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: 3:30 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

The Boeing Advanced Research Center (BARC) represents a new paradigm in the execution of industrial research at the University of Washington. BARC is housed in the Mechanical Engineering Department but faculty and students from many Departments in the Colleges of Engineering and Arts and Sciences collaborate in the research. Boeing-employed affiliate instructors work in the lab side by side with faculty and students on joint research projects in the manufacturing and assembly of aircraft and spacecraft structures. Our goal is to foster collaborative basic and applied research, translational research and development and student education-related activities. The focus of current BARC projects include Big Data/Machine Learning, Ergonomics and Safety, Advanced Composites, and Additive Manufacturing. Additional information can be found at the website: https://depts.washington.edu/barc/

Award Sponsors

Machines, an Open Access Journal by MDPI

Machines (ISSN 2075-1702) [IF 2.899, CiteScore 3.1] is an international, peer-reviewed, open access journal on machinery and engineering published monthly online by MDPI. Journal Rank: JCR - Q2 (Engineering, Mechanical) / JCR – Q2 (Engineering, Electrical & Electronic). Manuscripts are peer-reviewed and a first decision provided to authors approximately 16.2 days after submission; acceptance to publication is undertaken in 2.9 days (median values for papers published in this journal in the second half of 2022).

The following opportunities for collaboration may be of interest:
Machines 2023 Young Investigator Award (1500 CHF)
Nomination deadline: 30 November 2023
Apply at: https://www.mdpi.com/journal/machines/awards/2200

Machines 2023 Best PhD Thesis Award (500 CHF)
Application deadline: 31 October 2023
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Program at a Glance

AIM 2023 Technical Program Wednesday June 28, 2023

Track T1	Track T2	Track T3	Track T4	Track T5	Track T6	Track T7	Track T8
08:30-09:30 WePAMP Cascade Ballroom Plenary: Data-Enhanced Mechatronic Systems for Smart Manufacturing							
09:30-10:00 WeCAMC Cascade Foyer Posters - Wednesday I							
10:00-12:00 WeTAMT1 Olympic Aerial Robotics - Design	10:00-12:00 WeTAMT2 Adams Continuum and Soft Robots	10:00-12:00 WeTAMT3 Whidbey Micro and Nano Systems	10:00-12:00 WeTAMT4 Baker Control Applications I	10:00-12:00 WeTAMT5 Orcas Industrial Applications	10:00-12:00 WeTAMT6 Blakely Medical Robotics	10:00-12:00 WeTAMT7 Vashon I Robotics	10:00-12:00 WeTAMT8 Vashon II Mechatronics Pedagogy
13:30-14:30 WePPMP Cascade Ballroom Plenary: From R&D to Production: Challenges in Automation for Aerospace							
14:30-15:00 WeCPMC Cascade Foyer Posters - Wednesday II							
15:00-17:00 WeTPMT1 Olympic Aerial Robotics - Control	15:00-17:00 WeTPMT2 Adams Legged Robots	15:00-17:00 WeTPMT3 Whidbey Control Applications II	15:00-17:00 WeTPMT4 Baker [Title not available]	15:00-17:00 WeTPMT5 Orcas Spotlight: Best Student Papers	15:00-17:00 WeTPMT6 Blakely Exoskeletons	15:00-17:00 WeTPMT7 Vashon I Flexible Manipulators	15:00-17:00 WeTPMT8 Vashon II Automotive

AIM 2023 Technical Program Thursday June 29, 2023

Track T1	Track T2	Track T3	Track T4	Track T5	Track T6	Track T7	Track T8
08:30-09:30 ThPAMP Cascade Ballroom Plenary: The New Age of Learning-Based Robot Motion Planning							
09:30-10:00 ThCAMC Cascade Foyer Posters - Thursday I							
10:00-12:00 ThTAMT1 Olympic Aerial Robotics - Manipulation	10:00-12:00 ThTAMT2 Adams Machine Vision in Mobile Robots	10:00-12:00 ThTAMT3 Whidbey Innovations in MR Devices	10:00-12:00 ThTAMT4 Baker Actuators I	10:00-12:00 ThTAMT5 Orcas Sensors I	10:00-12:00 ThTAMT6 Blakely Rehabilitation Robotics	10:00-12:00 ThTAMT7 Vashon I Robotic Hands and Grippers	10:00-12:00 ThTAMT8 Vashon II Dynamic Cohesive Tracking in Networks
13:30-14:30 ThPPMP Cascade Ballroom Plenary: Working from Home Is Nice, but Flying to Work Is Better							
14:30-15:00 ThCPMC Cascade Foyer Posters - Thursday II							
15:00-17:00 ThTPMT1 Olympic Aerial Robotics - Sensing	15:00-17:00 ThTPMT2 Adams Mobile Robotics I	15:00-17:00 ThTPMT3 Whidbey Machine Vision	15:00-17:00 ThTPMT4 Baker Actuators II	15:00-17:00 ThTPMT5 Orcas Sensors II	15:00-17:00 ThTPMT6 Blakely HMI I	15:00-17:00 ThTPMT7 Vashon I AI Damage Detection	15:00-17:00 ThTPMT8 Vashon II Intelligent Human-Machine Collaboration

AIM 2023 Technical Program Friday June 30, 2023

Track T1	Track T2	Track T3	Track T4	Track T5	Track T6	Track T7	Track T8
08:30-09:30 FrPAMP Cascade Ballroom Plenary: Sea Lamprey, E-Skin, and Robotic Fish: Mechatronic Solutions to Invasive Species Control							
09:30-10:00 FrCAMC Cascade Foyer Posters - Friday I							
10:00-12:00 FrTAMT1 Olympic Mobile Robotics II	10:00-12:00 FrTAMT2 Adams Estimation and Identification I	10:00-12:00 FrTAMT3 Whidbey Manufacturing	10:00-12:00 FrTAMT4 Baker [Title not available]	10:00-12:00 FrTAMT5 Orcas Optimization	10:00-12:00 FrTAMT6 Blakely HMI II	10:00-12:00 FrTAMT7 Vashon I Vibration, and Noise Control	10:00-12:00 FrTAMT8 Vashon II Machine Learning I

13:30-14:30 FrPPMP Cascade Ballroom Plenary: Beyond Conventional Interfaces: Exploring the Intersection of Wearable Technologies, Textiles, and Physical Computing							
14:30-15:00 FrCPMC Cascade Foyer Posters - Friday II							
15:00-17:00 FrTPMT1 Olympic Mobile Robotics III	15:00-17:00 FrTPMT2 Adams Estimation and Identification II	15:00-17:00 FrTPMT3 Whidbey Mechatronics in Education	15:00-17:00 FrTPMT4 Baker [Title not available]	15:00-17:00 FrTPMT5 Orcas Modeling and Design	15:00-17:00 FrTPMT6 Blakely Planning and Navigation	15:00-17:00 FrTPMT7 Vashon I Biologically Inspired Intelligence for Mechatronics and Robotics	15:00-17:00 FrTPMT8 Vashon II Machine Learning II

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 embranchment 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, swam 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

for robot and vehicle systems, motion control, motion planning, movement control, sensor-motor coordination, and learning in biological systems for robot and vehicle systems.
This special session seeks to highlight and present the growing interests in emerging research, development and applications in the dynamic and exciting areas of biologically inspired algorithms for mechatronics and robotics and vehicle systems (autonomous robots, unmanned underwater vehicles, and unmanned aerial vehicles).

Invited Sessions

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 Univeristy (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

Workshop on Dynamic Cohesive Tracking in Networks

Thursday, June 29, 2023, 10:00 AM - 12:00 PM, Vashon 2

Organizer: Anuj Tiwari, University of Washington, Seattle, USA

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

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)

WeCAMC Cascade Foyer

Posters - Wednesday I (Poster Session)

09:30-10:00 WeCAMC.1

*Aerodynamic Effect for Collision-Free Reactive Navigation of a Small Quadcopter**.

Ding, Runze (CITY UNIVERSITY OF HONGKONG); 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

Formation Analysis of Dynamic Multi-Agent Systems Controlled by a Generalized Cyclic Pursuit Mechanism, pp. 1-1.

Kwak, Taeheon (Chung-Ang University); Kim, Yeongjae (Chung-Ang University); Kim, Tae-Hyoung (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, Hyungjin (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)

WeTAMT1 Olympic

Aerial Robotics - Design (Regular Session)

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 (Suzhou Automobile Research Institute, Tsinghua University, Suzho); 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

MorphoGear: An UAV with Multi-Limb Morphogenetic Gear for Rough-Terrain Locomotion, pp. 3-8.

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

10:40-11:00 WeTAMT1.3

Multi-Objective Co-Design for Mission-Specific Development of Unmanned Aerial Systems, pp. 9-16.

Wauters, Jolan (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, Marcel (High Flyers); Grzybowski, Jacek (Silesian Univeristy 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); Piórkowski, 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)

WeTAMT2 Adams

Continuum and Soft Robots (Regular Session)

10:00-10:20 WeTAMT2.1

Soft Continuum Robot Airbag Integrated with Passive Walker for Fall Mitigation, pp. 32-37.

Thompson, Jacob (Clemson University); Walker, Ian (Clemson University)

10:20-10:40 WeTAMT2.2

Design and Experimental Validation of a Novel Hybrid Continuum Robot with Enhanced Dexterity and Manipulability in Confined Space, pp. 38-38.

Ma, Xin (Chinese Univerisity of HongKong); Wang, Xuchen (The Chinese University of Hong Kong); Zhang, Zihao (Multi-Scale Medical Robotics Center Limited); Zhu, Puchen (Multi-Scale Medical Robotics Center Limited); Cheng, Shing Shin (The Chinese University of Hong Kong); Au, K. W. Samuel (The Chinese University of Hong Kong)

10:40-11:00 WeTAMT2.3

A Survey on the Current Trends and Applications of Design Optimization for Compliant and Soft Robotics, pp. 39-45.

