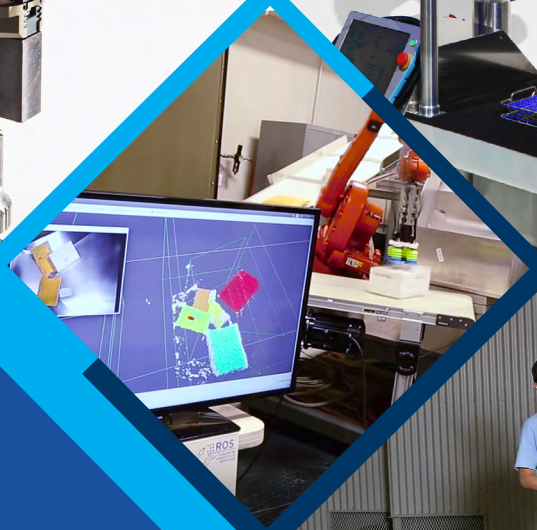
ROS industrial consortium americas

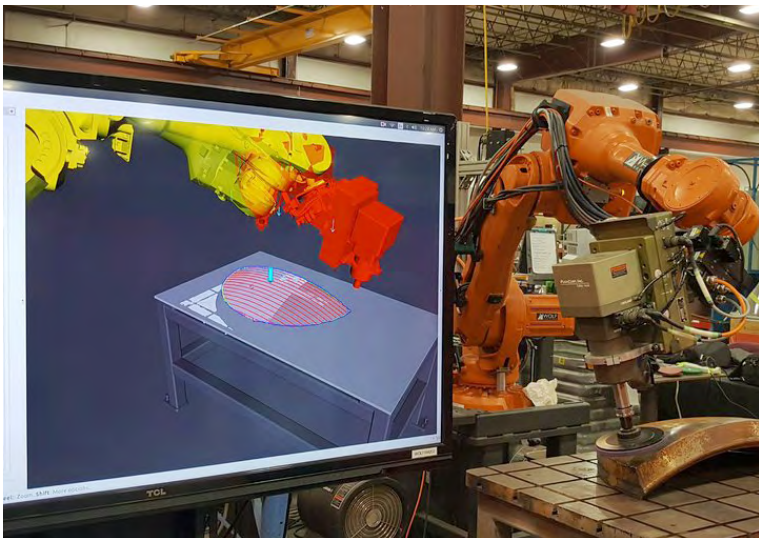
Annual Meeting 2018



rosindustrial.org

Annual Meeting Program

Overview & Introduction



ROS, a middleware that provides a common framework for robotics applications, has grown from largely a research community tool, to a broadly leveraged ecosystem that includes not just the noted framework, but numerous tools, applications and a thriving ecosystem. Within ROS, there has existed, and continues to grow, numerous open-source software packages delivering intelligence to applications including 2D/3D point cloud processing, robot motion planning and navigation, off-line visualization and planning tools, and more. Numerous companies have been created leveraging ROS to bring capabilities to market, and countless other large companies have adopted ROS from concept development for new products, or even leveraged elements or ROS within their solutions.

ROS-Industrial, which now is entering its 6th year, is an open-source project that seeks to bring these advanced capabilities, that ROS has brought to the robotics community, and apply them to industry-relevant hardware and applications. Leveraging ROS, it is possible to enable manufacturing robotics applications that were previously technically infeasible or cost prohibitive.

The ROS-Industrial repository includes interfaces for common industrial manipulators, grippers, sensors, and device networks. It also provides software libraries for automatic 2D/3D sensor calibration, process path/motion planning, such as Industrial MoveIt!, applications like Scan-N-Plan, developer tools like the Qt Creator ROS Plugin, and training curriculum that is specific to the needs of manufacturers.

Furthermore, an open-source approach enables a rising tide to benefit not just the entities that seek to leverage new capability, but to grow a community of passion around the development, improvement, and deployment of exciting new capabilities. In the most ideal form, there can be a continuum of development talent that starts early with a passion to solving these challenges due to a rich level of engagement through the education pipeline, universities & Non-profit entities, and our for-profit industrial stakeholders, which include small start-ups through multi-national corporations.

The ROS-Industrial Consortium Americas and the sister Consortia in Europe and Asia seek to bring these entities together in a way to set the strategy to realize the promise of ROS-Industrial. These goals include:

1. Provide a one-stop location for manufacturing-related ROS software.
2. Strive towards software robustness and reliability that meets the needs of industrial applications.
3. Combines 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, as opposed to replacing any one technology entirely.
4. Stimulates the development of hardware-agnostic software by standardizing interfaces.
5. Provides an "easy" path to apply cutting-edge research to industrial applications by using a common ROS architecture.
6. Provides simple, easy-to-use, well-documented application programming interfaces.

The Consortia and their respective membership have a chance to influence this strategy by providing guidance and direction for the areas that need addressed. Along with technical or application direction, membership is presented with other opportunities to grow the capabilities and health of ROS-Industrial. Some of these initiatives are to foster OEM or Community engagement, approaches to improve the ability of universities to collaborate with industry, and facilitate efficient leverage of regional initiatives such as ROSIN in the EU and the ARM Institute in the United States.

We hope that you find the ROS-Industrial mission and the objectives of the combined Consortia compelling and of value to your organization. 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!

