

ROS-I Americas Technical Update

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RIC Americas Tech Lead
2022 Annual Meeting

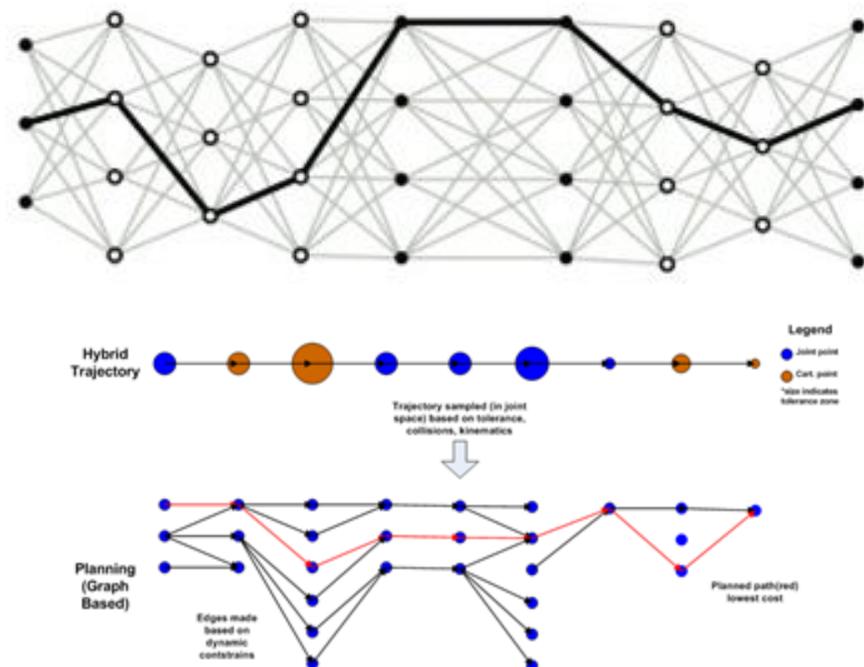


Tech Updates

- What's new
- ROS1 to ROS2 migration
- Usability Improvements
- Looking forward

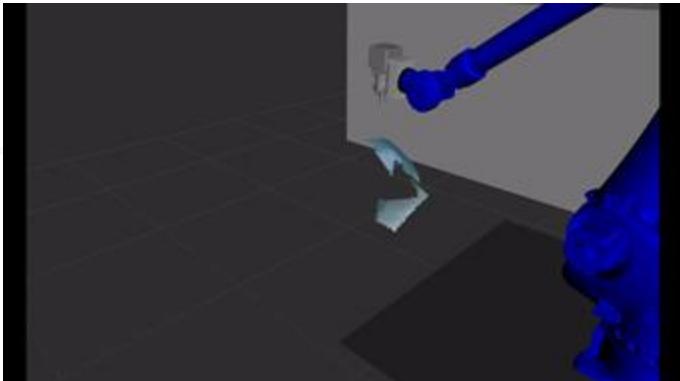
What's new

- Descartes light
- Reintroduce algorithms in BGL for reduced memory footprint
- Introduced non-optimal planning strategies (depth-first, OMPL) to produce seed trajectories for TrajOpt
- Benchmarking on-going
- https://github.com/swri-robotics/descartes_light
- Contact: Michael Ripperger (michael.ripperger@swri.org)