Thorapalli Muralidharan, Seshagopalan (KTH Royal Institute of Technology); Andrikopoulos, Georgios (KTH Royal Institute of Technology); Feng, Lei (KTH Royal Institute of Technology)

11:00-11:20 WeTAMT2.4

Efficient Jacobian-Based Inverse Kinematics with Sim-To-Real Transfer of Soft Robots by Learning, pp. 46-56.

Fang, Guoxin (The University of Manchester); Tian, Yingjun (The University of Manchester); Yang, Zhi-Xin (University of Macau); Geraedts, Jo (Delft University of Technology); Wang, Charlie C.L. (The University of Manchester)

11:20-11:40 WeTAMT2.5

Study on Soft Robotic Pinniped Locomotion, pp. 57-63.

Kodippili Arachchige, Dimuthu Dharshana (DePaul University); Varshney, Tanmay (The Ohio State University); Huzaifa, Muhammad Umer (DePaul University); Kanj, Iyad (DePaul University); Nanayakkara, Thrishantha (Imperial College London); Chen, Yue (Georgia Institute of Technology); Gilbert, Hunter B. (Louisiana State University); Godage, Isuru S. (Texas A&M University)

11:40-12:00 WeTAMT2.6

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

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

WeTAMT3 Whidbey

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

Self-Alignment Capillary Gripper for Microfiber Manipulation, pp. 85-85.

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)

11:00-11:20 WeTAMT3.4

AFM Microcantilever with On-Chip Electrothermal and Piezoelectric Transducers: Z-Axis Control and Standalone Operation, pp. 86-90.

Mahmoodi Nasrabadi, Hazhir (The University of Texas at Dallas); Nikooienejad, 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)

11:20-11:40 WeTAMT3.5

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

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

11:40-12:00 WeTAMT3.6

Ensemble Control for Manipulating Multiple Nanowires in Fluid Suspension Using External Electrical Fields, pp. 97-102.

Wu, Juan (Binghamton University); Yu, Kaiyan (Binghamton University)

WeTAMT4 Baker

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

Drop-On-Demand Inkjet Drop Control with One-Step Look Ahead Estimation of Model Parameters, pp. 109-109.

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

10:40-11:00 WeTAMT4.3

Data-Driven Optimal Tuning of BLDC Motors with Safety Constraints: A Set Membership Approach, pp. 110-110.

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

11:00-11:20 WeTAMT4.4

A Digital Twin Framework for Virtual Re-Commissioning of Work-Drive Systems Using CAD-Based Motion Co-Simulation, pp. 111-116.

Carlier, Remy (Dynamical Systems & Control Group (DySC), Ghent University and F); Gillis, Joris (KU Leuven); Rademakers, Erwin (Flanders MAke); Borghesan, 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)

WeTAMT5 Orcas

Industrial Applications (Regular Session)

10:00-10:20 WeTAMT5.1

Simulation of Particle Motion on Rotating Cone Feeder for a Multihead 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)

10:20-10:40 WeTAMT5.2

Low-Cost, Accurate Robotic Harvesting System for Existing Mushroom Farms, pp. 136-141.

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

10:40-11:00 WeTAMT5.3

Robot End-Effector for Fabric Folding, pp. 142-147.

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)

11:00-11:20 WeTAMT5.4

Task-Constrained Motion Planning Considering Uncertainty-Informed Human Motion Prediction for Human-Robot Collaborative Disassembly, pp. 148-148.

Liu, Wansong (University at Buffalo); Liang, Xiao (University at Buffalo); Zheng, Minghui (University at Buffalo)

11:20-11:40 WeTAMT5.5

CoboShell Robot for Automatic Scallop Shelling Process: Concepts and Applications, pp. 149-155.

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 Lille1)

WeTAMT6 Blakely

Medical Robotics (Regular Session)

10:00-10:20 WeTAMT6.1

Design and Prototyping of a Miniature Gripper with Decoupled Wrist and Rolling Capabilities for Robotic Surgery, pp. 156-163.

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

10:20-10:40 WeTAMT6.2

Haptic Interface Design for a New Wheelchair Locomotion Simulator Based on a Linear Time-Varying MPC Framework, pp. 164-170.

Ait Ghezala, Amel (Lamih, Umr Cnrs 8201, Uphf); Sentouh, Chouki (LAMIH UMR CNRS 8201, Université Polytechnique Hauts-De-France); Bentaleb, Toufik (Univ. Valenciennes, CNRS. Valenciennes); Pudlo, Philippe (Université Polytechnique Hauts-De-France); Poulain, Thierry (Lamih, Umr Cnrs 8201, Uphf); Conreur, Gerald (Lamih, Umr Cnrs 8201, Uphf)

10:40-11:00 WeTAMT6.3

Point-Based 3D Virtual Fixture Generating for Image-Guided and Robot-Assisted Surgery in Orthopedics, pp. 171-178.

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

11:00-11:20 WeTAMT6.4

Biplane Transrectal Ultrasound Probe Calibration Using Dual-Arm Robotic System with Multi-DOF End-Effectors, pp. 179-185.

Xiong, Jing (Shenzhen Institute of Advanced Technology, Chinese Academy of Sc); Li, Qiangyun (Shenzhen Institutes of Advanced Technology, Chinese Academy of S); 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)

11:20-11:40 WeTAMT6.5

Development of Orthopedic Haptic Drill for Spinal Surgery with Penetration Detection Scheme Based on Viscosity Estimation, pp. 186-192.

Takano, Shunya (Kanagawa Institute of Industrial Science and Technology); Shimono, Tomoyuki (Yokohama National University); Matsunaga, Takuya (Kanagawa Institute of Industrial Science and Technology); Yagi, Mitsuru (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)

11:40-12:00 WeTAMT6.6

Strategy for Haptic-Based Guidance of Soft Magnetic Particles in the Cochlea, pp. 193-199.

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

WeTAMT7 Vashon I

Robotics (Regular Session)

10:00-10:20 WeTAMT7.1

A Variable-Stiffness Robot for Force-Sensitive Applications, pp. 200-200.

Huang, Chun 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); Lan, Chao-Chieh (National Cheng Kung University)

10:20-10:40 WeTAMT7.2

ExSLeR: Development of a Robotic Arm for Human Skill Learning, pp. 201-206.

Lee, Deokjin (Daegu Gyeongbuk Institute of Science and Technology); Choi, Kiyoung (Deagu Gyeongbuk Institute of Science and Technology); Kim, Junyoung (DGIST); Yun, WonBum (Daegu Gyeongbuk Institute of Science and Technology (DGIST)); Kim, Taehoon (DGIST (Daegu Gyeongbuk Institute of Science & Technology)); Nam, Kanghyun (Yeungnam University); Oh, Sehoon (DGIST)

10:40-11:00 WeTAMT7.3

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, Jingyuan (Schaeffler Singapore Pte Ltd); Chow, Wai Tuck (Nanyang Technological University)

11:00-11:20 WeTAMT7.4

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)

11:20-11:40 WeTAMT7.5

Encrypted Coordinate Transformation Via Parallelized Somewhat Homomorphic Encryption for Robotic Teleoperation, pp. 220-225.

Kwon, Bin (Georgia Institute of Technology); Kosieradzki, Shane (Georgia Institution of Technology); Blevins, Jacob (Georgia

Institute of Technology); Ueda, Jun (Georgia Institute of Technology)

11:40-12:00 WeTAMT7.6

Design and Development of CAPM to Adaptively Reconfigure Precision/Power Grasps, pp. 226-230.

Chang, Ivy (Georgia Institute of Technology); Lee, Kok-Meng (Georgia Institute of Technology)

WeTAMT8 Vashon II

Mechatronics Pedagogy (Workshop/Tutorial Session)

10:00-10:20 WeTAMT8.1

*Half-Day Workshop: Mechatronics Pedagogy Workshop**.

Vikas, Vishesh (University of Alabama); Mishra, Sandipan (RPI)

WePPMP Cascade Ballroom

Plenary: From R&D to Production: Challenges in Automation for Aerospace (Plenary Session)

13:30-14:30 WePPMP.1

*From R&D to Production: Challenges in Automation for Aerospace**.

Freeman, Philip (Boeing)

WeCPMC Cascade Foyer

Posters - Wednesday II (Poster Session)

14:30-15:00 WeCPMC.1

*Aerodynamic Effect for Collision-Free Reactive Navigation of a Small Quadcopter**.

Ding, Runze (CITY UNIVERSITY OF HONGKONG); Dong, Kaixu (City University of Hong Kong); Bai, Songnan (City University of Hong Kong); Chirarattananon, Pakpong (City University of Hong Kong)

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); Shimonomura, Kazuhiro (Ritsumeikan University)

14:30-15:00 WeCPMC.3

Formation Analysis of Dynamic Multi-Agent Systems Controlled by a Generalized Cyclic Pursuit Mechanism, pp. 1-1.

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

14:30-15:00 WeCPMC.4

*Improving Human-Led Multi-Robot Platoon Using Decentralized DSR**.

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, pp. 2-2.

Gombo, Yoshua (University of Washington); Tiwari, Anuj (University of Washington); Devasia, Santosh (University of Washington)

14:30-15:00 WeCPMC.8

*Trajectory Planning and Motion Control of Unmanned Forklift for Efficient Operation in Automated Warehouse**.

Vorasawad, Konchanok (Pukyong National University); Kim, Hyungjin (Samsung Heavy Industry); Lee, Juhyun (Samsung Heavy Industry); Kim, Mooseok (Samsung Heavy Industry); Kim, Changwon (Pukyong National University)

14:30-15:00 WeCPMC.9

*Dynamic Inversion for Wheeled Inverted Pendulum with Extra Joint Using Singular Perturbation Technique**.