Regards,

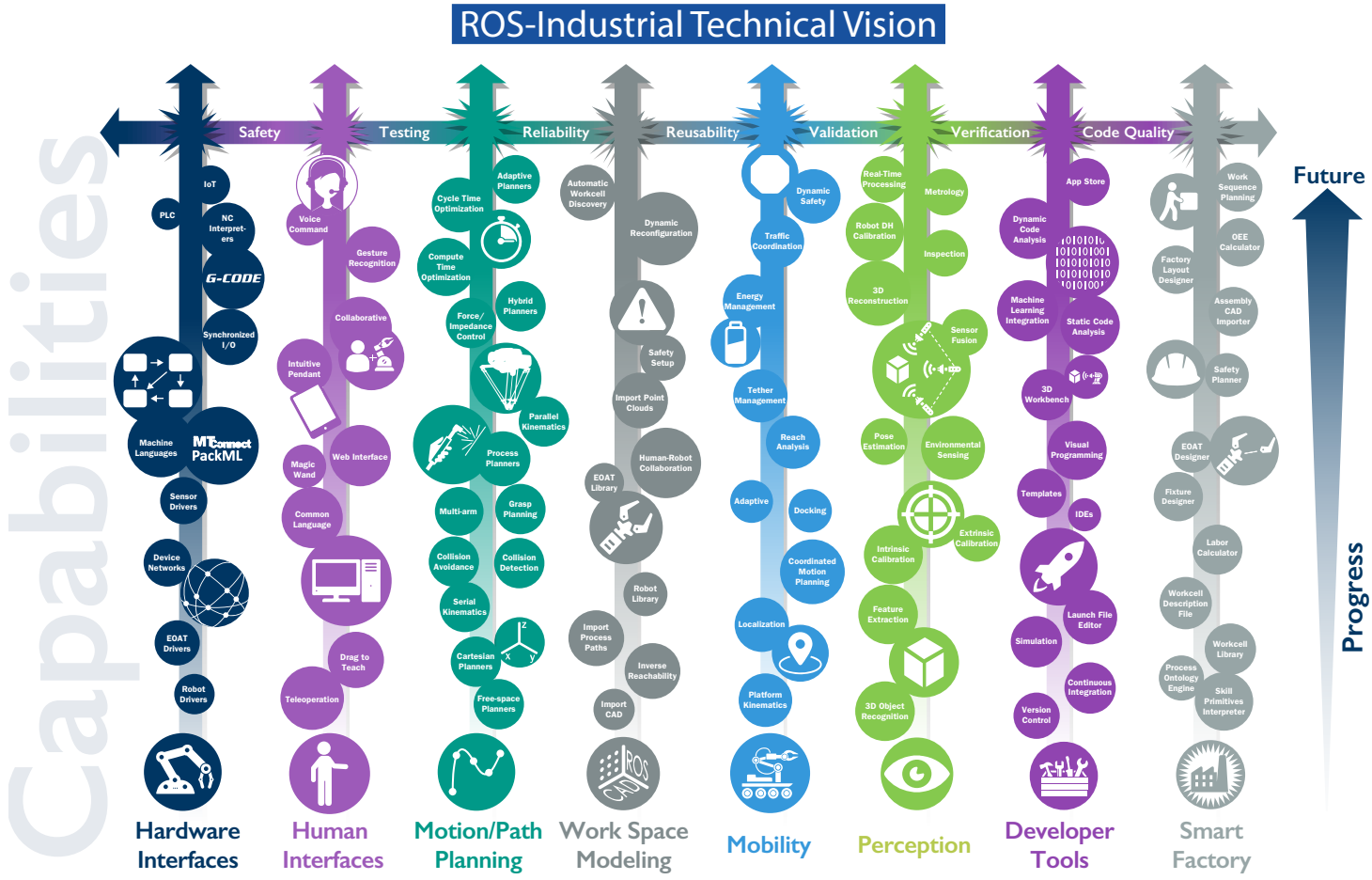
Matt Robinson

ROS-Industrial Consortium Americas

Objectives

The intent of the ROS-Industrial Consortium – Americas Annual Meeting is to convene the Consortium membership 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 particular event contains both public and non-public days to foster the means to drive awareness and grow the ROS-Industrial network through demonstrations and compelling presentations that highlight the value proposition for both what both 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, and what has happened in the last year, what is proposed moving forward.
2. Learn about the latest strategic non-technical initiatives that seek to move the ball forward in growing use, adoption, and support of ROS-Industrial
3. Communicate and share what has been beneficial and what has been a challenge during workshops and networking sessions.
4. Gather input to develop a "problem-centric" roadmap to compliment the technical vision. The idea is to cast the capabilities on the technical vision against prioritized problems to address a matrix, to ensure resources are focused on the right things.
5. Generate, based on the problems to solve, compelling project topics that can be championed and launched to address the biggest challenges to the membership.
6. Take what has been learned and share it with your organizations. Provide feedback, and continue to participate in these events, as well as the 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 – ROS-Industrial Consortium Americas Program Manager

Paul Evans – SwRI Manufacturing and Robotics Technologies Department Director

Levi Armstrong – ROS-Industrial Consortium Americas Technical Lead

About Southwest Research Institute® (SwRI®) – President's Message

"Innovation in science and technology has been a hallmark of Southwest Research Institute since its earliest days. It's no exaggeration to say we are committed to advancing science and applying technology to benefit government, industry, and all of humankind. That is our mission. Our multidisciplinary, collaborative approach allows us to successfully solve clients' most challenging problems.

Our staff is just as committed today as our founder Thomas Baker Slick Jr. was in 1947 when he proposed that the betterment of mankind depends on the use of advanced science and technology. His dream of building an internationally respected institution working in research and development has, I believe, been more than realized.

Today, we are a leader among independent, nonprofit research and development organizations. Our staff of 2,574 scientists, engineers, analysts, and support staff members continues to accomplish outstanding fundamental and applied engineering and research for clients from diverse segments of government and industry. And we will continue to strive to be the first choice for clients seeking solutions for their most complex problems."

Adam L. Hamilton, **President & CEO, Southwest Research Institute** (from https://www.swri.org/who-we-are/presidents-message)

Agenda

March 7th – Day 1 – Open to the Public		
Time	**Description**	**Speaker/Coordinator**
0800	Shuttle Pickup Courtyard Marriott Westover Hills	
0820-0900	Registration	SwRI Team
0900-0930	Welcome – SwRI Introduction	Paul Evans, SwRI
0930-1000	ROS-I Consortium Introduction	Matt Robinson, SwRI
1000-1015	Break	
1015-1045	Manufacturing in Mixed Reality	Dr. Aditya Das, UTARI
1045-1115	Discussion on the Design of a Multiuse Workcell and Incorporation of the Descartes Package	Christina Petlowany, UT Austin Nuclear Robotics Group
1115-1145	Integrating ROS into NASA Space Exploration Missions	Dustin Gooding, NASA
1145-1230	Lunch	
1230-1300	Lunch Keynote – Air Force ManTech Robotics Initiative / A5 Program Overview	Richard Meyers, AFRL
1300-1530	Lab Tours & Demonstrations: ADLINK Neuron (ADLink), KEBA KeMotion and ROS, Manufacturing in Mixed Reality (UTARI), Human Performance and ROS (SwRI), Class 8 Automated Vehicle Demonstration (SwRI), Intelligent Part Reconstruction (SwRI), A5 (SwRI), Improved Situational Awareness in Teleoperated Systems (UT Austin), Robotic Blending (RIC NA)	SwRI Team Guided
1530-1600	ADLINK Neuron: An industrial oriented ROS2-based platform	Hao-Chih Lin, ADLink
1600-1630	Unique ROS Combination with Safety and PLC	Thomas Linde, KEBA
1630-1700	Leveraging ROS-Industrial to Deliver Customer Value	Dr. Joe Zoghzoghy, Bastian Solutions
1700-1715	Closing Remarks	Matt Robinson, SwRI
1715	Shuttles Depart for Dinner: Iron Cactus, 200 River Walk Suite 100 San Antonio, TX 78205	

