

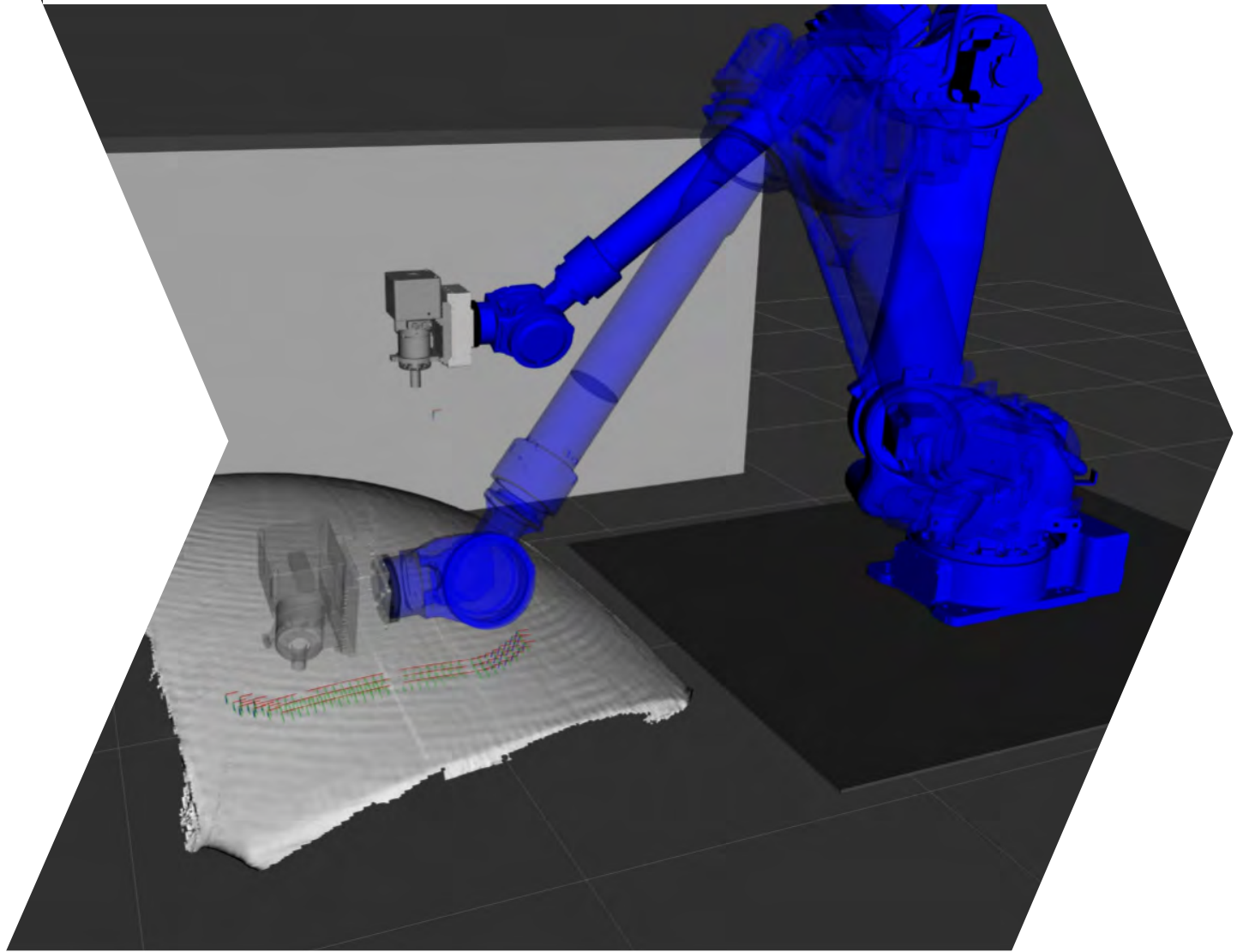


ROS-Industrial Consortium Americas
2023 Annual Meeting

Detroit



ROS-Industrial Consortium Americas Annual Meeting 2023



rosindustrial.org

Celebrating 10 Years of ROS-Industrial

Building a tradition of enabling industry to contribute and leverage open source

This is the tenth Annual Meeting of the ROS-Industrial Consortium Americas and it should be noted all the progress over that time since the first gathering of this group. There are now fully supported interfaces that enable interaction with ROS by known industrial players. It is now easier to leverage university research, as it isn't just in a paper, but a repository, typically implanted in ROS. Furthermore, with the embracing by numerous research and government organizations there is adequate funding to continue to develop new capabilities and make them available open source.