Kim, Munyu (Korea university); Cheong, Joono (Korea University)

14:30-15:00 WeCPMC.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)

WeTPMT1 Olympic

Aerial Robotics - Control (Regular Session)

15:00-15:20 WeTPMT1.1

Distributed Adaptive Dynamic Event-Triggered Control for Multiple Quadrotors, pp. 231-231.

Shan, Jinjun (York University); Wang, Hao (York University)

15:20-15:40 WeTPMT1.2

Mode Switching Algorithm to Improve Variable-Pitch-Propeller Thrust Generation for Drones under Motor Current Limitation, pp. 232-232.

Naoki, Yuto (The University of Tokyo); Nagai, Sakahisa (The University of Tokyo); Fujimoto, Hiroshi (The University of Tokyo)

15:40-16:00 WeTPMT1.3

Quasi-Static State Feedback Output Tracking for a Slung Load System with Rotor Drag Compensation: PX4 SITL Validation, pp. 233-238.

Jiang, Zifei (University of Alberta); Lynch, Alan (University of Alberta)

16:00-16:20 WeTPMT1.4

Path-Following Control for a Slung Load System, pp. 239-246.

Al Lawati, Mohamed Ali Abdulhussain (Sultan Qaboos University); Lynch, Alan (University of Alberta)

16:20-16:40 WeTPMT1.5

Design and Control of a Stable Invertible Coaxial Actuated ROtorcraft (SICARO), pp. 247-254.

Tang, Emmanuel (Singapore University of Technology & Design); Ang, Wei Jun (Singapore University of Technology & Design); Tan, Kian Wee (Singapore University of Technology & Design); Foong, Shaohui (Singapore University of Technology and Design)

16:40-17:00 WeTPMT1.6

Safe Residual Reinforcement Learning for Helicopter Aerial Refueling, pp. 255-261.

Jayarathne, Damsara (Rensselaer Polytechnic Institute); Paternain, Santiago (Rensselaer Polytechnic Institute); Mishra, Sandipan (RPI)

WeTPMT2 Adams

Legged Robots (Regular Session)

15:00-15:20 WeTPMT2.1

Balance Gait Controller for a Bipedal Robotic Walker with Foot Slip, pp. 262-269.

Mihalec, Marko (Rutgers University); Yi, Jingang (Rutgers

University)

15:20-15:40 WeTPMT2.2

Terrain-Blind Humanoid Walking on Rough Terrain with Trajectory Optimization and Biarticular Springs, pp. 270-277.

Pelit, Mustafa Melih (Tokyo Institute of Technology); Yamakita, Masaki (Tokyo Inst. of Technology)

15:40-16:00 WeTPMT2.3

RHex-T3: A Transformable Hexapod Robot with Ladder Climbing Function, pp. 278-278.

Sun, Chunhu (Tiangong University); Yang, Guiyu (Tiangong University); Yao, Senge (Tiangong University); Liu, Qi (Tiangong University); Wang, Jianmin (Tongji University); Xiao, Xuan (Tiangong University)

16:00-16:20 WeTPMT2.4

Alternative Locomotion Modalities for Lunar Rover, pp. 279-284.

Phornpimonchoke, Naphasthanan (Chulalongkorn University); Koosermmit, Sittiphol (Chulalongkorn University); Tanakijchumroon, Ashira (Chulalongkorn University); Chaichaowarat, Ronnapee (Chulalongkorn University)

16:20-16:40 WeTPMT2.5

A Wheel to Leg Transformation Strategy in a Leg-Wheel Transformable Robot, pp. 285-290.

Wang, Hua-Yu (National Taiwan University); Chen, Liang-Jie (National Taiwan University,); Yu, Wei-Shun (National Taiwan University); Lin, Pei-Chun (National Taiwan University)

16:40-17:00 WeTPMT2.6

A Hybrid Impedance and Admittance Control Strategy for a Shape-Transformable Leg-Wheel, pp. 291-296.

Zhuang, Yuan-Cheng (National Taiwan University); Liu, Yu-Ju (National Taiwan University); Yu, Wei-Shun (National Taiwan University); Lin, Pei-Chun (National Taiwan University)

WeTPMT3 Whidbey

Control Applications II (Regular Session)

15:00-15:20 WeTPMT3.1

Boundary Tracking Control for an Unstable Wave Equation with Boundary Uncertainties: A Backstepping Adaptive NN Approach, pp. 297-302.

Zhang, Jingting (University of Rhode Island); Gu, Yan (Purdue University); Zeng, Wei (Longyan University); Yuan, Chengzhi (University of Rhode Island)

15:20-15:40 WeTPMT3.2

Disturbance-Observer-Based Admittance Control and Its Application to Safe Contact Regulation, pp. 303-308.

Shikata, Kosuke (Keio University); Katsura, Seiichiro (Keio University)

15:40-16:00 WeTPMT3.3

Design, Modeling, and Parametric Analysis of a Syringe Pump for Soft Pneumatic Actuators, pp. 309-314.

Yang, Wu-Te (University of California, Berkeley); Hirao, Motohiro (University of California, Berkeley); Tomizuka, Masayoshi (University of California)

16:00-16:20 WeTPMT3.4

Prediction-Based Control for Uncertain Systems with Input Time Delay and Disturbance, pp. 315-320.

Lee, Seong-Min (Ulsan National Institute of Science and Techonolgy (UNIST)); Son, Hungsun (Ulsan National Institute of Science and Technology)

16:20-16:40 WeTPMT3.5

Adaptive Feedforward Control Using a Gaussian Process and a Recursive Least Squares Algorithm for a Hydraulic Axial Piston Pump, pp. 321-326.

Oberdorfer, Martin (University of Stuttgart); Schroeter, Sebastian (University of Stuttgart); Sawodny, Oliver (University of Stuttgart)

16:40-17:00 WeTPMT3.6

Stability Margins of Heavy-Lifting Machines with a Telescoping Boom and Jib, pp. 327-333.

Adams, Christopher (Georgia Institute of Technology); Singhose, William (Georgia Tech)

WeTPMT5 Orcas

Spotlight: Best Student Papers (Regular Session)

15:00-15:20 WeTPMT5.1

*Design and Parametric Analysis of a Magnetic Leadscrew with an Embedded Displacement Sensor**.

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

15:20-15:40 WeTPMT5.2

*Task-Constrained Motion Planning Considering Uncertainty-Informed Human Motion Prediction for Human-Robot Collaborative Disassembly**.

Liu, Wansong (University at Buffalo); Liang, Xiao (University at Buffalo); Zheng, Minghui (University at Buffalo)

15:40-16:00 WeTPMT5.3

*Motion Dynamics Modeling and Fault Detection of a Soft Trunk Robot**.

Jandaghi, Emadodin (University of Rhode Island); Chen, Xiaotian (University of Rhode Island); Yuan, Chengzhi (University of Rhode Island)

16:00-16:20 WeTPMT5.4

*Spectro-Temporal Recurrent Neural Network for Robotic Slip Detection with Piezoelectric Tactile Sensor**.

Ayral, Théo (Université Paris-Saclay, CEA, Leti); Aloui, Saifeddine (Université Grenoble Alpes, CEA, Leti); Grossard, Mathieu (Université Paris-Saclay, CEA, List)

16:20-16:40 WeTPMT5.5

*Design and Control of a Ground-Aerial Dual Actuator Monocopter (G-ADAM)**.

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)

WeTPMT6 Blakely

Exoskeletons (Regular Session)

15:00-15:20 WeTPMT6.1

Development and Evaluation of a Hip Exoskeleton for Lateral Resistance Walk Exercise, pp. 334-334.

Cao, Wujing (Shenzhen Institute of Advanced Technology); Shang, Dongyang (SIAT); Yin, Meng (Chinese Academy of Sciences); Xinwei, Li (University of Shanghai for Science and Technology); Xu, Tiantian (Chinese Academy of Sciences); Zhang, Li (The Chinese University of Hong Kong); Wu, Xinyu (CAS)

15:20-15:40 WeTPMT6.2

Design and Control of the Portable Upper-Limb Elbow-Forearm Exoskeleton for ADL Assistance, pp. 335-341.

Cheng, Hiu Yee Hilary (National University of Singapore); Kwok, Thomas M. (National University of Singapore); Yu, Haoyong (National University of Singapore)

15:40-16:00 WeTPMT6.3

Design and Validation of a Versatile High Torque Quasi-Direct Drive Hip Exoskeleton, pp. 342-349.

Bajpai, Aakash (Georgia Institute of Technology); Carrasquillo, 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)

16:00-16:20 WeTPMT6.4

Origami-Inspired Wearable Robot for Trunk Support, pp. 350-350.

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)

16:20-16:40 WeTPMT6.5

Development of Soft Pneumatic Actuator Based Wrist Exoskeleton for Assistive Motion, pp. 351-358.

Singh, Inderjeet (University of Texas at Arlington); Erel, Veysel (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 & White Institute for Rehabilitation); Wijesundara, Muthu B. J. (The University of Texas at Arlington)

16:40-17:00 WeTPMT6.6

Design and Development of a Lightweight, High-Torque, and Cost-Effective Hip Exoskeleton, pp. 359-364.

Esquivel Patricio, Jose (San Jose State University); Sharifi, Mojtaba (San Jose State University); Shrestha, Dhurba (San Jose State University); Thu, Sai Hein Si (San José State University)

WeTPMT7 Vashon I

Flexible Manipulators (Regular Session)

15:00-15:20 WeTPMT7.1

Compliant Control of Flexible Joint by Dual-Disturbance Observer and Predictive Feedforward, pp. 365-365.

Wan, Hongyu (Ningbo Institute of Materials Technology and Engineering, Chines); 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, CAS); Yang, Guilin (Ningbo Institute of Material Technology and Engineering, Chines)

15:20-15:40 WeTPMT7.2

Enhancing Torsional Stiffness of Continuum Robots Using 3-D Topology Optimized Flexure Joints, pp. 366-366.