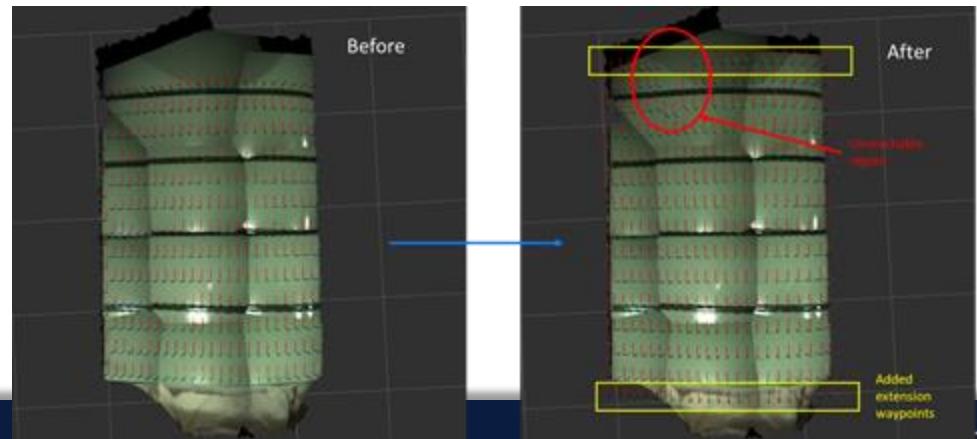
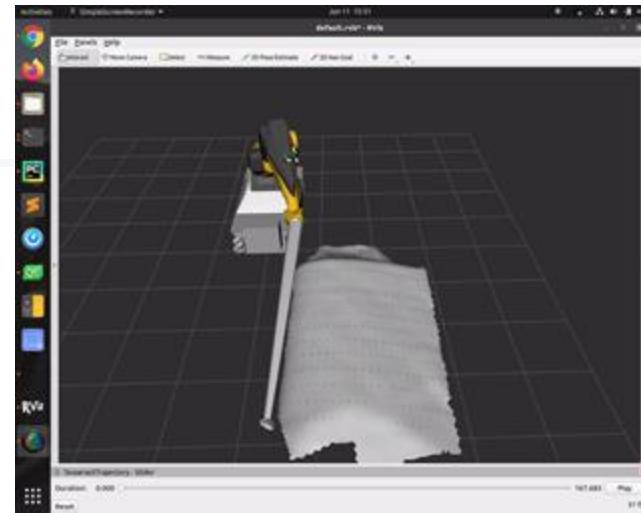
What's new

- Industrial reconstruction
 - Surface reconstruction pipeline (YAK generation 2)
 - Colorization and pose optimization
 - Works well for specular parts
 - https://github.com/ros-industrial/industrial_reconstruction
 - Contact: Tyler Marr (tyler.marr@swri.org)
- Notable tools
 - Open3D (<http://open3d.org/>)
 - CloudCompare
 - <https://github.com/cloudcompare/cloudcompare> (source)
 - <https://launchpad.net/~ros-industrial/+archive/ubuntu/ppa> (debian)



What's new

- Meta planner
 - Leverage hardware configuration flexibility to produce better motions (extra degrees of freedom, multiple TCPs, etc.)
 - Prune infeasible waypoints to increase motion planning reliability
 - Best-effort planning for dynamic or unstructured environments
- Contact: Michael Ripperger
michael.ripperger@swri.org



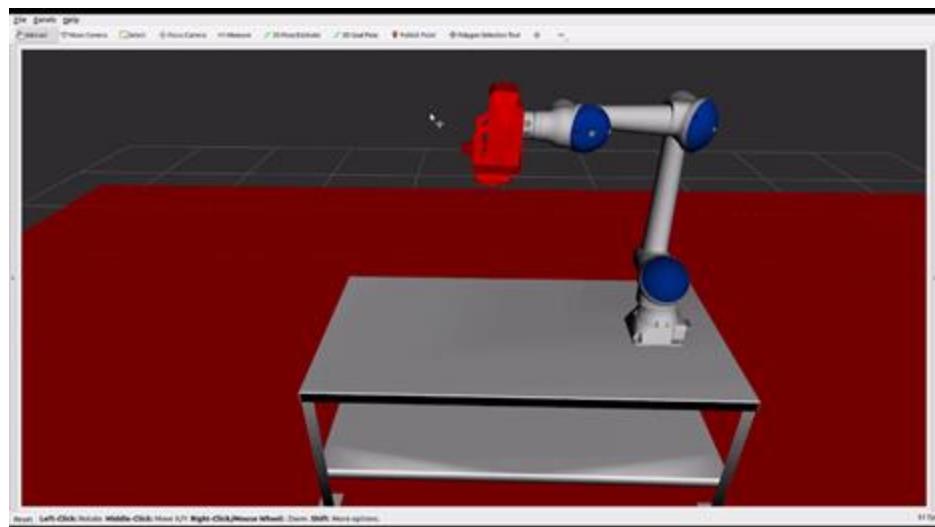
What's new

- ConnTact
 - Reduce reprogramming costs and complexity for individual assembly tasks
 - Open-source framework for assembly application developers leveraging ROS tools and drivers for force control
 - Task-specific development with variation-specific flexibility
 - <https://github.com/swri-robotics/ConnTact>
 - Contact: Josh Langsfeld
josh.langsfeld@swri.org