March 8th – Day 2 – Consortium Members		
Time	**Description**	**Speaker/Coordinator**
0800	Shuttle Pickup at Courtyard Marriott Westover Hills	
0815-0830	Registration, Light Breakfast	
0830-0845	Welcome and Introductions	Paul Evans, SwRI
0845-0920	RIC-Americas Highlights and Upcoming Events	Matt Robinson & Levi Armstrong, SwRI
0920-0940	RIC-Europe Highlights and ROSiN Update	Dr. Mirko Bordignon, Fraunhofer IPA
0940-1000	ROS-Industrial Lessons from Bootstrapping in Asia Pacific	Min Ling Chan, ARTC
1000-1015	Break	
1015-1045	ROS2 is Here	Dr. Dirk Thomas, Open Robotics
1045-1115	ARM Institute Introduction & Mission	Dr. Bob Grabowski, ARM Institute
1115-1145	Windows IoT & Robotics	Lou Amadio, Microsoft
1145-1215	Lunch	
1230-1300	Lunch Keynote: Why Boeing is Using ROS-Industrial	Dr. Philip Freeman, Boeing
1300-1430	ROS-I Problem-Centric Roadmapping Workshop	ROS-I Team Facilitated
1430-1445	Break	
1445-1515	Enabling Facility-Level Interoperability Between Robot Teams and Machine-Cell Devices	Shaurabh Singh, Association for Manufacturing Technology
1515-1545	The Past, Present and Future of DDS and its Relation with ROS2	Erik Boasson, ADLink
1545-1700	Project Topic Idea Generation based on Industry Needs	Matt Robinson, SwRI
1700-1715	Closing Remarks	Matt Robinson, SwRI
1715	Shuttle Direct to Courtyard Marriott Westover Hills	

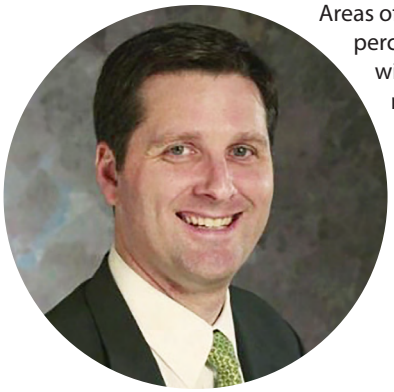
Talks March 7th

Southwest Research Institute, Host of the ROS-Industrial – Americas Annual Meeting

Southwest Research Institute (SwRI), headquartered in San Antonio, Texas, is one of the oldest and largest independent, nonprofit, applied research and development (R&D) organizations in the United States. Founded in 1947 by oil businessman Thomas Slick, Jr., SwRI provides contract research and development services to government and industrial clients.

The institute consists of nine technical divisions that offer multidisciplinary, problem-solving services in a variety of areas in engineering and the physical sciences. The Center for Nuclear Waste Regulatory Analyses, a federally funded research and development center sponsored by the U.S. Nuclear Regulatory Commission, also operates on the SwRI grounds. More than 4,000 projects are active at the institute at any given time. These projects are funded almost equally between the government and commercial sectors. At the close of fiscal year 2017, the SwRI staff numbered 2,574 employees and total revenue was more than $528 million. The institute provided more than $7 million to fund innovative research through its internally sponsored R&D program.

Paul Evans – Director Manufacturing Robotics and Technologies – Southwest Research Institute



Areas of specialization within Mr. Evans' department include advanced manufacturing, robotics, automation, machine perception, and process improvement. Over the course of his career, Mr. Evans has led and participated in a wide range of robotics and automation programs for both commercial and government customers. Programs relevant to flexible automation and intelligent machines encompass the development and implementation of a variety of robotics systems including custom, large-scale, mobile, underwater, enhanced off-the-shelf, and all the associated controls and perception technologies. Mr. Evans' department also initiated ROS-Industrial, an open-source extension of the Robot Operating System (ROS) that focuses on supporting the needs of manufacturers and industrial robot users, facilitated by a global consortia collaborative.

ROS-Industrial Consortium & Introduction to the Annual Meeting

ROS-Industrial has grown to be the default open-source advanced robotics development framework for manufacturing applications. The support of the research community, regional governments around the world, and industrial solution providers and end-users, has enabled significant growth. The Consortium has been instrumental in fostering this growth and setting forth the direction to enable continued success. This introduction serves to provide the motivation both for ROS-Industrial and the Consortium and set the stage for the remainder of the proceedings.

Matt Robinson – ROS-Industrial Consortium – Americas Program Manager

Matt Robinson is the Program Manager for the ROS-Industrial Consortium – Americas. In this role, Mr. Robinson is setting the strategy and vision to align the open source development community with industry needs to deliver innovative and sustainable advanced robotics solutions ready for factory deployment. Prior to this, Mr. Robinson was team leader for Caterpillar's Manufacturing Technology Automation Research. Here, Mr. Robinson led development and deployment of automation tools to improve the performance and productivity of Caterpillar manufacturing facilities around the globe. Mr. Robinson, during this time, also led manufacturing value stream design initiatives that led to the deployment of over 50 robotic/automated manufacturing systems around the world. Mr. Robinson has led developments for automated materials joining processes for titanium and other challenging dissimilar material combinations for high temperature applications. Mr. Robinson has a Master's Degree in Welding Engineering from Ohio State University.

Manufacturing in Mixed Reality

This talk will discuss the on-going research at the University of Texas at Arlington Research Institute (UTARI) to bring in a disruptive transformation in the field of dynamic multi-robot deployment and control optimization and execution in mixed reality, looking to answer the following questions:

- How quickly and cost effectively can a production line can be reconfigured for different products, processes, and equipment?
- How can we bridge the spatial and temporal gap among the different stake holders such as floor designers, operation managers, machine operators, maintenance engineers, and safety supervisors, working at different stages of production?
- How do you reduce the training cycle and reuse skillsets?

Mixed reality, as the name suggests, is a merger of real and virtual worlds to produce new environments and visualizations, where physical and digital objects can coexist and interact with in real-time. UTARI is studying several advantages of mixed reality including the ability to integrate and visualize spatially and temporally separated data. In addition to the visualization tool, mixed reality can also be used as an advanced human-machine interface, to provide the ability to real time parametric assessment with large sets of input variable. Finally, the mixed reality interface can be used to control the physical objects such as mobile platforms and manufacturing robots, through the common software platform, to execute the automated configuration and production.

Dr. Aditya Das – University of Texas at Arlington Research Institute

Dr. Aditya Das leads the Autonomous and Intelligent Systems division at the University of Texas at Arlington Research Institute. He also maintains a joint appointment as a faculty member at the department of electrical engineering at the University of Texas at Arlington. Dr. Das received his Masters and PhD in Electrical engineering from the University of Texas at Arlington in 2007 and 2009 respectively, and his MBA from University of Texas – Austin in 2017. His current research and development focus includes human robot interaction, knowledge-based automation, flexible manufacturing, heterogeneous system integration, miniaturization technology, instrumentation, and enhanced manned unmanned teaming. Dr. Das has received over $2 million in research grants and contracts from various federal agencies as well as multiple industries. Dr. Das is a senior member of IEEE. He has authored and coauthored 40 technical publications in international conferences, journals and articles, and two pending U.S. patents.

Discussion on the Design of a Multiuse Workcell and Incorporation of the Descartes Package

This talk will discuss the implementation of three manufacturing tasks inside a glovebox. These tasks include surface finishing, drilling, and sorting. ROS, vision, and the Descartes path planner were used in this endeavor. This talk will also briefly discuss the use of peripherals in ROS and identify pros and cons of Descartes for the surface finishing task.