Though we can be proud of the accomplishments, and the small part this organization has played, there is still plenty of work to do. There are a diverse set of needs and ever-changing technological landscape. As AI and new robotic platforms emerge, it is important to make resources available, continue to pull forward the tools that got us here in the first place and create new ones that leverage the newest developments. This is an important event to set the pace, update priorities and reignite the passion that has enabled us to have this tenth gathering of the ROS-Industrial Consortium Americas.

Relative to recent developments and advancements as we reach the midpoint of 2023. Each region of the ROS-Industrial Consortium has been leading various initiatives and delivering capabilities. Over the course of this program, the regions will provide updates on their focus areas and accomplishments and will look for feedback from the Americas on opportunities to collaborate and seek input on the applicability of their work.

Obviously, there is ROS 2 and the continued maturation of the latest variant which is nearing its ninth release. Some within the Americas have been waiting for the right time to consider migrating, and I believe in ROS-Industrial supporting the community to aid in transition by providing tools and support resources. There have been changes in how ROS 2 is developed and maintained, but we hope everyone is still excited about the promise in ROS 2 and the potential to enable a richer collaborative development community that has value in industrial use cases and hardened to operate on shop floors.

Here specifically in the Americas we have been working to provide tangible capabilities, in both ROS and ROS 2, and provide updates on how various ROS-Industrial repositories are going to transition. These transitions are opportune times to improve capability and implement new approaches in how they are developed and deployed. We look forward to sharing updates to training, some additional new tools that will be broadly available in the near future, that seek to enable a greater pool of industrial-centric personnel to leverage and contribute to these tools to enable those rising tides to indeed lift all ships.

As always, the ROS-Industrial Consortia of the Americas, Europe and Asia-Pacific are looking forward to improving how we work together to meet the needs of industry and enable next-generation industrial capability.

Goals & Strategies

As stated, before the goals across the Consortia include:

1. Provide a one-stop location for manufacturing-related ROS software
2. Strive toward software robustness and reliability to meet the needs of industrial applications
3. Combine the relative strengths of ROS and existing technology, combining ROS high-level functionality with the low-level reliability and safety of an industrial robot controller
4. Stimulate the development of hardware-agnostic software by standardizing interfaces
5. Provide an "easy" path to apply cutting-edge research to industrial applications, by using a common ROS architecture
6. Provide simple, easy-to-use, well-documented application programming interfaces

The Consortia and their memberships have been actively influencing this strategy. It is evident that this collaboration is leading to tangible benefits that move from university, into industry adopters.

Thank you for participating in the idea of open-source robotics for industry. As with any change, this takes a community to enable the realization of any vision, so thank you for being a part of the ROS-Industrial Community!

Matt Robinson



ROS-Industrial Consortium Americas

Objectives of the ROS-Industrial Consortium Annual Meeting

The ROS-Industrial Consortium Americas Annual Meeting convenes Consortium members to review the latest in developments, stakeholder and partner initiatives, sister Consortia activities, as well as review and provide input into the vision and strategic direction of ROS-Industrial.

This event contains both public and non-public content to foster the means to drive awareness and grow the ROS-Industrial network through collaborative workshops and compelling presentations that highlight the value proposition for what is going on within ROS-Industrial and how the Consortium enables that vision.

