ROS-Industrial

From Open-Source Repositories to Applications on the Floor

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State of Industrial Robotics

- Strong investment in industrial robotics
- Through 2022 driven by material handling
- Focus on Agility
- Advances in machine vision leveraging AI

Industrial robots are handling more new tasks have plateaued

Industrial robots are handling more

Industrial robots and "new tasks" have plateaued

Courtesy of: A3-robotics-statistics
More than 10 years in robotics innovation

ROS – Robot Operating System

- Open Source
- Established to prevent re-inventing the wheel
- Maintained by Open Source Robotics Foundation
- Reusable Software Components
- >1,000,000 user downloads/mo
ROS Releases and Journey to Industry

2008
- PR2 and ROS start at a research platform for universities and research institutes

Jan 2010
- ROS 1.0 is released with tutorials
- 12 releases between 2010-2018

Dec 2017
- First Beta release of ROS 2.0 for general use

Dec 2018
- Actions support
- Navigation package

May 2019
- Multi-axis robot motion planning

Jun 2022
- Latest LTS release

Source: Open Robotics Presentation at ROSCON 2018 (Updated)
What is ROS-I?

- Foundational libraries to enable interfacing with industrial hardware
- Utilities for calibration in industrial settings
- Development Interfaces and Application Toolsets
- Bridges and interoperability bridges
Roles SwRI plays...

- Independent steward of open source tool development for industry
- Assist entities in leveraging open source, where appropriate to develop and implement IP more efficiently
- Deliver first of a kind solutions into new operational environments
- Assist in tech transition
- Teach clients to be self sufficient to enable growth of developed solutions
- Develop in a way to ensure leverage/scalability
Challenges
Solutions
Tech Vision Supported by Industry

- **ROS-Industrial Consortium** acts as an ecosystem where different players – end-users, equipment providers, system integrators, institutes of research and training partners **come together to advance and proliferate** Open Source robotics.
Strategy for Development

Environment Layer (MoveIt, Tesseract, Dart, etc.)

ROS 1 / ROS 2 / Middleware Layer

Independent of ROS

Build ROS1 or ROS2, these are independent

Messages, Topics

Continue to support deployed end-user ROS1 systems with new capabilities as they are developed even if for a ROS 2 solution

Collision Detection
Motion Planners
Kinematic Solvers
Connectivity Structure
Network and Foster Collaboration

- In person conferences, training events, meetups
- Write ups and additional broader reach collaborative initiatives beyond the ROS community
  - American Welding Society
  - Founders’ Society of Americas
  - Coaters’ Association
  - Remanufacturing Industries Council
  - Manufacturing Innovation Institutes
Training & Educational Resources

- Workshops
- Training
  - ROS-I Training Events
    - Member hosted
    - Rotating special topics
    - Labs
  - Reference Resources
  - Example Applications
Collaborative Projects

• **Focused Technical Projects** – Members join a team to work on a core technical challenge manifesting in an application example
  • Robotic Blending – now on Milestone 5 championed by the Steel Founders’ Society of America
  • Delivering capability with contributions from a partner University into a working foundry
  • Delivering capability back to the Scan-N-Plan workshop
    • [https://github.com/ros-industrial-consortium/scan_n_plan_workshop](https://github.com/ros-industrial-consortium/scan_n_plan_workshop)
  • Enable students to get exposed to delivering software contributions in a way that is leverageable
  • Benefit to the entire ROS-I Community
Tools built on member voice

- SWORD
- REACH
- Coordinated Motion
- Optimization-based motion planning
- Improvements to tool path planning
ROS-I Capabilities & Modules

Cartesian Tolerance Waypoints

https://youtu.be/-6yAk05et1Q

Robotic Blending Milestone 5

Coordinated Motion

REACH
Resources for the Community

• ROS-Industrial
  • Home: rosindustrial.org
  • Documentation: wiki.ros.org/industrial
  • Code: https://github.com/ros-industrial;
    https://github.com/ros-industrial-consortium
  • Training: http://ros-industrial.github.io/industrial_training/
  • Training Docs: https://industrial-training-dev.readthedocs.io/en/latest/
  • Tesseract: https://github.com/tesseract-robotics
  • Upcoming Events (https://rosindustrial.org/events-summary/)