Christina Petlowany – University of Texas at Austin Nuclear Robotics Group

Christina Petlowany graduated with a bachelor's degree in Mechanical Engineering from Rice University in 2016. She is interested in control systems and design for extreme environments. Her research focuses on control plans for robotic manipulators in confined environments.

Integrating ROS into NASA Space Exploration Missions

Dustin Gooding will present information on how NASA is currently using ROS for robotic prototypes for future space exploration missions. ROS is integral to advancing autonomy in robots such as Robonaut2 and Valkyrie. This presentation will focus on how and why ROS is used in robotic prototypes and future avenues for ROS integration and development on flight-qualified NASA robots. This presentation will provide information to the greater ROS community on how future innovations could be integrated into NASA robots to enable manned missions beyond low-Earth orbit.

Dustin Gooding - NASA Johnson Space Center - Software Architecture Technical Lead, Robotic Technology Systems Branch

Dustin Gooding is currently the Software Architecture Technical Lead in the Robotic Technology Systems Branch (RTSB). In this role, he establishes standards and guidelines for robotic software development and works with the numerous RTSB projects to find common solutions to common goals. He has spent the last seven years designing and developing software for NASA robotic systems, including Robonaut2 and Valkyrie.

Lunch Keynote – Air Force ManTech Robotics Initiative / A5 Program Overview

This presentation will provide a perspective from Air Force ManTech and describe some ongoing R&D required to enable advancements in automation and robotics in a manufacturing environment. The speaker will highlight defense aerospace manufacturing challenges today and the need for adaptable, flexible, and collaborative solutions in the future. The speaker will describe a vision where robotics thrive in a low-volume, high-mix environment alongside human operators. The speaker will address how ROS is enabling that vision and a brief overview of how investment projects are enabling advanced robotic systems development. Finally, a brief overview of the Advanced Automation for Agile Aerospace Applications (A5) project will be provided. AFRL has funded the National Center for Defense Manufacturing and Machining (NCDMM), Southwest Research Institute (SwRI), and Boeing to develop a state of the art robotics technology platform. The A5 team is developing an open source solution using ROS that adapts to part variations and accounts for process variability by incorporating real time sensor feedback and adaptive processing. This presentation will provide an overview of the work that has been performed to date showcasing the development of a mobile adaptive robotic system capable of sanding C-17 and other aircraft platforms.

Rick Meyers - Deputy Program Manager, ARM Institute (Manufacturing USA) Materials and Manufacturing Directorate Air Force Research Laboratory

Rick Meyers is a Program Manager in the Manufacturing and Industrial Technologies Division of Air Force Research Laboratory located at Wright-Patterson Air Force Base, Ohio. Mr. Meyers manages a research portfolio focused on advancing manufacturing technology in Automation and Robotics for the US Air Force. In addition, Mr. Meyers serves as the Government Deputy Program Manager for the Advanced Robotics for Manufacturing (ARM) Institute on behalf of the Office of the Secretary of Defense for Manufacturing and Industrial Base Policy. Rick also serves as an Air Force representative on the Joint Defense Manufacturing Technology Panel and Advanced Manufacturing Enterprise Subpanel focused on aligning digital manufacturing R&D strategy for the Department of Defense. He has a Master of Science in Systems Engineering from the University of Dayton, a Master of Business Administration from Miami University, and a Bachelor of Science in Industrial and Systems Engineering from Ohio University.

ADLINK Neuron: An industrial oriented ROS2-based platform

ADLINK Technology, one of biggest IPC (industrial PC) companies in Taiwan, has acquired PrismTech which designs and implements DDS (Data Distribution Service). Since the middleware of ROS 2.0, or ROS2, was based on DDS, we believe expanding our existing resources to open source is an efficient, effective and logical solution to address the industry's challenges in the future.

To support to the buildup of the ROS2/DDS ecosystem, ADLINK has joined the ROS-I consortium and been keeping a tight working relationship with OSRF's ROS2 development team since 2017. In addition, we just announced that our commercial version, Vortex OpenSplice, will be open-sourced with the help of the Eclipse Foundation (called Eclipse Cyclone DDS), and will be released in the near future.

Recently, we also launched a novel product, called ADLINK Neuron - A miniITX type ROS2/DDS based IPC, to assist our industrial partners to easily transition to the ROS2 environment and provide consulting services for DDS implementation and ROS-related algorithm development. The ongoing, and potential, applications of ADINK Neuron include AMR's (Autonomous Mobile Robot), service robots, surveillance robots, AI application, smart grid, smart agriculture, and more.

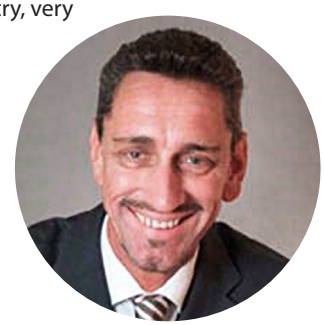
Hao-Chih Lin – ADLINK

Hao-Chih Lin studied aeronautical engineering at National Cheng Kung University and graduated in 2015. After graduation, he held an engineering internship in both Paris Observatory for CubeSat analysis and ISAE-Supaero for visual inertial odometry developing. Currently, Hao-Chih is a ROS technical consultant in ADLINK Technology. His research interests are nonlinear controller, motion planning and vision-based state estimation. In addition, Hao-Chih is dedicated to promoting the ROS ecosystem in Taiwan. He was the main organizer of a ROS Taipei developer event in 2018.

Unique ROS Combination with Safety and PLC

This presentation will shortly show our Company and our ROBOT control products in the market. We are a robot control supplier in Industrial Applications for more than 30 Years with significant experience in industrial requirements which we want to share.

We will show some use cases, and the main competence of KEBA Robotics, regarding precise and fast robot movement and programming. The main part will be to show the deep integration of ROS, combined with, Safety and Robot Control by using one programming tool for a fast setup in different types of applications. This combination is unique within the industry, very powerful, and easy to use.

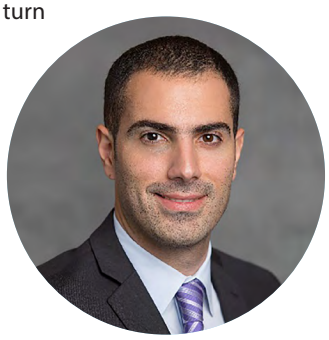


Thomas Linde – Dipl.Ing.; CIO KEBA groupe; Prokurist, Executive Vice President Industrial Automation

Biography: 2017 – now KEBA Groupe : CIO Chief Innovation Officer KEBA Groupe. Prior history: 2007- 2017 KEBA AG : Executive Vice President Industrial Automation; 1999- 2007 ADS-TEC : Sales- Marketing Manager, PC based Solutions for Automation; 1995-1999 ING. SCHAD : Product Manager, Controls / HMI; 1993- 1995 MAG :Software development Tool machines; 1989- 1993 University : Study "Automation" in Germany, Dipl.Ing.