Sun, Yilun (Technical University of Munich); Lueth, Tim C. (Technical University of Munich)

15:40-16:00 WeTPMT7.3

Compliant Finray-Effect Gripper for High-Speed Robotic Assembly of Electrical Components, pp. 367-372.

Hartisch, Richard Matthias (TU Berlin); Haninger, Kevin (Fraunhofer IPK)

16:00-16:20 WeTPMT7.4

Optimal Cosserat-Based Deformation Control for Robotic Manipulation of Linear Objects, pp. 373-380.

Artinian, Azad (ISIR - Sorbonne Université); Huet, Quentin (Sorbonne ISIR); Ben Amar, Faiz (Université Pierre Et Marie Curie, Paris 6); Perdereau, Véronique (Sorbonne University)

16:20-16:40 WeTPMT7.5

Development of a Long Flexible Manipulator Utilizing the Motions of Twining and Tightening to Enhance Holding Ability, pp. 381-386.

Shimegi, Shotaro (Waseda University); Ishibashi, Keitaro (Waseda University); Usami, Toshihiro (Waseda University); Ishii, Hiroyuki (Waseda University)

16:40-17:00 WeTPMT7.6

Six-Bar Pulley-Guided Node Based Prismatic Tensegrity Robot Form-Finding Analysis and Experiment, pp. 387-392.

Yeshmukhametov, Azamat (Nazarbayev University); Tileukulova, Aisulu (Al-Farabi Kazakh National University); Koganezawa, Koichi (Tokai University)

WeTPMT8 Vashon II

Automotive (Regular Session)

15:00-15:20 WeTPMT8.1

A Grey-Box Surrogate Vehicle Energy Consumption Model Capable of Real-Time Updating, pp. 393-400.

Hua, Lingyun (Michigan State University); Tang, Jian (Michigan State University); Dourra, Hussein (Magna International); Zhu, Guoming George (Michigan State University)

15:20-15:40 WeTPMT8.2

Development of an Autonomous, Explainable, Robust Robotic System for Electric Vehicle Battery Disassembly, pp. 401-406.

Zhang, Yisheng (Shanghai Jiao Tong University); Zhang, Hengwei (Shanghai Jiao Tong University); Wang, Zhigang (Intel Labs China); Zhang, Shengmin (Shanghai Jiao Tong University); Li, Huaicheng (Central South University of Forestry and Technology); Chen, Ming (Shanghai Jiao Tong University)

15:40-16:00 WeTPMT8.3

Stability and Intervehicle Distance Analysis of Heterogeneous Platoons in Look-Ahead Topologies, pp. 407-407.

Zakerimanesh, Amir (University of Alberta); Z. Qiu, Tony (University of Alberta); Tavakoli, Mahdi (University of Alberta)

16:00-16:20 WeTPMT8.4

Optimal and Adaptive Engine Switch Control for a Parallel Hybrid Electric Vehicle Using a Computationally Efficient Actor-Critic Method, pp. 408-415.

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)

16:20-16:40 WeTPMT8.5

Proposal of On-Board Camera-Based Driving Force Control Method for Autonomous Electric Vehicles, pp. 416-421.

Ueno, Takumi (The University of Tokyo); Pousseur, 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)

16:40-17:00 WeTPMT8.6

An Efficient Hybrid Deep Learning Approach for Accurate Remaining EV Range Prediction, pp. 422-427.

Eissa, Magdy (Tennessee Technological University); Chen, Pingen (Tennessee Technological University)

Technical Program for Thursday June 29, 2023

ThPAMP Cascade Ballroom

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

08:30-09:30 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

*AcTeR: 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 Suit 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); Niitsuma, 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)

ThTAMT1 Olympic

Aerial Robotics - Manipulation (Regular Session)

10:00-10:20 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 Uni-Directional Thrust Multirotors, pp. 438-445.

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

11:20-11:40 ThTAMT1.5

A Tiltable Airframe Multirotor 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)

ThTAMT2 Adams

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

Robust Visual Odometry on SE(3): Design and Verification, pp. 461-461.

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

Multi-Camera Visual Predictive Control Strategy for Mobile Manipulators, pp. 462-468.

Bildstein, Hugo (LAAS-CNRS); Durand-Petiteville, Adrien (Federal University of Pernambuco UFPE); Cadenat, 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

Real-Time Visual-Servo Navigation for Map-Free Self-Driving in Unstructured Outdoor Environments, pp. 475-480.

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 (I), 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 (I), 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 (Unversity 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, Hyo 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 (Excelitas Technologies Corporation)

10:20-10:40 ThTAMT5.2

Extrinsic Calibration of 2D Millimetre-Wavelength Radar Pairs Using Ego-Velocity Estimates, pp. 545-551.

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

Spectro-Temporal Recurrent Neural Network for Robotic Slip Detection with Piezoelectric Tactile Sensor, pp. 559-564.

Ayral, Théo (Université Paris-Saclay, CEA, Leti); Aloui, Saifeddine (Université Grenoble Alpes, CEA, Leti); Grossard, Mathieu

(Université Paris-Saclay, CEA, List)

11:40-12:00 ThTAMT5.6

Design and Implementation of Bending Force Sensor Featuring Printed Circuit Board, pp. 565-569.

Hsieh, I-Wen (National Yang Ming Chiao Tung University); Chen, Yu-Chi (National Chiao Tung University); Hung, Shao-Kang (National Yang Ming Chiao Tung University)

ThTAMT6 Blakely

Rehabilitation Robotics (Regular Session)

10:00-10:20 ThTAMT6.1

A Reliable Kinematic Measurement of Upper Limb Exoskeleton for VR Therapy with Visual-Inertial Sensors, pp. 570-576.

Kwok, Thomas M. (National University of Singapore); Li, Tong (National University of Singapore); Yu, Haoyong (National University of Singapore)

10:20-10:40 ThTAMT6.2

Neural Network Learning of Robot Dynamic Uncertainties and Observer-Based External Disturbance Estimation for Impedance Control, pp. 577-583.

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

10:40-11:00 ThTAMT6.3

Modulation of Joint Stiffness for Controlling the Cartesian Stiffness of a 2-DOF Planar Robotic Arm for Rehabilitation, pp. 584-589.

Tantagunninat, Thanapol (Chulalongkorn University); Wongkaewcharoen, Narakorn (Chulalongkorn University); Pornpipatsakul, Khemwutta (Chulalongkorn University); Chuengpichanwanich, Rada (Chulalongkorn University); Chaichaowarat, Ronnapee (Chulalongkorn University)

11:00-11:20 ThTAMT6.4

Precise Torque Control in High Temperature with Heat Transfer Model Based Torque Constant Compensation Algorithm, pp. 590-594.

Youn, Jimin (KAIST); Kim, Hyeongjun (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)

11:40-12:00 ThTAMT6.6

Prediction Accuracy and Model Robustness of Neural Network-Based Ground Reaction Force Estimators, pp. 595-600.

Abdelhady, Mohamed (NIH); Bulea, Thomas (National Institutes of Health); Abouelwafa, Wael (Minia Unversity); Simon, Dan (Cleveland State University)

ThTAMT7 Vashon I

Robotic Hands and Grippers (Regular Session)

10:00-10:20 ThTAMT7.1

Design and Validation of a Push-Latch Gripper Made in Additive Manufacturing, pp. 601-601.

Ottonello, Emilio (Istituto Italiano Di Tecnologia); Baggetta, Mario (University of Genoa); Berselli, Giovanni (Università Di Genova); Parmiggiani, Alberto (Fondazione Istituto Italiano Di Tecnologia (IIT))

10:20-10:40 ThTAMT7.2

A Methodology for Early Design Specifications of Robotic Grippers, pp. 602-608.

Escorcia Hernandez, Jonatan Martin (Université Paris-Saclay, CEA, List); Grossard, Mathieu (Université Paris-Saclay, CEA, List); Gosselin, Florian (CEA LIST)

10:40-11:00 ThTAMT7.3

An Iterative Method for Solving the Inverse Kinematic Problem of Three-Joints Robotic Fingers with Distal Coupling, pp. 609-614.

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)

11:00-11:20 ThTAMT7.4

Serial Chain Hinge Support for Soft, Robust and Effective Grasp, pp. 615-621.

Stuhne, Dario (Faculty of Electrical Engineering and Computing, University of Z); Vuletic, Jelena (University of Zagreb, Faculty of Electrical Engineering and Comp); Car, Marsela (University of Zagreb); Orsag, Matko (University of Zagreb, Faculty of Electrical Engineering and Comp)

11:20-11:40 ThTAMT7.5

Dynamic Manipulation Like Normal-Type Pen Spinning by a High-Speed Robot Hand and a High-Speed Vision System, pp. 622-628.

Nakatani, Shoma (The University of Tokyo); Yamakawa, Yuji (The University of Tokyo)

11:40-12:00 ThTAMT7.6

STAR–2: A Soft Twisted-String-Actuated Anthropomorphic Robotic Gripper: Design, Fabrication, and Preliminary Testing, pp. 629-634.

Baker, Aaron (University of Nevada, Reno); Foy, Claire (University of Nevada, Reno); Swanbeck, Steven (University of Nevada, Reno); Konda, Revanth (University of Nevada Reno); Zhang, Jun (University of Nevada Reno)

ThTAMT8 Vashon II

Dynamic Cohesive Tracking in Networks (Workshop/Tutorial Session)

10:00-10:20 ThTAMT8.1

*Dynamic Cohesive Tracking in Networks**.

Tiwari, Anuj (University of Washington)

ThPPMP Cascade Ballroom

Plenary: Working from Home Is Nice, but Flying to Work Is Better (Plenary Session)

13:30-14:30 ThPPMP.1

*Working from Home Is Nice, but Flying to Work Is Better**.