Additional objectives beyond a strategic direction and technical activities include:

1. Understand where ROS-Industrial is, technically and sustainably, what has happened in the last year, and what is proposed moving forward.
2. Learn about the latest strategic non-technical initiatives that move the ball forward in use, adoption, and support of ROS-Industrial.
3. New this year, collaborative workshops with technically aligned organizations that have an interest in open-source tools and/or advanced capability for their audience.
4. Communicate and share what has been beneficial and what has been a challenge during workshops and networking time.
5. Continue to provide inputs to the “problem-centric” roadmap to compliment the technical vision. Cast the capabilities of the technical vision against prioritized problems to address a matrix, to ensure resources are focused on the right things.
6. Generate, based on the problems to solve, compelling project topics that can be championed and launched to address the biggest challenges to the membership.
7. Take what has been learned and share it with your organizations. Provide feedback and continue to participate in these events, as well as other meetings that take place throughout the year and in the various regions. Without the engagement of the membership and community, ROS-Industrial will not realize its potential.



Chairs

Matt Robinson – Program Manager, ROS-Industrial Consortium Americas

Paul T. Evans, P.E. – Director, SwRI Manufacturing Robotics and Technologies Dept.

Michael Ripperger – Technical Lead, ROS-Industrial Consortium Americas

Welcome & Networking Dinner

The Apparatus Room

250 W Larned St., Detroit, MI 48226

(313) 800-5600

The welcome dinner is a chance for members and guests to network and socialize in a relaxed atmosphere. The dinner is included with registration and open to all attendees, but advanced registration is required. Dinner starts at 6:30 p.m. Eastern.



Agenda

| Time | Topic | Speaker |
|--------------------------|--|---|
| Wednesday May 24 | | |
| 1830 | ROS-I Consortium Americas Welcome Dinner – Apparatus Room – Requires Advanced Registration | |
| Thursday May 25 | | |
| 0745 | Light Breakfast, Check In | |
| 0820 | Welcome and ROS-I Americas State of the Consortium | Matt Robinson, RIC-Americas Program Manager |
| 0850 | ROS-I European Union: Towards Reference Robot Cell for ROS2 | Christoph Hellmann Santos, ROS-I EU Program Manager, Fraunhofer IPA |
| 0920 | ROS-I Asia-Pacific: Developing ROS 2 Platform Technologies - From Unit to System Level | Maria Vergo, ROS-I AP Program Manager, ARTC |
| 0950 | Break | |
| 1000 | What's New in ROS 2 Iron Irwini | Kat Scott, Developer Relations, Intrinsic |
| 1030 | Movelt Studio and Movelt Space: Bringing ROS to New Frontier | Dave Coleman, CEO, PickNik |
| 1100 | Job Shop Automation - A Pilot for the Foundry of the Future | David Poweleit, SFSA & Matt Robinson, SwRI |
| Lunch Keynote | | |
| 1130 -1300 | Agile Automation for Aerospace | Shane Whitaker, Applications Engineer, Lockheed Martin |
| Rotating Workshop | | |
| 1300 | <i>Collaborating Consortium Steel Founders' Society of Americas - Next Gen</i> | David Poweleit, Vice President of Technology, SFSA |
| | <i>Discussion on Open Source Robotics</i> | Adam Norton, Associate Director, NERVE Center |
| | <i>Improving Tools for Industry</i> | Michael Ripperger, ROS-I Americas Tech Lead, SwRI |
| 1430 | Empowering Aerospace Manufacturing: ROS-Powered Innovations at Spirit AeroSystem | Bharath Rao, Senior Research Lead Robotics/AI, Spirit AeroSystems |
| 1500 | Factory Automation Applications enabled by Robotics A | Dr. Eugen Solowjow, Head of Research, Siemens |
| 1530 | Break | |
| 1540 | Fast and Accurate Robot Tracking of 3D Curves | Dr. John Wen, Professor and Head of Electrical, Computer, and Systems Engineering, Rensselaer Polytechnic Institute (RPI) |
| 1610 | Update On ARM Institute Initiatives | Joseph Giampapa, Principal Robotics Scientist, ARM Institute |
| 1640 | MotoROS2: Yaskawa Motoman Native ROS 2 Node | Ted Miller, Associate Chief Specialist, Yaskawa America |
| 1710 | Adjourn | |