Leveraging ROS-Industrial to Deliver Customer Value

This Presentation will put a new perspective on how a system integrator is leveraging ROS-Industrial to help solve challenging problems in the material handling industry. From running dynamical simulations, to computer vision, all the way to path planning and navigation, ROS-I has been a key enabler for new product development and accelerated go-to market strategies. The effective tools that ROS-I provides bring down developmental costs and shorten payback periods for the customer. This in turn secures a commitment to maintain this platform from every perspective.



Dr. Joe Zoghzoghy – Bastian Solutions

Joe Zoghzoghy, Ph.D. is the Mobile Robotics Manager at Bastian Solutions. He started a new division for Bastian Solutions in Texas that focuses on the development and production of mobile robots. Dr. Zoghzoghy has a B.E degree from the American University of Beirut, as well as, a Ph.D. and master's degree from the Southern Methodist University, all in mechanical engineering, with a focus in the areas of robotics, mechatronics, and electro-mechanical systems. He also has a background in startups and new business development.

Talks March 8th

RIC-Americas Highlights and Upcoming Events

An overview of the last year related to the ROS-Industrial Consortium – Americas including updates to training, strategic initiatives, changes upcoming, and technical highlights and developments. This will include a review of the "Health of the Consortium", as well as upcoming changes that are expected to positively impact the Consortium and the Community. Technical highlights will include new capabilities that are in the pipeline that should deliver unique capability to the membership and community.

Matt Robinson & Levi Armstrong – ROS-Industrial Consortium – Americas Manager and Technical Lead

Matt Robinson is the Program Manager for the ROS-Industrial Consortium – Americas. In this role, Mr. Robinson is setting the strategy and vision to align the open source development community with industry needs to deliver innovative and sustainable advanced robotics solutions ready for factory deployment.

Levi Armstrong is the Technical Lead for the ROS-Industrial Consortium - Americas and the group leader of the Collaborative Systems Section at SwRI. Armstrong has developed technical knowledge in the areas of optimization-based motion planning, meshing, collision detection and calibration to develop custom automation solution for industry. Prior to his current roll, Armstrong was an Engineer at Bell Helicopter focused on low-cost composite manufacturing leveraging automation in the areas of drilling, routing, deburring, machining, and heat treat to meet aerospace engineering specifications. He holds a B.S. and M.E. in Aerospace Engineering from the University of Texas at Arlington.

RIC-Europe Highlights & ROSiN Update

After a tepid start, ROS-Industrial seems now well-positioned for wider adoption by European users and providers of automation. This can be gauged by the growth of the ROS-I EU Consortium, the support from funding agencies, and the feedback gathered at outreach events. Starting from an overview of EU activities along these metrics, with a special highlight on the EU H2020 "ROSIN" ongoing project, the talk will then examine the factors identified as key for further growth of the initiative, preview the program for ROS-I EU activities in 2018, and conclude with some questions open for discussion.

Dr. Mirko Bordignon – ROS-Industrial Consortium – European Union Program Manager – Fraunhofer IPA

Dr. Mirko Bordignon manages the ROS-Industrial Consortium Europe on behalf of Fraunhofer IPA, where he leads the Software Engineering and System Integration Group within the Robot and Assistive Systems Department. The goal of his team is to support the transition of manufacturing systems from vertically-integrated solutions to platform-like stacks, enabling flexibility and fast (re)configuration as needed by current and upcoming production trends. Before his appointment at Fraunhofer IPA, he worked in the automation industry as a software engineer for end-of-line machinery, after a stint in academic research in the field of modular robotics. He holds BS and MS degrees in Computer Engineering from the University of Padova, Italy, and a PhD in Robotics from the University of Southern Denmark, with visiting positions at Orebro University, Sweden, and Harvard University, USA.

ROS-Industrial Lessons from Bootstrapping in Asia Pacific

ROS-Industrial in Asia Pacific awareness is key. The use of ROS in universities in the region is growing; however, many are unaware of ROS-Industrial capabilities or features that can be tapped, contributed and open-sourced by universities and industries in the region. The presentation will highlight our objectives and strategy towards understanding the region's needs in software development, hardware integration, ROS 2 requirements and how we plan to advance ROS-Industrial software adoption in the Asia Pacific and ensuring community continued growth in terms of users and contributors for ROS-Industrial.

Min Ling Chan – Program Manager, ROS-Industrial Program Manager – Asia-Pacific – Advanced Remanufacturing Technology Centre

Min Ling Chan is currently the Program Manager for the ROS-Industrial Consortium – Asia Pacific managed by ARTC, an initiative of A*STAR in Singapore. She aims to increase robotic development in industry through ROS development and adoption in Asia Pacific.

She holds a double degree in Mechanical Engineering and Computer Science from RMIT University, Australia. She has worked in various manufacturing industries in Germany, Belgium and Australia, ranging from air compressors to automotive with Ford Australia. Prior to this role she worked in the Ford Asia Pacific team as the Asia Pacific lead on Engineering Design and Testing governance and process amongst supporting the AP Engineering team on process improvements. She brings with her experiences in manufacturing, product design and development, supply chain support to project management of large vehicle programs.

ROS2 is Here

The Robot Operating System just celebrated its 10th anniversary. While ROS has been very successful in several domains there are specific use cases and requirement it can't currently satisfy well. The next major version - ROS 2 - is aiming to address many of those limitations. Built upon an established communication standard, it provides the advantages of a modular designed robotic software to be used all the way in production systems.

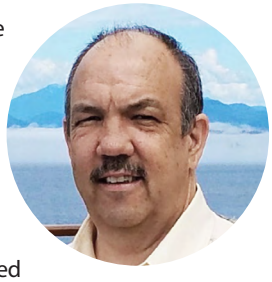
It is designed from the ground up to meet the needs for a deterministic and reliability system behavior and supports a variety of platforms. This presentation will give an insight on what features are available in the latest release as well as what is planned in the future.

Dr. Dirk Thomas – Lead Software Engineer ROS2 – Open Robotics

Dr. Dirk Thomas is a software engineer at the Open Source Robotics Foundation. He received his Ph.D. in Computer Science from the Technische Universitaet of Darmstadt (Germany) in 2010. In 2012 he moved to California to start as a Research Engineer at Willow Garage where he took on the responsibility to work on the most crucial foundations of ROS. His area of expertise within ROS ranges from the build system and the CI infrastructure over the C++ and Python client libraries up to developer tools like rqt. Dr. Thomas is currently leading the ROS development team working on the next major generation of ROS 2.

ARM Institute Introduction & Mission

In 2017, the Advanced Robotics for Manufacturing (ARM) Institute was established as the last of 14 National Institutes under an effort called Manufacturing USA with the objective of bring manufacturing back to the USA. The goal of ARM is to establish and grow a robust industrial ecosystem that facilitates the transition of needed robotic technologies and approaches from early TRL innovations to robust industrial applications. With initial funding from the DoD, this institute was established as a public-private partnership to build a rich community, composed of academia, industry and government, that shares both ideas, processes and consortium developed intellectual property. In this talk, I will briefly describe the evolving member construct and give an update of the current investment process and talk briefly about the aspirations and challenges of building a persistent ecosystem.