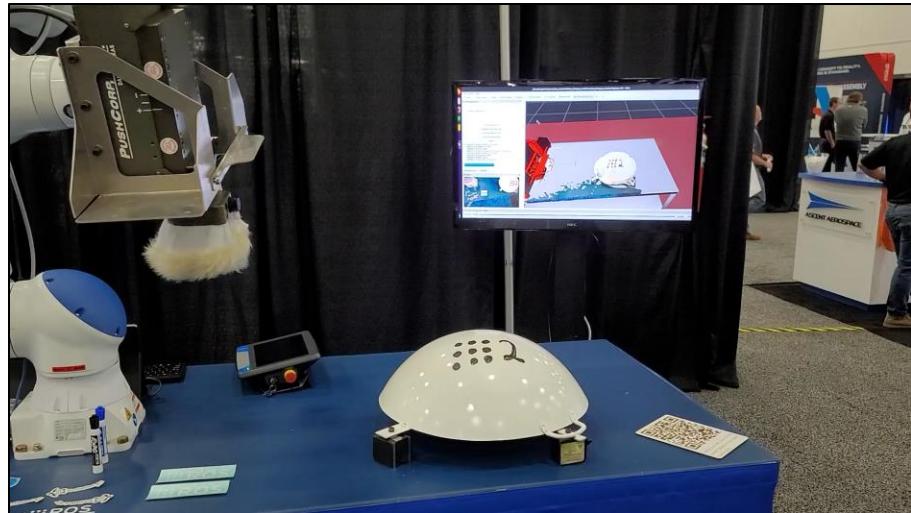
What's new

- Rviz polygon selection tool
 - Extract region of interest selection from Rviz
 - Point selection mode, lasso mode
 - https://github.com/marip8/rviz_polygon_selection_tool
 - Contact: Michael Ripperger (michael.ripperger@swri.org)



What's new

- Scan 'N Plan Workshop
 - SwRI/ROS-I Automate Demo 2022
 - Scan 'N Plan application for simple surface processing scan 'n plan application
 - Template repository for bootstrapping custom scan 'n plan applications
 - https://github.com/ros-industrial-consortium/scan_n_plan_workshop

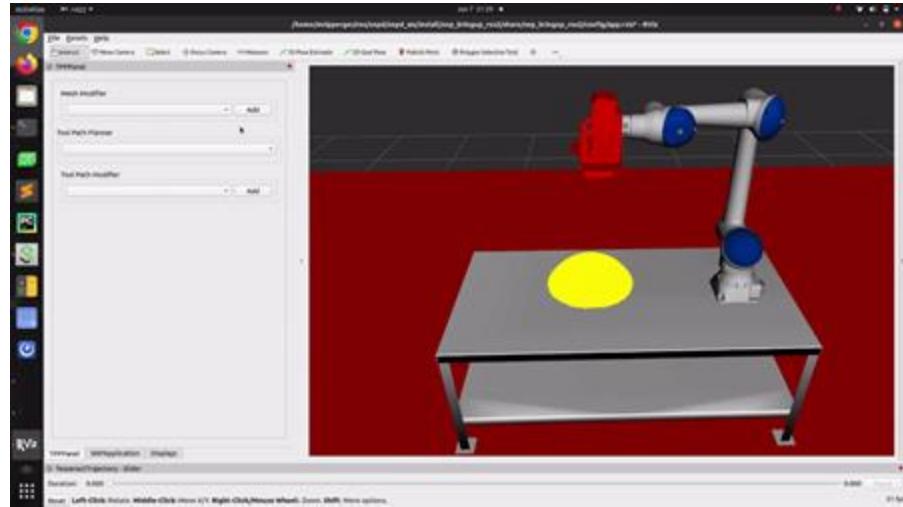


ROS1 to ROS2

- Active ports
 - Reach study
 - Motoman driver
 - Tesseract ROS2
 - Noether
- Supporting legacy ROS1 systems
 - End of life: Melodic (May 2023), Noetic (May 2025)
 - ROS1 packages currently hosted on Conda for availability on future Ubuntu distributions
 - <https://github.com/RoboStack/ros-noetic>
 - Build ROS core from source
- Migration strategies
 - Start new development in ROS2
 - Isolate ROS interfaces from “core” code
 - Separate packages/repositories
 - ROS-independent build (https://github.com/ros-industrial/ros_industrial_cmake_boilerplate)