Welcome & State of the ROS-Industrial Consortium Americas



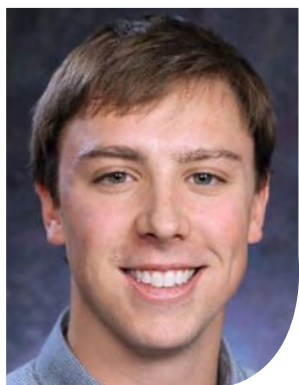
Matt Robinson will cover the latest developments out of ROS-Industrial Consortium Americas, what resources have been provided, and what are the upcoming initiatives that are of interest or aligned with the Consortium objectives.

Matt Robinson – ROS-I Consortium Americas Program Manager, SwRI

Matt Robinson is the Program Manager for the ROS-Industrial Consortium Americas, an industry-driven open source program bringing advanced manufacturing solutions for the industrial robotics community. Prior to his current role, Mr. Robinson was team leader for Caterpillar's Manufacturing Technology Automation Research where he led development and deployment of automation tools to improve the performance and productivity of Caterpillar manufacturing facilities around the globe.

Mr. Robinson also led manufacturing value stream design initiatives that led to the deployment of over 50 robotic/automated manufacturing systems around the world.

ROS-Industrial Consortium Americas Technical Updates



Michael Ripperger will be sharing the latest technical developments within the ROS-Industrial Consortium Americas, focusing on updates to repositories and capabilities, and what is upcoming relative to ease of use, and performance in the space of motion planning.

Michael Ripperger – ROS-I Americas Tech Lead, SwRI

Michael Ripperger is a Senior Research Engineer at Southwest Research Institute. He leads the development, design, and deployment of advanced "scan and plan" robotics systems, which use sensor data to autonomously perform various manufacturing tasks with minimal user guidance. In these efforts he has developed software for the perception, tool path and motion planning, hardware interface, and user interface components of these applications. He currently serves as the software lead for several automation projects in a variety of fields, including the Advanced Automation for Agile Aerospace Applications (A5) program.

Towards a Reference Robot Cell for ROS 2



Christoph Hellmann Santos will present about recent initiatives focusing on a recent initiative to create a reference robotic cell implementation for ROS 2 application development and testing available to researchers and end users.

Christoph Hellmann Santos – ROS-I Consortium EU Program, Manager, Fraunhofer IPA

M.Sc. Dipl.-Ing. Christoph Hellmann Santos (M) obtained his master's degree in mechanical engineering from the Karlsruhe Institute for Technology in 2016. In the same year, he received a diplôme d'Ingenieur from Arts et Métiers ParisTech. From 2016 - 2019 he worked as research fellow and as project manager at Fraunhofer IPA in the Department for Robots and Assistive Systems. Since June 2019, he manages the research group for Software Engineering and System Integration. In 2020 he started as program manager of the ROS-Industrial Consortium Europe.

ROS Industrial Consortium Asia-Pacific Update



The lack of ROS 2 based libraries and formally tested packages has been cited as one of the main reasons many people are still reluctant to move from ROS 1 to ROS 2. In this presentation, I will share a few platform technologies that are currently being developed from enhancing vision capabilities, whole body coordination to interoperability among different systems.

Maria Vergo – ROS-Industrial Consortium Asia-Pacific, Program Manager, ARTC

Maria Vergo is a talented professional with a diverse background in the digital solutions. She graduated with a first-class honors in Chemical Engineering specializing in control and automation. She started her career in engineering before transitioning to a techno-commercial role. It was in this role that she discovered her passion for business development, particularly in the field of robotics.

Currently, Maria serves as a Consortium Manager of ROS-Industrial Consortium Asia Pacific, where she manages complex projects, stakeholder management while ensuring successful project execution. Her extensive experience in the digital solutions for multinational companies has given her a unique perspective on the challenges and opportunities that arise in this field.