Dr. Bob Grabowski – Deputy Chief Technology Officer – ARM Institute

Dr. Bob Grabowski is the deputy Chief Technology Officer for the newly formed Advanced Robotics for Manufacturing (ARM) Institute. Bob is responsible for the technical oversight of ARM's growing investment portfolio as well as development and maintenance of its roadmap strategy. His background includes nine years in the U.S. Navy as a reactor operator, including three years as a nuclear prototype instructor. Following his tour in the Navy, he received a dual undergraduate degree in Electrical Engineering and Physics at the University of South Carolina in 1999 and was selected Engineering Valedictorian and was awarded Honorary Physics Fellow. In 2004, he completed his Ph.D. from Carnegie Mellon University where he developed the Millibots, a fleet of small, 5cm scale heterogeneous robots. In 2017, Bob completed 13 years at MITRE, a Federally Funded Research and Development Center as the director of MITRE's Autonomous and Intelligent Systems. His accomplishments include Chief Scientist and lead perception engineer for MITRE's finalist entry in the 2005 DARPA Grand Challenge. He was MITRE's lead subject matter expert for the DoD's Autonomy Community of Interest, Office of Net Assessment and the Test Resource Management Center's Unmanned and Autonomous Systems Test technology research portfolio. He was the Principal Investigator on twelve of MITRE's internal research projects totally 6 million dollars of investment. He has published 16 papers on robotics including two journal papers and two featured articles in Scientific American.

Windows IoT & Robotics

Microsoft is committed to supporting Robotics scenarios in Windows IoT – both Windows 10 IoT Enterprise and Windows 10 IoT Core. Each platform will be introduced, including the benefits of each platform. Microsoft will discuss plans for supporting ROS 1 and ROS 2 on Windows IoT.

Lou Amadio – Windows 10 IoT Architect - Microsoft

Lou Amadio is an architect in the Windows IoT group at Microsoft. Lou has worked on consumer and enterprise robotics research and products, including Microsoft Robotics Studio. In the Windows IoT Group, he has been working on versions of Windows 10 targeted at dedicated purpose devices.

Lunch Keynote: Why Boeing is Using ROS-Industrial

Boeing has been a long user of ROS and ROS-Industrial. The genesis and where these efforts have led have enabled Boeing to revolutionize approaches to produce their products. A vision enabled by open source software, including ROS-Industrial, has led to innovation, as well as the realization of the benefits of that innovation in a more efficient manner than legacy approaches to solution development.

Dr. Philip L. Freeman - Senior Technical Fellow - Assembly Automation, Boeing Research & Technology

As a Senior Technical Fellow in the area of Materials and Manufacturing Technology, Dr. Freeman has expertise in robotics, automation, and control. He currently leads 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 20 patents covering a range of manufacturing technologies, and is an author on several publications in machine tool volumetric accuracy and machine vision for inspection. Currently, he is working in the area of automatic task and path planning for industrial automation.

Dr. Freeman is a member of American Society of Mechanical Engineers (ASME) where he serves as the vice chairperson for ASME B5.TC52 standards committee on machine tool performance. He is also a member of the Institute of Electrical and Electronic Engineers (IEEE) where he is a member of the industrial advisory board for the Robotics and Automation Society (RAS) within the IEEE organization.

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.

Enabling Facility-Level Interoperability Between Robot Teams and Machine-Cell Devices

Manufacturing equipment is already designed to interoperate within a CNC machine, production cell, or a line. However, device interoperability at a factory-wide level or above still faces significant hurdles. The MTConnect standard and ROS bridge enable a new degree of orchestration with a multi-device interface model, which in turn will lower the cost of automation solutions especially for small and medium sized enterprises.

The Cost Effective Coordinated and Cooperative Robotics Enabled by Open Technologies research project is being developed by SwRI, AMT, and System Insights. Funded by a NIST Measurment Science and Engineering (MSE) grant, the project investigates the use and bridging of open standards and technologies. It is exploring application of a flexible automation testbed that demonstrates lowering the cost of automating typical processes, such as in-process inspection, intelligent part management, and automated, just-in time servicing of machine and machine cell applications.

Open source software permits free development over a very large workspace to solve complex problems at no cost to the end user. The output from this project is intended to be an enabler for industry-wide adoption of open source technologies by providing a use-case and testbed showcasing lower cost solutions for comprehensive factory floor integration for the small and medium sized manufacturer.

Shaurabh Singh – Association for Manufacturing Technology

Shaurabh Singh is a Research Engineer at The Association For Manufacturing Technology in McLean, Va. Through the MTConnect Institute, he works on developing and maintaining the MTConnect standard and related applications, services and technologies. He holds a MSc from NC State University in Industrial and Systems Engineering where he was first exposed to MTConnect while using the standard in a cloud based cyber manufacturing setup. His research interests include smart manufacturing, automation and cyber physical systems.

The Past, Present and Future of DDS and its Relation with ROS2

With the release of ROS2, the use of DDS in robotics will grow significantly, and especially in industrial robotics, the real-time character of DDS is especially valuable. In theory, using ROS2 does not require knowledge of DDS, but at the same time the complexity of robots is increasing and indeed is slowly moving further into the territory that gave rise to DDS. It stands to reason that this may lead to re-discovery of some issues, and necessitate some further enhancements to ROS2. Thus, it is valuable to understand where DDS came from and where it may be going in the future, and how the decision to abstract from DDS gives some valuable degrees of freedom.

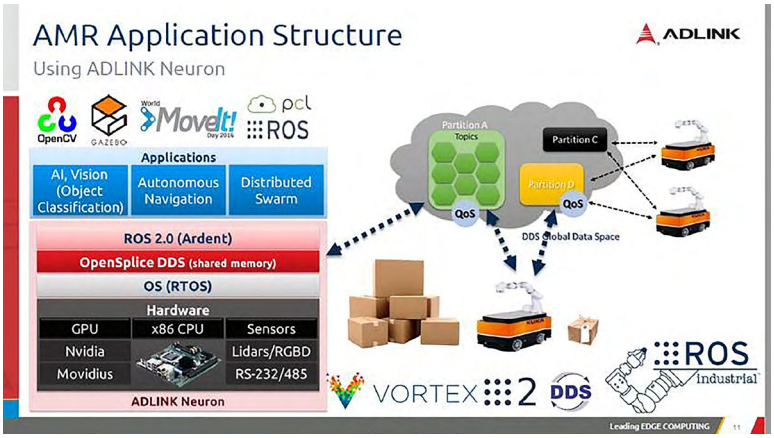
Erik Boasson – ADLink

Erik Boasson is a member of the Technology Office of ADLINK Technology. His focus is on DDS and its applications and future developments such as a reduced version capable of operating in very resource-constrained environments while retaining the key characteristics of DDS. He has more than two decades of experience in the field, starting at the source of data-centric programming model at Hollandse Signaalapparaten BV in the '90s. While there, he developed a complete and independent implementation of the SPLICE architecture that has proven itself in several contexts, including as a tool to convince the US DoD to mandate data-centric systems and that is direct ancestor of DDS.

