiang University)

Template-Free Non-Visiting Uniform Coverage Path Planning on Curved Surfaces, pp. 1261-1269.

Yang, Tong (Zhejiang University); Valls Miro, Jaime (University of Technology Sydney); Nguyen, Huy Nhat Minh (University of Technology Sydney); Wang, Yue (Zhejiang University); Xiong, Rong (Zhejiang University)

Performance Comparison for Aggregation and Formation of Swarm Robots, pp. 1270-1275.

Yazici, Emre (Istanbul Technical University, NISO); Temeltas, Hakan (Istanbul Technical University)

Cooperative Time-Optimal Trajectory Generation for a Heterogeneous Group of Redundant Mobile Manipulators, pp. 1276-1281.

Hierholz, Alice (University of Stuttgart, Institute for System Dynamics); Gienger, Andreas (University of Stuttgart); Sawodny, Oliver (University of Stuttgart)


Kästner, Linh (T-Mobile, TU Berlin); Meusel, Marvin (Technische Universität Berlin); Buiyan, Teham (Technical University Berlin); Lambrecht, Jens (Technische Universität Berlin)

Biologically Inspired Intelligence for Mechatronics and Robotics (Organized Session)

Biologically Inspired Intelligence for Mechatronics and Robotics*. Lue, Chaomin (Mississippi State University); Bi, Zhuming (Purdue University Fort Wayne)

Motion Profile Optimization in Industrial Robots Using Reinforcement Learning, pp. 1289-1296.

Wen, Yunshi (Rensselaer Polytechnic Institute); He, Honglu (Rensselaer Polytechnic Institute); Julius, Agung (Rensselaer Polytechnic Institute); Wen, John (Rensselaer Polytechnic Institute)

Registration of Deformed Tissue: A GNN-VAE Approach with Data Assimilation for Sim-To-Real Transfer, pp. 1297-1297.

Afshar, Mehmoosun (University of Alberta); Meyer, Tyler (Baker Cancer Centre); Sloboda, Ronald (Cross Cancer Institute); Husain, Siraj (Tom Baker Cancer Centre); Usmani, Nawaid (Cross Cancer Institute); Takakoli, Mahdi (University of Alberta)

Deformable Fractional Filters, pp. 1298-1303.

Zamora-Esquível, Julio (Intel); Rhodes, Anthony (Intel); Macias-García, Edgar (Centro De Investigación Y Estudios Avanzados Del Instituto Polít); Nachman, Lama (Intel Labs)

Motion Dynamics Modeling and Fault Detection of a Soft Trunk Robot, pp. 1304-1309.

Janadghi, Emadodin (University of Rhode Island); Chen, Xiaotian (Zhejiang University)
16:20-16:40 FrTPMT8.5

3-D Precision Positioning Based on Deep Comparison Convolutional Neural Networks, pp. 1310-1315.

Wen, Bo-Xu (National Taipei University of Technology); Li, Chih-Hung G. (National Taipei University of Technology)

16:40-17:00 FrTPMT8.6

Deep Neural Network Design for Improving Stability and Transient Behavior in Impedance Control Applications, pp. 1316-1323.

Slightam, Jonathon E. (Sandia National Laboratories); Griego, Antonio (University of New Mexico)
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Places to Eat

Lunch:

**Counter Service Only (up to 2 blocks)**

**Dahlia Bakery** 2001 4th Ave 1 block Mon-Fri 8-5, Sat-Sun 8-4, kitchen until 3

**Café Madeline** 700 Stewart 1 block (actually on Virginia St) Mon-Fri 7-2

**Marination** 2000 6th Ave 1 block Hawaiian/Korean Mon-Sat 11-8

**Pho Bac** 1923 7th Ave 2 blocks Vietnamese Mon-Sat 10am-8:45pm, closed Sundays

**Rubinstein Bagels** 2121 6th Ave 2 blocks, bagel sandwiches daily 7-3

**Westlake Center Food Hall** 1 block Caliburger, Sushi Burrito, Zuba, Xian Noodles

**Dine-In (to 4 blocks)**

**Relish** in the Westin lobby level daily 11-3, **Relish to Go** in the Westin lobby level daily 11-9

**Andare** 808 Howell, Hyatt Regency, 4 blocks Italian Mon-Fri 11-3 Sat-Sun 11:30-3

**Capital Grille** 1301 4th Ave, 3 blocks Steakhouse Mon-Fri 11-3

**Casco Antiguo**, 2102 7th Ave, 2 blocks Mexican M-Wed 11-9 Thu-Fri 11-10, Sat 2-10, closed Sundays

**Cheesecake Factory** 700 Pike St, 4 blocks M-Thu 11-10, Fr-Sa 11-11, Sun 10-10

**Cinque Terre** 2001 Westlake Ave, 1 block Italian, Seafood Mon-Fri 11-3

**Din Tai Fung** Pacific Place, 2 blocks Taiwanese Su-Thu 11-8, Fri-Sat 11-9

**Lola** 2000 4th Ave, 1 block Greek-inspired Wed-Fri 11-3, Sat-Sun 11-2 closed Mon & Tue

**Molino** 2325 6th Ave, 4 blocks authentic Mexican Mon-Fri 10-3:30, Sat-Sun 10-130

**Mr. West** 720 Olive Way 2 blocks American Mon-Fri 7-6 Sat-Sun 8-3

**Pike Place Chowder** Pacific Place, 2 blocks M-Sa 11-7, Su 11-6

**Serious Pie** 2001 4th Ave, 1 block thin crust pizza, salads daily 11:30-9, reserve 6+ only

**Skillet Diner** 2050 6th Ave, 1 block American Mon-Fri 11-7, Sat-Sun 10-7

**Thai Ginger** Pacific Place, 2 blocks Mon-Fri 11:30-9, Sat-Sun 12-9

**Victor Tavern**, 2121 6th Ave, 2 blocks American Mon-Fri 11-10, brunch on weekends

**Wild Ginger** 2202 8th Ave, 4 blocks Asian/Fusion Tue-Fri 11:30-9, Sat 4-9

**Katsu-ya** 122 Westlake Ave N, 4 blocks Japanese Tue-Thur 11:30-230, Fri-Sat 11:30-230

**Momiji** 731 Bell St, 4 blocks Japanese daily 11-2

**Lunch in Pike Place Market (4-5 blocks)**
Cutters 2001 Western Ave, Seafood Mon-Wed 3-9 Thu-Sun 12-9
Pike Place Bar & Grill 90 Pike St, American Sun-Thu 10-9, Fr-Sa 10-10
Pike Brewing Company 1415 1st Ave, American daily 11-9
Seatown 2010 Western Ave, Seafood Sun-Thu 1130-7 Fri-Sat 1130-8 no reservations
Lunch on the Waterfront (almost a mile)
Elliott's 1201 Alaskan Way Pier 56, Seafood Sun-Thu 12-9 Fri-Sat 12-10
Ivar's 1001 Alaskan Way Pier 54, Seafood daily 12-8

Dinner:
1900 FIFTH BAR + LOUNGE 21+ Westin Lobby daily 3-11
Barolo 1940 Westlake, Italian daily 3pm-12am, reserve 1 block
Cinque Terre 2001 Westlake Ave Italian, seafood daily 3-10 1 block
Serious Pie 2001 4th Ave, pizzas, salads Sun-Thu 1130-9, Fri-Sat 1130-10 1 block
Lola 2000 4th Ave, Greek Wed-Sat 3-8, no dinner Sun-Tue 1 block
Victor Tavern, 2121 6th Ave, American daily 11-10 2 blocks
2120 at 2120 6th Ave, New American daily 4-9 2 blocks
Wilmott's Ghost 2100 6th Ave, pizza, Italian Mon-Fri 1130-9 Sat 4-9 reserve 2 blocks
Din Tai Fung Pacific Place, Taiwanese Sun-Thu 11-830, Fri-Sat 11-9 2 blocks
Pike Place Chowder Pacific Place, Mon-Sat 11-7, Sun 11-6 2 blocks
Thai Ginger Pacific Place, Mon-Fri 3-9, Sat-Sun 12-9 2 blocks
Butcher’s Table 2121 Westlake Ave, Steakhouse Mon-Sat 4-9 2 blocks
Wann Izakaya 2020 2nd Ave, Japanese Mon-Sat 5-10, closed Sun 3 blocks
Tidal+ 1635 8th Ave, Hyatt Olive 8, Seafood Tue-Thu 3-10, Fri-Sat 3-11 3 blocks
Capital Grille 1301 4th Ave, Steaks Mon-Thu 3-10, Fri 3-11 Sat 4-11, Sun 4-9 3 blocks
Casco Antiguo 2102 7th Ave, Mexican Mo-Wed 11-9, Thu-Fri 11-10, Sat 2-10 3 blocks
Ruth Chris 727 Pine St, Steaks Mon-Sat 4-10, Fri-Sat 4-1030, Sun 4-9 4 blocks
Chan Seattle 724 Pine St Paramount Hotel Korean daily 5-9 reserve 4 blocks
Wild Ginger 2208 8th Ave, Asian/Fusion Tue-Fri 1130-9, Sat 4-9 4 blocks
Momiji 731 Bell St, Japanese, sushi Sun-Thu 4-9 Fri-Sat 4-10, reserve 4.5 blocks
Aerlume 2003 Western Ave, Steak & seafood Tue-Sat 4-9, closed Sun-Mon 5 blocks
Etta’s Big Mountain BBQ 2020 Western Th-Fr 3-9 Sat 12-9 Su 12-8 Mon 3-8 5 blocks
Cutter’s 2001 Western Ave, Seafood Thu-Sun 12-830, Mon-Wed 3-830 5 blocks
Hatch Cantina 200 Bell St, Southwestern Tue-Thu 4p-12am Fri-Sat 4pm-1am 6 blocks
Purple Café 1225 4th Ave, New American Tue-Sat 4-10, Sun 4-9 6 blocks
Wasabi Sushi 2311 2nd Ave, Japanese Sun-Thu 4-10 Fri-Sat 4-12am 6 blocks
Umi Sake’ House 2230 1st Ave, Japanese Sun-Thu 4-11, Fr-Sa 4-12am 6 blocks
El Gaucho 2200 Western Ave, Steakhouse Tue-Sat 4-930 ½ mile
Boca Restobar & Grill 2201 1st Ave, Argentine Steakhouse daily 5-10 ½ mile
Rocco’s Specialty Bar & Pizzeria 1232 2nd Ave, daily 11am-12am, reserve ½ mile
Elliott’s 1201 Alaskan Way, Seafood Mon-Thu 3-9, Fri-Sat 12-10, Sun 12-9 1 mile
Ivar’s 1001 Alaskan Way, Seafood Wed-Sun 12-8, closed Mon-Tue 1 mile