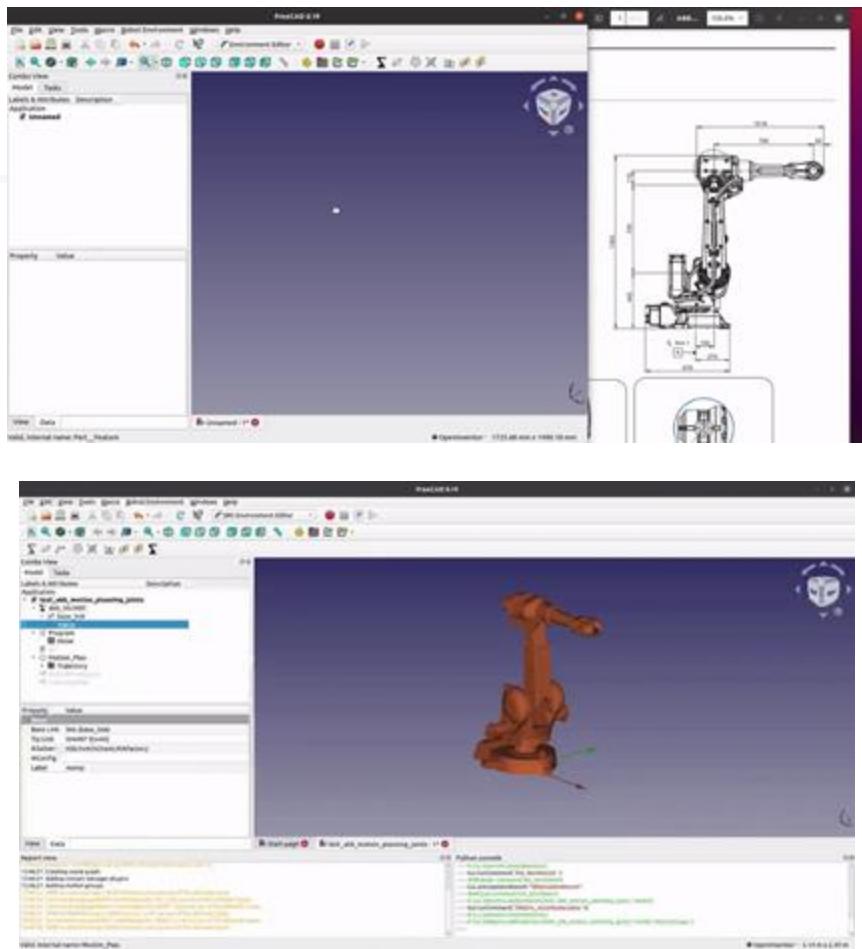
Usability Improvements

- Noether (tool path planner)
 - Architecture redesign to ROS-independent core libraries with ROS interface to support ROS2 port
 - Interfaces to support customization
 - Modular design
 - Improved consistency and quality across planners
 - Reduce code duplication
- Supports custom tool path planning pipeline creation
 - Mesh modification (smoothing, segmentation, etc.)
 - Tool path planners
 - Tool path “modifications” (orientation, direction, splitting)
- Plugins
 - Specify tool path planning pipeline in YAML file (no code development)
 - Simple configuration and planning GUI widget/application



Usability Improvements

- Robotics Workbench
 - Leverage ROS-I tools in a CAD-based environment (FreeCAD)
 - Current capabilities
 - Create/export robot models (URDF)
 - Create convex hulls for collision models
 - Visualize kinematics
 - Define tool path
 - Perform motion planning with OMPL, Descartes, TrajOpt, etc.
 - Configure custom motion planning pipelines
- Capabilities under development
 - Export robot trajectories to deployable format
 - Generate tool paths using mesh and CAD data
 - Motion planning profile wizards
 - Reach study
- Cross-platform (Windows, Linux)
- Looking for feedback on features, beta-testers, deployment strategies



Looking forward

- Calibration refactor and ROS2 port
- Python Bindings
 - Wrappers for optimized C++ code
 - Lower barrier to entry
 - pybind11, swig
- Increased Windows support for ROS2 packages

Thank You

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- Southwest Research Institute
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