What’s New in ROS 2 Iron Irwini



In this talk, Open Robotics’ developer advocate Katherine “Kat” Scott will discuss the on-going ROS 1-to-ROS 2 transition and she will also cover new and notable ROS projects and packages from the ROS community. ROS 2 Iron Irwini is scheduled for release on May 23, 2023. In terms of features and improvements, ROS 2 Iron is one of our biggest releases yet! In this talk we’ll walk you through some of the new features in ROS 2 Iron. We’ll also discuss the ROS project roadmap, the current ROS 1-to-ROS 2 transition, and how our user community can help support core ROS development.

Kat Scott – ROS Developer Advocate, Intrinsic

Katherine “Kat” Scott is presently the ROS developer advocate at Intrinsic, an Alphabet company (formerly Open Robotics). She is a co-founder of Tempo Automation (electronics manufacturing) and Sight Machine (manufacturing analytics) and led image analytics teams at Planet (satellite imagery) and 3Scan (medical imagery). Kat holds a master’s degree in computer science from Columbia University and undergraduate degrees in electrical engineering and computer engineering from the University of Michigan. She also serves on the board of the Open Source Hardware Association as its Open Hardware Certification Chair.

Movelt Studio and Movelt Space: Bringing ROS to New Frontier



While robot arms have seen decent adoption in the manufacturing industry, we believe we have just begun to scratch the surface of applications in other industries and domains. In these semi-structured and unstructured environments, the technical challenges of applying robot arms are much greater but the need is enormous. In this talk we will highlight how PickNik has been using open source to lead the robotics industry in applying manipulation and grasping to some of the toughest challenges, using our Movelt, Movelt Studio, and now Movelt Space products. From farm fields to ghost kitchens, subsea to outer space, we will discuss our strategies to leverage ROS 2 to make robotic arm hardware more intelligent.

Dr. Dave Coleman – CEO, PickNik

Dr. Dave Coleman is CEO of PickNik Robotics, chairman of Space ROS, and an industry thought leader in robotics. PickNik has been successfully delivering robotic manipulation innovations on and off earth over the past 8 years to over 80 customers, based on its Movelt line of products. Before founding PickNik, Dave worked at Google Robotics, Open Robotics, and Willow Garage. Dave is an international advocate of robotic interoperability and a published expert in autonomous motion control. His insights into robot-agnostic platforms for different morphologies and different end-user technical requirements give him a well-rounded understanding of the needs of powerful robotic software.

Job Shop Automation – A Pilot for the Foundry of the Future



Steel Founders' Society of America (SFSA) has long been supporting advanced manufacturing capability to support Founders here in the United States. To further these efforts, the SFSA has sponsored Robotic Blending Milestone 5, which seeks to instantiate a template for Foundry Job Shop Automation, or a simple system that can manage low lot, high mix, in a robust, but easy to use way. This talk ties together SFSA's vision for foundry operations with the Robotic Blending Focused Technical Project framework.

David Poweleit – Vice President of Technology, Steel Founders' Society of America & Matt Robinson, ROS-Industrial Consortium Americas Program Manager, SwRI

David Poweleit is the Vice President of Technology for SFSA with over 20 years of industry experience. He has served as an AMC CAST-IT Application Engineer and is a member of the AMC Technical Advisory Committee.

Keynote and Workshops

LUNCH Keynote: Agile Automation for Aerospace Manufacturing

Lockheed Martin's interest in using ROS is part of their goal to achieve agile automation, which enables them to quickly and efficiently to develop and deploy new robotic capabilities to meet their advanced manufacturing requirements. ROS allows them to add new functionalities to multiple brands of robot hardware and keep up with the latest advancements in robotics. With ROS, Lockheed Martin can focus their development time on solving the problem at hand, instead of spending valuable time building functionalities from scratch.



Shane Whitaker – Applications Engineer, Lockheed Martin Co.

Shane Whitaker is a Senior Applications Engineer in the Manufacturing Technology group at Lockheed Martin Aeronautics, where he is responsible for developing robotic and automation systems for F-35 production. He holds a Bachelor of Science in Mechanical Engineering from New Mexico State University and a Master of Science in Mechanical Engineering from the University of Texas at Arlington.