Demonstrations

ADLINK Neuron – ADLINK

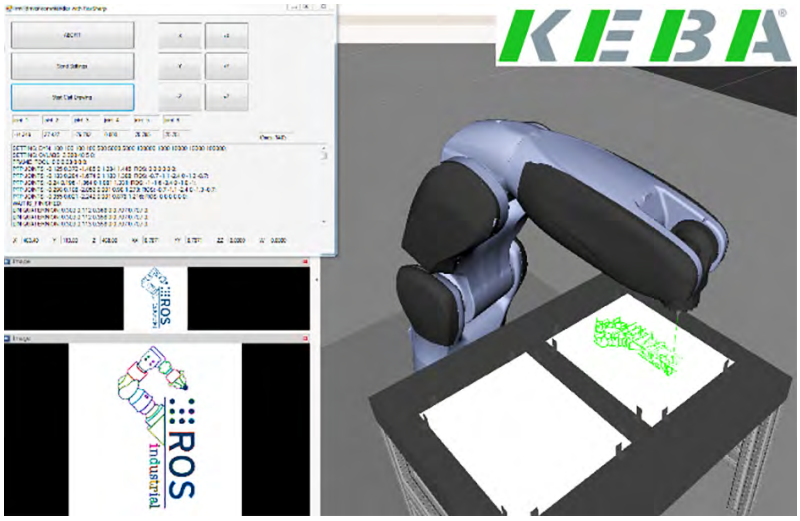
ADLINK Neuron - A miniITX type ROS2/DDS based IPC, to assist our industrial partners to easily transition to the ROS2 environment and provide consulting services for DDS implementation and ROS-related algorithm development. The ongoing, and potential, applications of ADINK Neuron include AMR's (Autonomous Mobile Robot), service robots, surveillance robots, AI application, smart grid, smart agriculture, and more.



Hao-Chih Lin
ADLINK

KeMotion and ROS – Keba

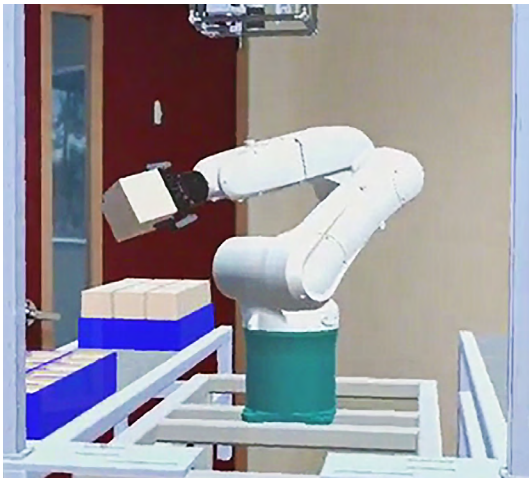
With this demonstration KEBA will show a ROS-based application combined with their high performance industrial robot controller by drawing graphical content like company logos at high speeds. Cartesian paths are created with OpenCV by analyzing a sample image, checked for collisions, and then streamed to the controller as linear movements with the new rmi_driver interface. Handling small segments is typically a difficult challenge for a robotic motion controller, but the KEBA C5 controller and rmi_driver are able to handle paths with thousands of linear or joint moves.



Doug Smith
Keba

Manufacturing in Mixed-Reality – University of Texas at Arlington Research Institute

UTARI will present a mixed reality based human machine interface for multi-agent, cooperative operations management of process automation, quality control, and other advanced manufacturing tasks. The mixed reality implemented through Microsoft HoloLens, allows the users to fuse process guidelines, real-time inspection data, and cross referencing information to derive adaptive measures and projected outcomes, which are then superimposed in the users view through the HoloLens. Using a novel spectator view technique, more than one user can have process oversight, allowing parallel multi-level quality control in production feasible.

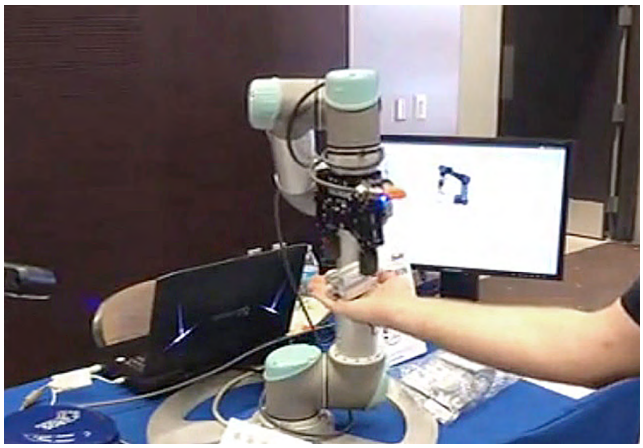


Dr. Aditya Das
UTARI

Human Performance and ROS – Southwest Research Institute

This demonstration leverages work by SwRI's Human Performance Initiative Markerless Motion Capture that enables precise, 3-D capture of biomechanical movement, and merge it with some of the path planning capability inherent to ROS/ROS-Industrial. This demonstrations aim is to recognize a hand, and a specific open gesture of a user and this would then queue the robotic system to retrieve a part from the hand.

Though at the surface this demonstration seems simple, this is a means of enabling richer collaboration between human and machine. Through richer understanding of the biomechanics and enabling gesture recognition, or even other cues from the human, the machine can respond in the most efficient manner. We're excited to see where this can go over here, and hopefully others find it compelling as well. Thanks to the Human Performance Solutions team for their collaborative efforts on this demonstration.



Dr. Josh Langsfeld
Southwest Research Institute

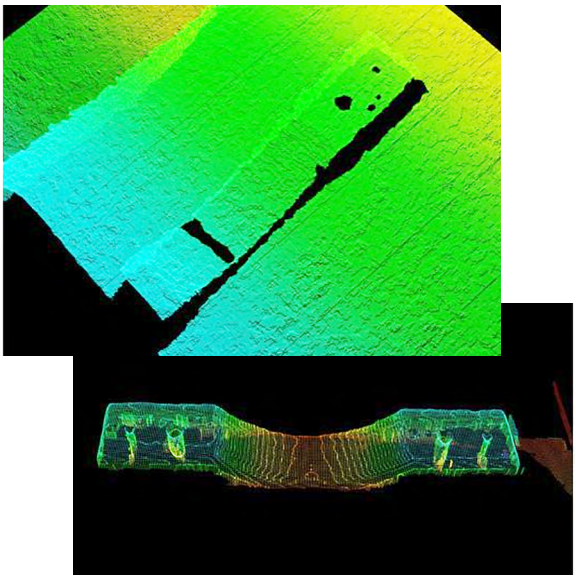
Class 8 Automated Vehicle Demonstration

Southwest Research Institute's Autonomous Systems Department, within Intelligent Systems Division will be demonstrating their autonomous Class 8 Automated Vehicle Platform. This autonomous Freightliner® truck called "Big Red" is outfitted automated sensors, radar and vision systems, and will be demonstrated navigating the test track on SwRI's campus.