Oakley, Celia (Opener)

ThCPMC Cascade Foyer

Posters - Thursday II (Poster Session)

14:30-15:00 ThCPMC.1

*AcTeR: Actuated Tensegrity Revolute Joint**.

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

14:30-15:00 ThCPMC.2

Design of Knee Joint Support Suit 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)

14:30-15:00 ThCPMC.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)

14:30-15:00 ThCPMC.4

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

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

14:30-15:00 ThCPMC.5

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

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

14:30-15:00 ThCPMC.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)

14:30-15:00 ThCPMC.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)

14:30-15:00 ThCPMC.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)

14:30-15:00 ThCPMC.9

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

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

ThTPMT1 Olympic

Aerial Robotics - Sensing (Regular Session)

15:00-15:20 ThTPMT1.1

*Perception-Aware Image-Based Visual Servoing of Aggressive Quadrotor UAVs**.

Qin, Chao (University of Toronto); Yu, Qiuyu (Shanghai Jiao Tong Univirsity); Go, H S Helson (University of Toronto); Liu, Hugh H.-T. (University of Toronto)

15:20-15:40 ThTPMT1.2

Application of Support Vector Machine for Near Real Time Health Structural Diagnosis for Drones, pp. 635-640.

Lai, Wei-Hsiang (National Cheng KUNG University); Liang, Yih Rong (Nathion Cheng Kung University); Cristales Cardona, Carlos Rene (National Cheng Kung University); Cheng, DeLi (National Cheng Kung University)

15:40-16:00 ThTPMT1.3

Marker-Based Localisation System Using an Active PTZ Camera and CNN-Based Ellipse Detection, pp. 641-641.

Oh, Xueyan (Singapore University of Technology and Design); Lim, Ryan Jon Hui (Singapore University of Technology & Design); Foong, Shaohui (Singapore University of Technology and Design); Tan, U-Xuan (Singapore University of Techonlogy and Design)

16:00-16:20 ThTPMT1.4

Panoramic Image-Based Aerial Localization Using Synthetic Data Via Photogrammetric Reconstruction, pp. 642-648.

Sufiyan, Danial (Singapore University of Technology & Design); Pheh, Ying Hong (Singapore University of Technology & Design); Win, Luke Soe Thura (Singapore University of Technology & Design); Win, Shane Kyi Hla (Singapore University of Technology & Design); Tan, U-Xuan (Singapore University of Techonlogy and Design); Foong, Shaohui (Singapore University of Technology and Design)

16:20-16:40 ThTPMT1.5

Wind Vector Estimation Considering Difference of Propeller Model Characteristics for Fully Actuated Drone, pp. 649-654.

Kamiya, Manto (The University of Tokyo); Nagai, Sakahisa (The University of Tokyo); Fujimoto, Hiroshi (The University of Tokyo)

16:40-17:00 ThTPMT1.6

Aerial Deployment of Novel Gravity-Assisted Ground Penetrating Sensors Using Nature-Inspired Platform, pp. 655-660.

Win, Shane Kyi Hla (Singapore University of Technology & Design); Lim, Kristabel (Singapore University of Technology & Design); Suhadi, Brian Leonard (Singapore University of Technology and Design); Sufiyan, Danial (Singapore University of Technology & Design); Foong, Shaohui (Singapore University of Technology and Design)

ThTPMT2 Adams

Mobile Robotics I (Regular Session)

15:00-15:20 ThTPMT2.1

A Shape-Changing Wheeling and Jumping Robot Using Tensegrity Wheels and Bistable Mechanism, pp. 661-661.

Spiegel, Sydney (Colorado State University); Sun, Jiefeng (Yale); Zhao, Jianguo (Colorado State University)

15:20-15:40 ThTPMT2.2

A Supervisory Learning Control Framework for Autonomous & Real-Time Task Planning for an Underactuated Cooperative Robotic Task, pp. 662-669.

De Witte, Sander (Ghent University); Lefebvre, Tom (Ghent University); Van Hauwermeiren, Thijs (Ghent University); Crevecoeur, Guillaume (Ghent University)

15:40-16:00 ThTPMT2.3

Dynamics Analysis and Simulation of an Open-Chain Tetrahedral Robot, pp. 670-675.

Wang, Yubin (Shanghai University); Shen, Zhenjun (Shanghai University); Yang, Qian (Shanghai University); Bao, Yichen (Shanghai University); Chen, Dongdong (Shanghai University)

16:00-16:20 ThTPMT2.4

Study on Omnidirectional Cooperative Trasnport System Using Multiple Dual-Wheeled Mobile Robots with Active-Caster Control, pp. 676-681.

Arai, Yu (Tokyo University of Science); Wada, Masayoshi (Tokyo University of Science)

16:20-16:40 ThTPMT2.5

A Feasible Study on the Model Predictive Control for Docking Approach of Small Spacecraft Using Thrusters and a Control Moment Gyro, pp. 682-687.

Tsujita, Katsuyoshi (Tottori University)

16:40-17:00 ThTPMT2.6

Coordinated Pose Control of Mobile Manipulation with an Unstable Bikebot Platform, pp. 688-688.

Han, Feng (Rutgers University); Jelvani, Alborz (Rutgers University); Yi, Jingang (Rutgers University); Liu, Tao (Zhejiang University)

ThTPMT3 Whidbey

Machine Vision (Regular Session)

15:00-15:20 ThTPMT3.1

Pose Estimation Based on Point Pair Features with Optimized Voting and Verification Strategies, pp. 689-694.

Chen, Gaoming (Shanghai Jiao Tong University); Gao, Ao (Shanghai Jiao Tong University); Liu, Wenhang (Shanghai Jiao Tong University); Liu, Chao (Shanghai Jiao Tong University); Xiong, Zhenhua (Shanghai Jiao Tong University)

15:20-15:40 ThTPMT3.2

BiSPD-YOLO: Surface Defect Detection Method for Small Features and Low-Resolution Images, pp. 695-700.

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)

15:40-16:00 ThTPMT3.3

Image Foreground Segmentation Based on Small Data Set for Visual Servo Applications, pp. 701-706.

Luo, Yan (Shanghai Jiao Tong University); Chen, Gaoming (Shanghai Jiao Tong University); Liu, Chao (Shanghai Jiao Tong University); Xiong, Zhenhua (Shanghai Jiao Tong University)

16:00-16:20 ThTPMT3.4

Copy and Paste Augmentation for Deformable Wiring Harness Bags Segmentation, pp. 707-712.

Žagar, 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)

16:20-16:40 ThTPMT3.5

Convolutional Neural Network Based Denoising for Digital Image Correlation Reconstructing High-Fidelity Deformation Field, pp. 713-718.

Niu, Bangyan (Huazhong University of Science and Technology); Ji, Jingjing (Huazhong University of Science and Technology)

16:40-17:00 ThTPMT3.6

A Vision-Based Shared Autonomy Framework for Deformable Linear Objects Manipulation, pp. 719-724.

Chiaravalli, 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)

ThTPMT4 Baker

Actuators II (Regular Session)

15:00-15:20 ThTPMT4.1

Motion Decoupling for Cable-Driven Serial Robots Based on a Noncircular Pulley, pp. 725-731.

Cheng, Jinsai (Kent State University); Shen, Tao (Kent State University)

15:20-15:40 ThTPMT4.2

Adaptive Extended State Observer-Based Terminal Sliding Mode Control for PMSM System with Uncertainties, pp. 732-737.

Ma, Yuxiang (Beihang University); Li, Yunhua (BeiHang University); Qin, Tao (Beihang University)

15:40-16:00 ThTPMT4.3

Intelligent Servo Control Strategy for Robot Joints with Incremental Bayesian Fuzzy Broad Learning System, pp. 738-745.

Zuo, Guoyu (Beijing University of Technology); Zhou, Jiyong (Beijing University of Technology); Gong, Daoxiong (Beijing University of Technology); Huang, Gao (Beijing University of Technology)

16:00-16:20 ThTPMT4.4

A Novel Series Elastic Actuator with Variable Stiffness, pp. 746-750.

Wang, Chao (University of Leeds); Li, Zhenhong (University of Manchester); Sheng, Bo (Shanghai University); Sivan, Manoj (University of Leeds); Zhang, Zhiqiang (University of Leeds); Li, Guqiang (Binzhou Medical University); Xie, Sheng Quan (University of Leeds)

16:20-16:40 ThTPMT4.5

OpenPneu: Compact Platform for Pneumatic Actuation with Multi-Channels, pp. 751-756.

Tian, Yingjun (The University of Manchester); Su, Renbo (The University of Manchester); Wang, Xilong (University of Manchester); Altin, Nur Banu (The University of Manchester); Fang, Guoxin (The University of Manchester); Wang, Charlie C.L. (The University of Manchester)

16:40-17:00 ThTPMT4.6

Torque Model and Drive Method for Developing Closed-Loop Orientation Control of Spherical Brushless Direct Current Motor, pp. 757-762.

Lee, Sangheon (Ulsan National Institute of Science and Technology); Son, Hungsun (Ulsan National Institute of Science and Technology)

ThTPMT5 Orcas

Sensors II (Regular Session)

15:00-15:20 ThTPMT5.1

A Study of Hand Function in Stroke Patients Using Kinematic Metrics, pp. 763-768.

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 Leeds); Tao, Jing (Shanghai University)

15:20-15:40 ThTPMT5.2

Understanding and Controlling the Sensitivity of Event Cameras in Responding to Static Objects, pp. 769-772.

Qiyao, Gao (University of Washington); Xiaoyang, Sun (University of Washington); Yu, Zhitao (University of Washington); Chen, Xu (University of Washington)

15:40-16:00 ThTPMT5.3

Design, Fabrication, and Characterisation of a Novel Piezoimpedal Tactile Sensor for Use in Soft-Prosthetic Devices, pp. 773-778.