Rotating Workshops

Consortium Steel Founders' Society of Americas - Next Gen

Moderator: David Poweleit, SFSA

Review of SFSA Industry 4.0 activities and work with interested parties on capability of interest and the use cases that may shape a roadmap for capabilities that align with the Foundry of the Future vision that the SFSA has been maintaining and implementing with the recent Job Shop Automation pilot deployment at their member site Fisher Cast Steel.

Discussion on Open Source Robotics

Moderator: Adam Norton, UMass Lowell, Nerve Center

To support and improve the development and deployment of robotic manipulation systems, the open-source ecosystem should facilitate development and dissemination of open-source assets (i.e., hardware, software, datasets), benchmarking practices, and sharing of results. Such a distributed, community-driven venue would enable researchers and developers to share and learn about open-source resources, find tools to utilize them, collaborate on developing systematic robot experimentation methodologies, and disseminate their findings. During this workshop, we will facilitate forum discussions around two topics: (1) identification of current gaps that limit the effectiveness of the ecosystem (e.g., hardware access, simulation fidelity, lack of relevant assets), and (2) proposing solutions to the identified issues and improve the state of the ecosystem (e.g., establishing advisory boards, integrating benchmark promotion within ROS, developing streamlined infrastructure). The primary goal is to receive feedback from workshop attendees to drive the development and implementation of new activities for an improved open-source ecosystem.

Improving Tools for Industry

Moderator: Michael Ripperger, ROS-I Consortium Americas Tech Lead, SwRI

Reflecting on the rapid changes in the open source robotics space and the acceleration of the adoption of ROS 2 this workshop seeks to develop inputs to drive specific actions around resource development, training content, and potential programs/collaborations that lead to improved adoption of ROS 2 within industry. We will provide a snap shot of current tools and resources, and seek feedback on their efficacy to understand areas for improvement. Discussions may center on developer resources, resources for decision makers, as well as utilities/tools for those wanting to provide content for use by developers/solution providers. The outcomes from this workshop will influence proposed working groups, roadmaps for specific capabilities and resource development available to the community.

Empowering Aerospace Manufacturing: ROS-Powered Innovations at Spirit AeroSystem



Recent breakthroughs in Machine Vision, AI, and Extended Reality have profoundly impacted various industries. Yet, the aerospace manufacturing shop floor has not experienced significant penetration of these technologies.

In this talk, Bharath Rao will share Spirit AeroSystems' journey in pinpointing the unique challenges faced by the aerospace industry and Spirit's strategy to tackle these issues through a custom framework known as "Spirit Cognitive Robotics" which is built on top of ROS and ROS-I libraries.

Spirit Cognitive Robotics emerged from efforts to address the multi-faceted challenges associated with high-mix + low-volume aerospace manufacturing, a fragmented IIoT landscape, and skill set shortages needed to operate and maintain complex systems.

Beginning in 2019, Spirit embarked on a mission to tackle these challenges through the development of a modular software, hardware, and firmware framework. The objective was to increase the conversion rate of automation opportunities into shop floor implementations.

This framework-based approach has led to the deployment of multiple advanced manufacturing solutions at Spirit. Furthermore, each solution is designed to scale across multiple products, processes, and production cells with minimal effort.

The talk will provide insights into the development, implementation, challenges, and successes of an open-source based automation framework, offering a glimpse into the potential avenues for large scale automation in aerospace manufacturing.

Bharath Rao – Senior Research Lead Robotics/AI, Spirit AeroSystems

Bharath Rao is a Senior Research Lead at Spirit AeroSystems, where he drives the R&T Future Factory research programs in autonomous manufacturing solutions. With a focus on robotics and AI technologies, Bharath leads a project developing a platform for rapidly deploying autonomous robotic systems. Using this platform-based approach, Bharath has helped deploy multiple advanced manufacturing solutions at Spirit.

