Strategies for Making Advanced Robotic Manufacturing Technology Accessible to System Integrators and End Users

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ROS-Industrial Annual Meeting
San Antonio TX
March 27, 2024
Agenda

• ARM Institute update: ROS-Industrial contributions
  • 2023 highlights

• Technology transition to system integrators & end users
  • 2024 initiatives

• ROS-Industrial / ARM collaboration opportunities
ORGANIC INDUSTRIAL BASE MODERNIZATION CHALLENGE

WINNERS

ARM Institute, Aris Technology
Robotic Non-Contact 3D Inspection Replacing Tank Ammunition Hard Gaging
ARM Institute, Grid Raster Inc.
Extended Reality and AI-Assisted Paint Masking
ARM, Figure Engineering, Siemens, Lockheed Martin
Maskless Robotic Painting with Realtime Control
MxD, Anark
A Closed-loop Technical Data Exchange that Meets the OIB Where They Work
NextFlex, Aptima Inc
Cybersecure Data Compliance for Integrated Sensors and Shop Floor Digitization

We are thrilled to announce the winners of the Organic Industrial Base Modernization Challenge. Each of these innovative projects will be awarded $500,000 in government funding sponsored by OSD.

#OIBMODERNIZATION
2023 Highlights: Painting
2023 Highlights: Welding

- Compact multimodal sensor design
- Dual RGB-D Sensor mode
  - Leading: pre-weld detection and tracking
  - Trailing: post weld monitoring
- FLIR Thermal camera (Center)
  - Temperature monitoring
  - Welder feedback to control
- Rugged protective packaging
- Design for in-situ closed-loop control

Rapid Welding of Thermoplastic Composite Structures (RTX, CMU)
2023 Highlights: DoD Sustainment

Incremental Forging (OSU, Capsen)
Example: ROS-based project

Convergent Manufacturing with Wire Arc Additive Manufacturing (WAAM)
Strengthening Robot System Integrator Engagement

Current situation

- Integrators are the missing **critical link** between ARM Consortium Developed IP (CDIP) and delivering Advanced Robotic Manufacturing capabilities to US manufacturers.

- Need to **reduce risks** for integrators in transitioning lab prototypes and breadboard systems to readiness for pilot production.
Tech Transition to Integrators: Lessons Learned

RPI & GE

Titan Robotics & GrayMatter Robotics
## Creating the Process

### Input Sources:
- Robotics and Automation Technology Suppliers
- Robot System Integrators
- End Users
- ARM Project Principal Investigators
- ARM Funding Sponsors
- ROS-Industrial

### Readiness Level Definitions:
- TRL and MRL
- Government Agencies
- Industry Sectors
Transition from Lab to Near-Pilot Production Ready

Laboratory ➔ Production Relevant ➔ Production Representative

TRL/MRL 4 to 7
Accelerating Transition to Near-Pilot Ready

Final project demonstrations
- Production-Relevant or Production-Representative Environments, beyond Laboratory stage
- Operated by production personnel, beyond lab engineers & technicians

- **Components, subsystem maturity**
  - System prototype comprised of components & sub-systems for planned pilot line build

- **System architecture and software**
  - System architecture, networking, operating system, and controls for pilot line build

- **System integrators and end users**
  - Earlier engagement to validate end user production conditions, constraints, targets for productivity, quality, cost
2024 ARM / ROS-Industrial Opportunities

Communication at upcoming events

• ROS-Industrial Annual Meeting, March 27
• Robotic Summit 2024 in Boston, May 1-2
• Automate 2024 in Chicago, May 6

2024 ARM Project Call

• Draft released (members only) March 11
• Tech Day event at Mill 19 (members only) April 4
• Final call released to public April 5
• Concept papers submitted May 1
• Team presentations June 11
• Target project start date On or before July 14
2024 Opportunities

ARM eco-system support for transition to pilot-ready status

- FANUC and Yaskawa interface support
- Integrator-friendly toolkits (Manufacturing Automation Systems, Plus One Robotics, Capsen, others)
- ROS-Industrial tools?
- Coaching project teams as needed (proposal & project execution phases)
- Integrator recruiting visits