Searle, Thomas (University of Wollongong); Sencadas, Vitor (School of Mechanical, Materials and Mechatronics and Biomedical); Alici, Gursel (University of Wollongong)

16:00-16:20 ThTPMT5.4

Modeling of Interface Loads for EOD Suit Wearers, pp. 779-785.

Gao, Yuan (Uml); Epstein, Stephanie (UMass Lowell); Inalpolat, Murat (UMass Lowell); Wu, Yi-Ning (University of Massachusetts Lowell); Gu, Yan (Purdue University)

16:20-16:40 ThTPMT5.5

Comparison Analysis of Thermistor and RTD for Energy Transfer Station Application, pp. 786-791.

Mashhood, Zafar (Texas A&M University Kingsville); Wei, Bin (Texas a & M University - Kingsville)

ThTPMT6 Blakely

HMI I (Regular Session)

15:00-15:20 ThTPMT6.1

HAPSEA: Hydraulically Amplified Soft Electromagnetic Actuator for Haptics, pp. 792-800.

Kohls, Noah (Georgia Institute of Technology); Colonnese, Nicholas (Facebook Reality Labs); Mazumdar, Yi (Georgia Institute of Technology); Agarwal, Priyanshu (Facebook Inc)

15:20-15:40 ThTPMT6.2

Model-Based Estimation of Mental Workload in Drivers Using Pupil Size Measurements, pp. 801-807.

Pillai, Prarthana (University of Windsor); Balasingam, Balakumar (University of Windsor); Biondi, Francesco (University of Windsor)

15:40-16:00 ThTPMT6.3

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); Adwani, Neel (University of Petroleum and Energy Studies); Han, Tao (New Jersey Institute of Technology)

16:00-16:20 ThTPMT6.4

Non-Invasive Feedback for Prosthetic Arms: A Conceptual Design of a Wearable Haptic Armband, pp. 814-819.

Zhuwawu, Sudhir Solomon (Egypt Japan University of Science and Technology); Zaki, Ahmed Baioumy (Egypt Japan University of Science and Technology); Elsamanty, Mahmoud (Egypt Japan University for Science and Technology (EJUS)); Parque, Victor (Waseda University); El-Hussieny, Haitham (Faculty of Engineering(Shoubra), Benha University)

16:40-17:00 ThTPMT6.6

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)

ThTPMT7 Vashon I

AI Damage Detection (Invited Session)

Organizer: Rao, Jing	School of Instrumentation and Opto-Electronic Engineering, Beihang University, Beijing 100191, China
Organizer: Lei, Yaguo	Xi'an Jiaotong University
Organizer: Dorafshan, Sattar	University of North Dakota

15:00-15:20 ThTPMT7.1

STAD-FEBTE, a Shallow and Supervised Framework for Time Series Anomaly Detection by Automatic Feature Engineering, Balancing, and Tree-Based Ensembles: An Industrial Case Study, pp. 826-832.

Zakeriharandi, Mohammadali (Aalborg University); Li, Chen (Aalborg University); Schou, Casper (Aalborg University, Department of Materials and Production); Lazic Villumsen, Sigurd (Aalborg University); Bøgh, Simon (Aalborg University); Madsen, Ole (Aalborg University)

15:20-15:40 ThTPMT7.2

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 ThTPMT7.3

Deep Learning Based Time-Frequency Image Enhancement Method for Machinery Health Monitoring, pp. 838-843.

Choudhury, Madhurjya Dev (Victoria University of Wellington); Blincoe, Kelly (University of Auckland); Dhupia, Jaspreet (The University of Auckland)

16:00-16:20 ThTPMT7.4

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 ThTPMT7.5

Accelerating Full Waveform Inversion Using Pre-Trained Neural Networks (I), pp. 852-857.

Kollmannsberger, Stefan (Technische Universität München); Singh, Divya (Technische Universität München); Herrmann, Leon (Technische Universität München)

16:40-17:00 ThTPMT7.6

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)

ThTPMT8 Vashon II

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

15:00-15:20 ThTPMT8.1

A Robotic System of Systems for Human-Robot Collaboration in Search and Rescue Operations, pp. 864-871.

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, Jin Yuan (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 Techonlogy and Design); Heng, Lionel (DSO National Laboratories); Foong, Shaohui (Singapore University of Technology and Design)

15:20-15:40 ThTPMT8.2

A Novel Human-Machine Collaboration Approach for Autonomous Driving with Hand Gesture-Based Guidance (I), pp. 872-876.

Zhang, Yiran (Nanyang Technological University); Hu, Zhongxu (Nanyang Technological University); Lv, Chen (Nanyang Technological University)

15:40-16:00 ThTPMT8.3

Human-Robot Interactive Disassembly Planning in Industry 5.0 (I), pp. 877-881.

Lou, Shanhe (Nanyang Technological University); Tan, Runjia (Nanyang Technological University); Zhang, Yiran (Nanyang Technological University); Lv, Chen (Nanyang Technological University)

16:00-16:20 ThTPMT8.4

Musculoskeletal Model Construction of Deep Squat Using Low-Cost

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)

FrPAMP Cascade Ballroom

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

08:30-09:30 FrPAMP.1

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

Tan, Xiaobo (Michigan State University)

FrCAMC Cascade Foyer

Posters - Friday I (Poster Session)

09:30-10:00 FrCAMC.1

*Development of Bar-Shape Nonlinear Series Elastic Actuator**.

Hirao, Motohiro (University of California, Berkeley); Ghanbarpour, Alireza (University of California at Berkeley); Tomizuka, Masayoshi (University of California)

09:30-10:00 FrCAMC.2

*Model-Based Impedance Modulation of Antagonistic Pneumatic Artificial Muscles**.

Wang, Xinyao (University of California Riverside); Liu, Tuo (University of California Riverside); Realmuto, Jonathan (Univeristy of California Riverside)

09:30-10:00 FrCAMC.3

*Development of Mobile Welding Robot Motion Software for Large-Scale Environment Welding**.

Choi, Taeyong (KIMM); Park, Jongwoo (Korea Institue of Machinery & Materials); Park, Dongil (Korea Institute of Machinery and Materials (KIMM))

09:30-10:00 FrCAMC.4

Hysteresis Dehunting of a Tendon-Sheath Confined Space Manipulator for Fast and Precise Control, pp. 888-888.

Schultz, Kyle (University of Washington); Marquette, Wade (University of Washington); Devasia, Santosh (University of Washington)

09:30-10:00 FrCAMC.5

*Robot-Based Automation of Charging Process for Electric Vehicle**.

Do, Hyunmin (Korea Institute of Machinery and Materials)

09:30-10:00 FrCAMC.6

*Learning to Detect Slip through Tactile Measures of the Contact Force Field and Its Entropy**.

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

09:30-10:00 FrCAMC.7

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

Ryu, Ho Ju (Chungnam National University); Kim, Jeoing Ku (Hyuyndai MOBIS); Jung, Seul (Chungnam National University)

09:30-10:00 FrCAMC.8

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

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

FrTAMT1 Olympic

Mobile Robotics II (Regular Session)

10:00-10:20 FrTAMT1.1

ARMoR: Amphibious Robot for Mobility in Real-World Applications, pp. 890-895.

Hammond, Matthew (Texas A&M University); Lee, Kiju (Texas A&M University)

10:20-10:40 FrTAMT1.2

Energy Efficient Depth Control for Underwater Devices Using Soft and Hard Actuators, pp. 896-901.

Koc, Denizcan (University of Houston); Zuo, Wenyu (University of Houston); Ghorbel, Fathi (Rice University); Chen, Zheng (University of Houston)

10:40-11:00 FrTAMT1.3

Amphibious Robot with Self-Rotating Paddle-Wheel Mechanism, pp. 902-909.

Kim, Chaewon (Hanyang Unviersity); Lee, Kyungwook (Hanyang University); Ryu, Sijun (Hanyang University); Seo, TaeWon (Hanyang University)

11:00-11:20 FrTAMT1.4

Bio-Mimetic Autonomous Underwater Vehicle Control Using Time Delayed Estimation Technique, pp. 910-915.

Algethami, Abdullah (Taif University); Sarkar, Rajasree (Indian Institute of Technology Delhi); Amrr, Syed Muhammad (Linköping University); Banerjee, Arunava (Indian Institute of Technology Delhi)

11:20-11:40 FrTAMT1.5

Constrained Model Predictive Control of Variable Buoyancy Device, pp. 916-921.

Masood, Muhammad Umar (University of Houston); Kaaya, Theophilus (University of Houston); Chen, Zheng (University of Houston)

11:40-12:00 FrTAMT1.6

Novel Rigid-Wing Bi-Directional Sailboat Design and Method of Sailing, pp. 922-927.

Win, Luke Soe Thura (Singapore University of Technology & Design); Win, Shane Kyi Hla (Singapore University of Technology & Design); Sufiyan, Danial (Singapore University of Technology & Design); Foong, Shaohui (Singapore University of Technology and Design)

FrTAMT2 Adams

Estimation and Identification I (Regular Session)

10:00-10:20 FrTAMT2.1

Optimal Multisine Perturbations for Improved Dynamic System Identification Using a Mechanical Platform: A Preliminary Simulation Study, pp. 928-933.

Qiu, Yingxin (Georgia Institute of Technology); Wu, Mengnan (Emory University); Ting, Lena (Emory University and Georgia Tech); Ueda, Jun (Georgia Institute of Technology)

10:20-10:40 FrTAMT2.2

Multi-Axis Manipulator Kinematic Calibration Using a Novel Linearized Finite Screw Deviation Model, pp. 934-939.

Kim, Jaehyung (Pusan National Univ); Lee, Min Cheol (Pusan National University)

10:40-11:00 FrTAMT2.3

Optimal 2nd Order LTI System Identification, pp. 940-945.

Stocco, Leo (University of British Columbia)

11:00-11:20 FrTAMT2.4

Solving Stochastic Inverse Problems with Stochastic BayesFlow, pp. 946-952.