Previously, Bharath was a Consultant at Infosys, assisting aerospace clients with their digital transformation journeys. He holds a Bachelor's degree in Mechanical Engineering from Bangalore University and a Master's degree in Industrial, Systems, and Manufacturing Engineering from Wichita State University. Bharath has published academic papers in esteemed IEEE forums, primarily concentrating on enabling robot autonomy in manufacturing.

Fast and Accurate Robot Tracking of 3D Curves



This talk considers the use case of cold spray coating of an engine fan blade. Current leading industry deployment involves a dual-robot system, where one robot holds the fan blade and the second robot holds the spray gun to impinge metal powders onto the blade. These robots move together in a fully coordinated 12-degrees-of-freedom (dof) space. The spray task is 5-dof assuming a symmetrical spray pattern, implying 7-dof kinematic redundancy. The problem posed by this application is: How to create high-speed, high-precision, and uniform robot tool motion on a 3D curve using industrial robots with redundant degrees of freedom?

We pose the problem as maximizing the robot path speed subject to the tracking accuracy and speed uniformity constraints. This problem involves multiple challenges: pose optimization (where to place the robots and which robot configuration to use), redundancy resolution (how to choose complete robot configuration subject to the task requirement), joint velocity and acceleration constraints (how to maximize velocity and uniformity subject to the robot joint constraints which may be uncertain or unknown), robot waypoint placement (number and locations of the robot end effector waypoints), and motion segment optimization (which robot motion primitive, moveL, moveJ, or moveC, to use and how to blend them together).

This talk will present a hierarchical optimization approach for this problem. The robot pose and configuration are optimized using a global optimization method (evolutionary optimization) based on local kinematic redundancy resolution along the trajectory. Blending zones are selected to ensure speed uniformity. The motion primitives and waypoints are optimized based on simulated or actual robot motion to minimize the tracking error. The procedure is then repeated until the speed is maximized, subject to the tracking error and speed uniformity constraint.

To assess the efficacy of this methodology, we first use the current practice to develop baseline performance for two sample curves. We then apply our method to industrial robots from multiple vendors, in single and dual-arm configurations, and in simulation and physical experiments, for evaluation and demonstration. The resulting performance improvement over the baseline is at least 3X in all cases.

Dr. John Wen – Professor and Head of Electrical, Computer, and Systems Engineering, Rensselaer Polytechnic Institute (RPI)

Dr. John Wen is the Russell Sage Professor in Engineering and Head of Electrical, Computer, and Systems Engineering at Rensselaer Polytechnic Institute. He was with Fisher Controls 1981-1983, Jet Propulsion Laboratory 1985-1988, and RPI since 1988. He received B.Eng. from McGill University, M.S. from University of Illinois, and Ph.D. from RPI, all in Electrical Engineering. He served as Head of Industrial and Systems Engineering 2013-2018 and Director of the Center for Automation Technologies and Systems (CATS) 2005-2013. He received 2013 IEEE Control Systems Society Transition to Practice Award, was Overseas Assessor for the Chinese Academy of Sciences 2004-2009, Senior Visiting Scientist of the Japan Society for the Promotion of Science in 1997, and IEEE Fellow since 2001. His research is in the areas of control theory and applications including robotics, material processing, thermal management, and biorhythm regulation. autonomy in manufacturing.

Update On ARM Institute Initiatives



The ARM (Advanced Robotics for Manufacturing) Institute is one of nine DoD Manufacturing Innovation Institutes (MIIs) and one of sixteen Manufacturing USA® Institutes. With nearly 400 member organizations spanning industry, government, and academia, the ARM Institute accelerates the development and adoption of innovative robotics technologies, artificial intelligence, and autonomous systems that are the foundation of every advanced manufacturing activity today and in the future. For example, the ARM Institute seeks to leverage these technologies to improve US manufacturing in terms of:

- Flexibility – able to be economically productive at high-mix and low-volume ratios,
- Agility – able to respond to new goals and market requests, and
- Robustness – able to withstand changes in the supply chain, as well as the ability to take advantage of them.