John Esposito
Southwest Research Institute

Intelligent Part Reconstruction

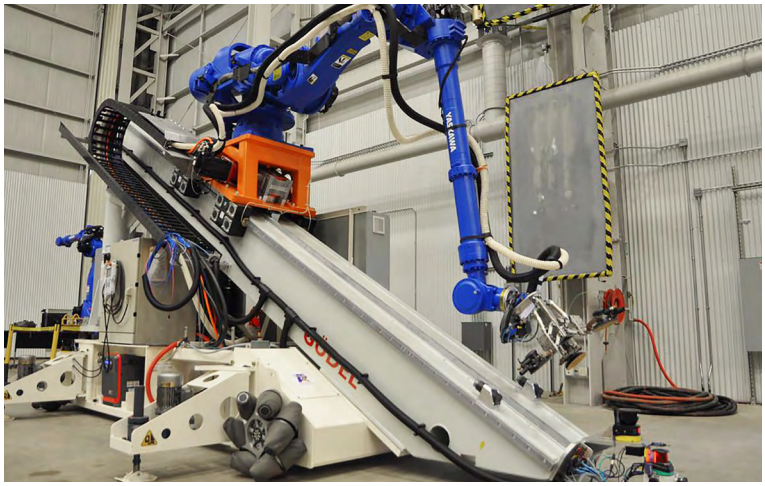
In recent years, academic research in the field of on-line surface reconstruction has built on the Truncated Signed Distance Field (TSDF). The Kinect Fusion TSDF technique pioneered by Microsoft Research involves probabilistically fusing many organized depth images from 3D cameras into a voxelized distance field, to estimate an average, implicit surface. The TSDF-based reconstruction process only produces good results if the sensor gets good views of as much of the surface as possible. This is a fairly intuitive task for a human, since we can look at the partially-reconstructed surface, recognize which areas are incomplete, and move the camera to compensate. This demonstration showcases a robot-based version of TSDF that creates meshes in the coordinate frame of the robot and leverages ICP to merge generated meshes into one complete mesh for subsequent path planning.



Dr. Chris Lewis
Southwest Research Institute

Advanced Automation for Agile Aerospace Applications (A5)

The A5 program aims to upend that paradigm using ROS-Industrial to develop flexible technology that can be used across different manufacturing processes and environments. Phase I will develop adaptive robotic capabilities in aircraft sanding. Phase II will apply those capabilities to composite aircraft repair, and Phase III will develop nondestructive capabilities using the same mobile platform. This demonstration will showcase the capability around the sanding of a presented surface that is identified and then low-level scanning and processing takes place.



Jonathan Meyer & Michael Ripperger
Southwest Research Institute

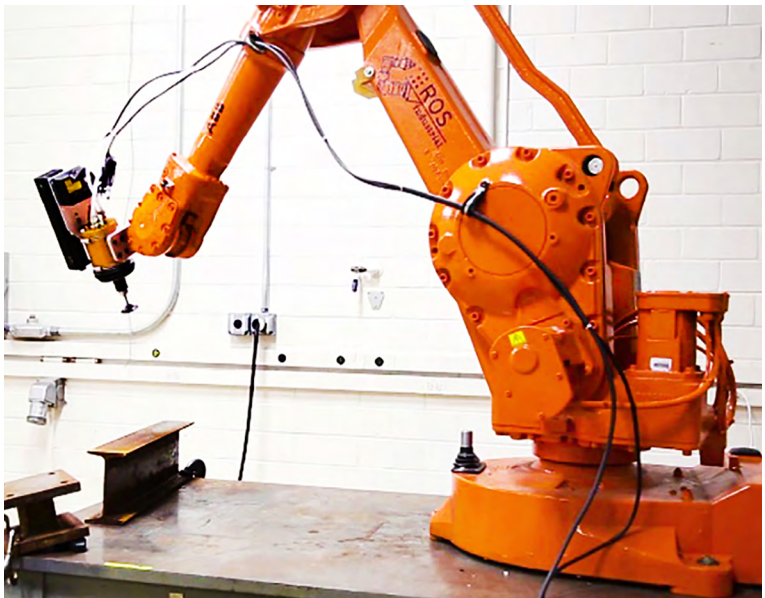
Improved Situational Awareness for Mobile Manipulation

The Nuclear Robotics Group will demonstrate a mobile manipulation platform. The platform performs hazardous tasks such as high-voltage switching in both nuclear and oil/gas domains. A rugged Clearpath Husky base and dual UR5 arms provide a wide range of manipulation capabilities. There will be a demo of 360* video feed which is piped to VR goggles, providing much better situational awareness for the operator. A ROS-based control system which has been studied and optimized for rapid, efficient completion of simple tasks (pushing buttons, turning valves) will also be shown.

Veiko Vunder & Andy Zelenak
University of Texas at Austin
Nuclear Robotics Group

Robotic Blending – ROS-Industrial Consortium

The Robotic Blending project is the first open source instantiation of what will become a general Scan-N-Plan™ framework (Figure 1). The project has been making steady progress over the past two and a half years. Within the capability to be demonstrated, processing of complex contours of as-presented parts, with no tie back to CAD, processing of edges, and the generation of surface, edge, and quality assurance trajectories all in one processing instance. Closed loop processing highlights areas that need additional processing and generates specific trajectories for that processing. A milestone 5 is in the proposal phase, and is open for further parties to participate.



Alex Goins
Southwest Research Institute

Accommodations and Welcome Dinner

Meeting attendees can extend their stay to include the weekend. San Antonio offers many family friendly amenities, and the Courtyard San Antonio SeaWorld®/Westover Hills is a close drive to nearby theme parks, downtown, and other San Antonio sites.

Hotel Address:

Courtyard San Antonio SeaWorld®/Westover Hills
11605 State Highway 151
San Antonio TX 78251

A shuttle will be provided to and from the hotel on March 7th & 8th, departing at 8:00 AM both days, and includes return service to the hotel both days.

For participants that drive to the Southwest Research Institute campus a shuttle to and from dinner will be available, that makes a stop on campus after the dinner en route to the hotel.

The Welcome Dinner will be held at the Iron Cactus, located on San Antonio's historic River Walk. This dinner is open to all attendees. Approximate dinner start time for those that may need to arrive separately is approximately 6:15 PM on the evening of March 7th.

The location of the Iron Cactus is:

San Antonio
200 River Walk Suite 100
San Antonio, TX78205
Tel: (210) 224-9835

Web: https://ironcactus.com/san-antonio-riverwalk-mexican-restaurant/

Thank you to our Members