Zhang, Yi (University of Augsburg); Mikelsons, Lars (University of Augsburg)

11:20-11:40 FrTAMT2.5

A New Torque Estimation Method Based on Equivalent Efficiency Model and BP Neural Network of Mechatronic Integrated Joint, pp. 953-958.

Dai, Junjie (Ningbo Institute of Materials Technology and Engineering, CAS); Yang, Xin (Ningbo Institute of Materials Technology&Engineering, Chinese Aca); Chen, Chin-Yin (Ningbo Institute of Material Technology and Engineering, CAS); Yang, Guilin (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 Priors with Application to Acrobot, pp. 959-965.

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

FrTAMT3 Whidbey

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 Univercity); 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, Yentl (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

System Identification and Force Estimation of a Grinding Tool, pp. 988-993.

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 Orcas

Optimization (Regular Session)

10:00-10:20 FrTAMT5.1

An Industrial Applicable Approach towards Design Optimization of a Reciprocating Mechanism: An Emergency Ventilator Case Study, pp. 1000-1006.

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

Sensitivity Analysis Framework for the Evaluation of Modular Drivetrain Architectures, pp. 1007-1012.

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

10:40-11:00 FrTAMT5.3

Towards Task Tailored Articulated Robot Designs, pp. 1013-1019.

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

11:00-11:20 FrTAMT5.4

Single and Multi-Degree-Of-Freedom Servo Trajectory Generation: An Optimization Framework, Implementation, and Examples, pp. 1020-1027.

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

11:20-11:40 FrTAMT5.5

Continuous Dynamic Wireless Power Transfer for Circular Roadway with Optimal Load: Design and Analysis, pp. 1028-1034.

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

Actuator Placement in Adaptive Structures for Static Compensation – Minimizing Displacements versus Minimizing Actuator Forces, pp. 1035-1040.

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

FrTAMT6 Blakely

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); Ikeuchi, 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, Quaye (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 FrTAMT6.6

Generating Synthetic Data Using a Knowledge-Based Framework for

Autonomous Productions, pp. 1066-1073.

Petrovic, Oliver (Laboratory for Machine Tools and Production Engineering (WZL), R); Dias Duarte, David Leander (Laboratory for Machine Tools WZL, RWTH Aachen University); Herfs, Werner (WZL, RWTH Aachen)

FrTAMT7 Vashon I

Vibration, and Noise Control (Regular Session)

10:00-10:20 FrTAMT7.1

Bridge State and Train Axle Mass Estimation for Adaptive Railway Bridges, pp. 1074-1074.

Zeller, Amelie (University of Stuttgart); Dakova, Spasena (University of Stuttgart); Stein, Charlotte (University of Stuttgart); Böhm, Michael (University of Stuttgart); Senatore, Gennaro (University of Stuttgart); Reksowardojo, Arka P. (University of Stuttgart); Blandini, Lucio (University of Stuttgart); Sawodny, Oliver (University of Stuttgart); Tarín, Cristina (University of Stuttgart)

10:20-10:40 FrTAMT7.2

Reduced-Order Nominal Model Design and Validation for Task Space DOB-Based Motion Control of an Industrial Robot, pp. 1075-1081.

Samuel, Kangwagye (DGIST); Haninger, Kevin (Fraunhofer IPK); Oh, Sehoon (DGIST); Lee, Chan (Yeungnam University)

10:40-11:00 FrTAMT7.3

Identification and Reduction Method of Normal-Direction Force Ripple in Permanent Magnet Linear Synchronous Motor, pp. 1082-1087.

Kwon, Yoon Sik (Yonsei University); Lee, Sangmin (Yonsei University); Yoon, Jun Young (Yonsei University)

11:00-11:20 FrTAMT7.4

Multi-Axis Active Vibration Suppression for Wafer Transfer Systems, pp. 1088-1094.

Qiu, Jiajie (Massachusetts Institute of Technology); Kim, Hongjin (Samsung Electronics); Xia, Fangzhou (Massachusetts Institute of Technology); Youcef-Toumi, Kamal (Massachusetts Institute of Technology)

11:20-11:40 FrTAMT7.5

Validation of Feedforward Disturbance Cancellation for the PSS3 HDD Benchmark Problem for Dual Stage Actuators, pp. 1095-1100.

Tanaka, Yuma (Tokyo Denki University); Ishikawa, Jun (Tokyo Denki University)

11:40-12:00 FrTAMT7.6

Experimental Comparison of Manual and Automated Crane Control through Obstacle Fields, pp. 1101-1106.

Rome, Tyler (Georgia Tech); Adams, Christopher (Georgia Institute of Technology); Singhose, William (Georgia Tech)

FrTAMT8 Vashon II

Machine Learning I (Regular Session)

10:00-10:20 FrTAMT8.1

Early Inner Race Fault Detection on a Ball Bearing Setup Using Histogram of Oriented Gradients and Wavelet Subselection, pp. 1107-1114.

Van Heck, Cedric (UGent - University of Ghent); Wauters, Jolan (Ghent University); Staessens, Tom (Ghent University); Crevecoeur, Guillaume (Ghent University); Ooijevaar, Ted (Flanders Make)

10:20-10:40 FrTAMT8.2

Sensitivity Analysis of Geometric Parameter Errors for Industrial Robots Based on Random Forest, pp. 1115-1120.

Lv, Pin (Shanghai University); Shi, Weihao (Shanghai University); Wang, Yubin (Shanghai University); Li, Ruiyan (Shanghai University); Chen, Dongdong (Shanghai University)

10:40-11:00 FrTAMT8.3

DQDWA: Dynamic Weight Coefficients Based on Q-Learning for Dynamic Window Approach Considering Environmental Situations, pp. 1121-1126.

Kobayashi, Masato (Osaka University); Zushi, Hiroka (Kobe University); Nakamura, Tomoaki (Kobe University); Motoi, Naoki (Kobe University)

11:00-11:20 FrTAMT8.4

Transformer for Automated Feedback System Design, pp. 1127-1132.

Hughes, Isaac (University of Wyoming); O'Brien, John (University of Wyoming)

11:20-11:40 FrTAMT8.5

Encrypted Classification for Prevention of Adversarial Perturbation and Individual Identification in Health-Monitoring, pp. 1133-1138.

Kawase, Hiroaki (The University of Electro-Communications); Meinhold, Waiman (Georgia Tech); Ueda, Jun (Georgia Institute of Technology)

11:40-12:00 FrTAMT8.6

A Fast Score-Based Method for Robotic Task-Free Point-To-Point Path Learning, pp. 1139-1144.

Pasquali, Alex (University of Bologna); Galassi, Kevin (Università Di Bologna); Palli, Gianluca (University of Bologna)

FrPPMP Cascade Ballroom

Plenary: Beyond Conventional Interfaces: Exploring the Intersection of Wearable Technologies, Textiles, and Physical Computing (Plenary Session)

13:30-14:30 FrPPMP.1

*Beyond Conventional Interfaces: Exploring the Intersection of Wearable Technologies, Textiles, and Physical Computing**.

Seyed, Teddy (Microsoft)

FrCPMC Cascade Foyer

Posters - Friday II (Poster Session)

14:30-15:00 FrCPMC.1

*Development of Bar-Shape Nonlinear Series Elastic Actuator**.

Hirao, Motohiro (University of California, Berkeley); Ghanbarpour, Alireza (University of California at Berkeley); Tomizuka, Masayoshi (University of California)

14:30-15:00 FrCPMC.2

*Model-Based Impedance Modulation of Antagonistic Pneumatic Artificial Muscles**.

Wang, Xinyao (University of California Riverside); Liu, Tuo (University of California Riverside); Realmuto, Jonathan (Univeristy of California Riverside)

14:30-15:00 FrCPMC.3

*Development of Mobile Welding Robot Motion Software for Large-Scale Environment Welding**.

Choi, Taeyong (KIMM); Park, Jongwoo (Korea Institue of Machinery & Materials); Park, Dongil (Korea Institute of Machinery and Materials (KIMM))

14:30-15:00 FrCPMC.4

Hysteresis Dehunting of a Tendon-Sheath Confined Space Manipulator for Fast and Precise Control, pp. 888-888.

Schultz, Kyle (University of Washington); Marquette, Wade (University of Washington); Devasia, Santosh (University of Washington)

14:30-15:00 FrCPMC.5

*Robot-Based Automation of Charging Process for Electric Vehicle**.

Do, Hyunmin (Korea Institute of Machinery and Materials)

14:30-15:00 FrCPMC.6

*Learning to Detect Slip through Tactile Measures of the Contact Force Field and Its Entropy**.

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.7

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

Ryu, Ho Ju (Chungnam National University); Kim, Jeoing Ku (Hyuyndai MOBIS); Jung, Seul (Chungnam National University)

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, Mingyu (Chung-Ang University); Kim, Tae-Hyoung (Chung-Ang University)

FrTPMT1 Olympic

Mobile Robotics III (Regular Session)

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

Rhino: An Autonomous Robot for Mapping Underground Mine Environments, pp. 1146-1153.

Arend Tatsch, Christopher Alexander (West Virginia University); Bredu, Jonas Amoama (West Virginia University); Covel, Dylan (West Virginia University); Tulu, Ihsan 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, Eemil (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 Adams

Estimation and Identification II (Regular Session)

15:00-15:20 FrTPMT2.1

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

Tsuji, 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 Side-Mounted Ultrasonic Tool Holder System under Minimum Impedance Resonance Frequency Tracking, pp. 1174-1174.

Yau, Her-Terng (National Chung Cheng University, Department of Mechanical Engine); 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); Bortoluzzi, 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 Reliab); Melz, Tobias (Fraunhofer LBF)

FrTPMT3 Whidbey

Mechatronics in Education (Regular Session)

15:00-15:20 FrTPMT3.1

Towards Mechatronics Approach of System Design, Verification and Validation for Autonomous Vehicles, pp. 1188-1193.