Enabling industry to achieve the above quality attributes requires not only advances in relevant technologies, but also the support of a robust technological ecosystem, and an appropriately skilled workforce. This presentation will provide a description of the ARM Institute's latest initiatives, for the purposes of developing collaborative synergies with ROS-I programs, community, and ecosystem.

Joseph Giampapa – Principal Robotics Scientist, ARM Institute

Mr. Joseph Andrew Giampapa is ARM Institute's Principal Robotics Scientist. His activities focus on creating artificial intelligence, autonomous systems, and robotics development programs that can benefit US industry and the DoD supply chain.

Prior to joining the ARM Institute from Carnegie Mellon University (CMU) in 2022, Mr. Giampapa was responsible for leading industrial and government-sponsored R&D projects in off-road autonomous ground vehicles. Prior to CMU, Mr. Giampapa was product manager for Olivetti's artificial intelligence product lines, providing direction to both European Community R&D projects as well as solutions to international government, manufacturing, and industrial clients such as: Aeroporti di Roma, the Milan Chamber of Commerce, FIAT, the ship builder Fincantieri, Lloyd's Register, Vodafone Italia, and Whirlpool Italia, among others.



MotoROS2: Yaskawa Motoman Native ROS 2 Node



This talk will introduce Yaskawa Motoman's native ROS2 node. In collaboration with the Delft University of Technology, we have successfully integrated the micro-ROS architecture onto the Motoman controller. This interface is currently* released for public beta evaluation. We will discuss how the integration with MotoPlus SDK allows us to run a ROS2 node on the robot controller's CPU. Additionally, we will outline the current capabilities of the interface. Finally, a roadmap will be presented that outlines the continued growth of the feature set, based on feedback from our beta users.

**Currently by the time of the RIC meeting*

Ted Miller – Associate Chief Specialist, Yaskawa America & Gijs vd. Hoorn – Research Scientist, TU Delft

Ted Miller is a software developer at Yaskawa America since 2006. He later graduated from the University of Dayton in 2009 with a bachelor's degree in computer science. Now he leads the development of software products embedded into the Motoman robot controllers. Although he specializes in interfacing with arc welding equipment and peripherals, Ted has been involved with maintaining the MotoROS interface since 2013. He is currently working to embed a native ROS2 node into the Motoman platform.

Gijs van der Hoorn is a researcher in the Robot Dynamics group of the Cognitive Robotics Department of the Mechanical, Maritime and Materials Engineering faculty in Delft. He is also the Technical Lead Europe for the ROS-Industrial Consortium (RIC-EU) and member of the coordination team of the H2020 EU project ROSIN: ROS-Industrial Quality-Assured Robot Software Components. Furthermore, he sits on the board of the Smart Advanced Manufacturing XL research centre for composite manufacturing automation (SAM|XL) in Delft. He graduated with his Master's degree from Delft University of Technology. As a member of the ROS and ROS-Industrial communities he continuously works to further the adoption of open-source software in automation. Besides his technical duties as a maintainer of various software components he supports users by answering questions and solving problems.

Being co-located with Automate 2023 has given the opportunity to highlight ROS-Industrial members that are exhibiting on the show floor. The below list are the ROS-Industrial members that are exhibiting and showcasing capabilities offered through their products or services. For the latest exhibiting info please refer to: <https://www.automateshow.com/exhibitors>

- 3M Booth #1019
- ABB Booth #5623
- ADLINK Technology Booth #2019
- Aerobotix Booth #3813
- ARM Institute Booth #5251
- KEBA Booth #3945
- Mitsubishi Electric Booth #4018
- Numurus LLC Booth #124
- NIST Booth #745
- OMRON Booth #1049
- Panasonic Booth #3218
- Pepperl & Fuchs Booth #639
- Plus One Robotics, Inc. Booth #419
- PushCorp Booth #2423





Thank you to our Members

ROS-I is supported by an international Consortium of industry and research members. The ROS-Industrial Consortium Americas Annual Meeting is supported by the membership. Thank you to all of the members for their continued support of ROS-Industrial and the open source industrial robotics community!