Samak, Chinmay (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

Virtual Reality System Using Explainable AI for Identification of Specific Expert Refinery Inspection Skills, pp. 1194-1199.

Takeuchi, Hiroki (The University of Tokyo); Takamido, Ryota (Research into Artifacts, Center for Engineering (RACE), School O); Kanda, Shinji (University of Tokyo); Umeda, Yasushi (The University of Tokyo); Asama, Hajime (The University of Tokyo); Kasahara, Seiji (ENEOS Corporation); Fukumoto, Seigo (ENEOS Corporation); Tamura, Sunao (ENEOS Corporation); Kato, Toshiya (ENEOS Corporation); Korenaga, Masahiro (ENEOS Corporation); Sasamura, Akinobu (ENEOS Corporation); Hoshi, 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, Yuhao (The University of Tokyo); Takamido, Ryota (Research into Artifacts, Center for Engineering (RACE), School O); Kanai-Pak, Masako (Tokyo Ariake University of Medical and Health Sciences); Maeda, Jukai (Tokyo Ariake University of Medical and Health Sciences); Kitajima, Yasuko (Tokyo Ariake University of Medical and Health Sciences); Nakamura, Mitsuhiro (Tokyo Ariake University of Medical and Health Sciences); Kuwahara, Noriaki (Graduate School of Science and Technology,

Kyoto Institute of Te); Ogata, Taiki (The University of Tokyo); Ota, Jun (The University of Tokyo)

16:20-16:40 FrTPMT3.5

On the Design and Development of a Tabletop Robot for Interaction with Children, pp. 1212-1217.

Christos, Andreanidis (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 (Kungliga Tekniska Högskolan); 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); Andrikopoulos, Georgios (KTH Royal Institute of Technology)

FrTPMT5 Orcas

Modeling and Design (Regular Session)

15:00-15:20 FrTPMT5.1

A Novel Sidewinding Snake Robot with Non-Zero Slope in Granular Terrains Modeled by DRFM, pp. 1218-1225.

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

15:20-15:40 FrTPMT5.2

Design and Parametric Analysis of a Magnetic Leadscrew with an Embedded Displacement Sensor, pp. 1226-1233.

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

15:40-16:00 FrTPMT5.3

Design and Analysis of a Compliant Mechanism with Variable Stiffness, pp. 1234-1239.

Zhang, Weipeng (Shandong University); Yan, Peng (Shandong University)

16:00-16:20 FrTPMT5.4

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

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

16:20-16:40 FrTPMT5.5

Design and Backdrivability Modeling of a Portable High Torque Robotic Knee Prosthesis with Intrinsic Compliance for Agile Activities, pp. 1246-1246.

Zhu, Junxi (North Carolina State University); Jiao, Chunhai (City College of New York); Dominguez, Israel (North Carolina State University); Yu, Shuangyue (City University of New York, City College); Su, Hao (North Carolina State University)

FrTPMT6 Blakely

Planning and Navigation (Regular Session)

15:00-15:20 FrTPMT6.1

A Parameterized Cubic B´ezier Spline-Based Informed RRT for Non-Holonomic Path Planning*, pp. 1247-1252.

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

15:20-15:40 FrTPMT6.2

Efficient Trajectory Planning and Control for USV with Vessel Dynamics and Differential Flatness, pp. 1253-1260.

Huang, Tao (Zhejiang University); Xue, Zhenfeng (Zhejiang University); Chen, Zhe (ZheJiang Univercity); Liu, Yong (Zhejiang University)

15:40-16:00 FrTPMT6.3

Template-Free Non-Revisiting 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)

16:00-16:20 FrTPMT6.4

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

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

16:20-16:40 FrTPMT6.5

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)

16:40-17:00 FrTPMT6.6

Holistic Deep-Reinforcement-Learning-Based Training of Autonomous Navigation Systems, pp. 1282-1288.

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

FrTPMT7 Vashon I

Biologically Inspired Intelligence for Mechatronics and Robotics (Organized Session)

15:00-17:00 FrTPMT7.1

*Biologically Inspired Intelligence for Mechatronics and Robotics**.

Luo, Chaomin (Mississippi State University); Bi, Zhuming (Purdue University Fort Wayne)

FrTPMT8 Vashon II

Machine Learning II (Regular Session)

15:00-15:20 FrTPMT8.1

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)

15:20-15:40 FrTPMT8.2

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

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

15:40-16:00 FrTPMT8.3

Deformable Fractional Filters, pp. 1298-1303.

Zamora-Esquivel, Julio (Intel); Rhodes, Anthony (Intel); Macias-Garcia, Edgar (Centro De Investigación Y Estudios Avanzados Del Instituto Polit); Nachman, Lama (Intel Labs)

16:00-16:20 FrTPMT8.4

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

Jandaghi, Emadodin (University of Rhode Island); Chen, Xiaotian

(University of Rhode Island); Yuan, Chengzhi (University of Rhode Island)

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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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-845pm, closed Sundays

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Thai Ginger Pacific Place, 2 blocks Mon-Fri 1130-9, 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 1130-9, Sat 4-9

Katsu-ya 122 Westlake Ave N, 4 blocks Japanese Tue-Thu 1130-230, Fri-Sat 1130-230

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 daily12-8

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**

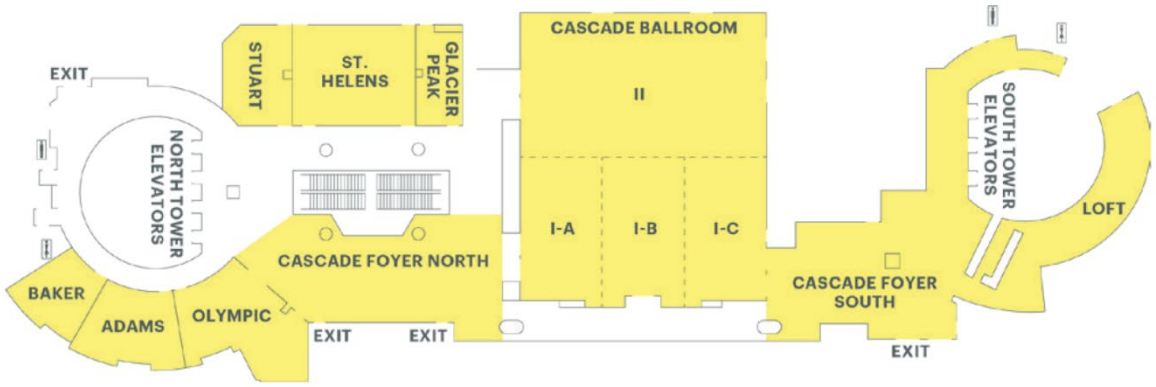
Rocco's Specialty Bar & Pizzeria 1232 2nd Ave, daily 11am-12am, reserve **½ mile**

Elliott's 1201 Alaskan Way, Seafood Mon-Thu 3-9, Fri-Sat 12-10, Sun 12-9 **1 mile**

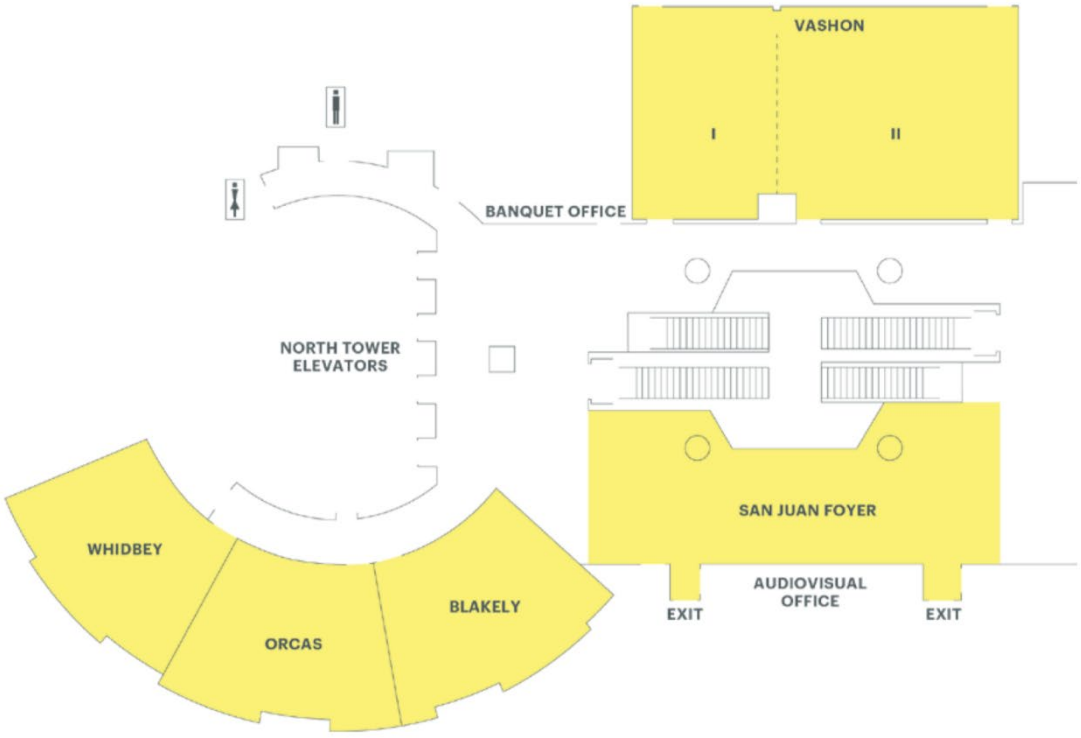
Ivar's 1001 Alaskan Way, Seafood Wed-Sun 12-8, closed Mon-Tue **1 mile**

Floor Plan

LOBBY LEVEL - FIRST FLOOR



MEZZANINE LEVEL - SECOND FLOOR



SAN JUAN LEVEL - THIRD FLOOR