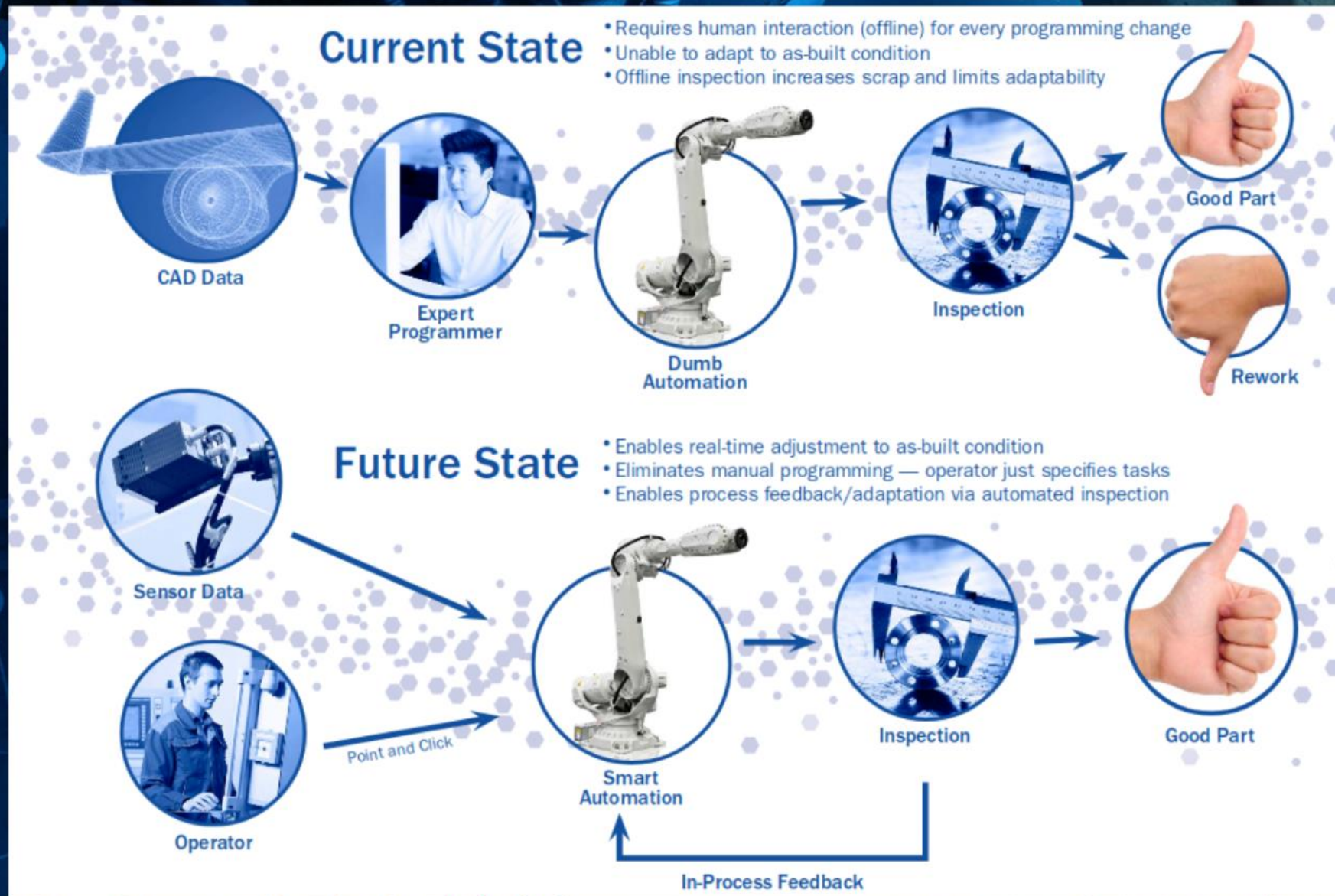
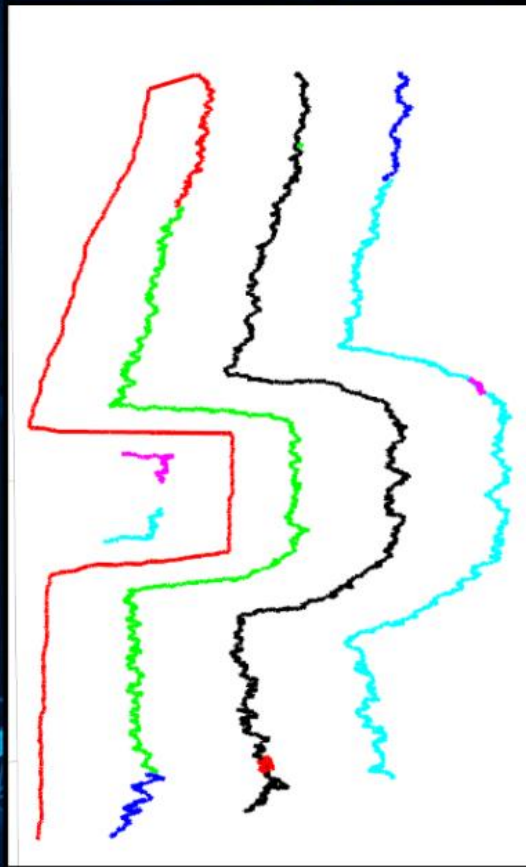
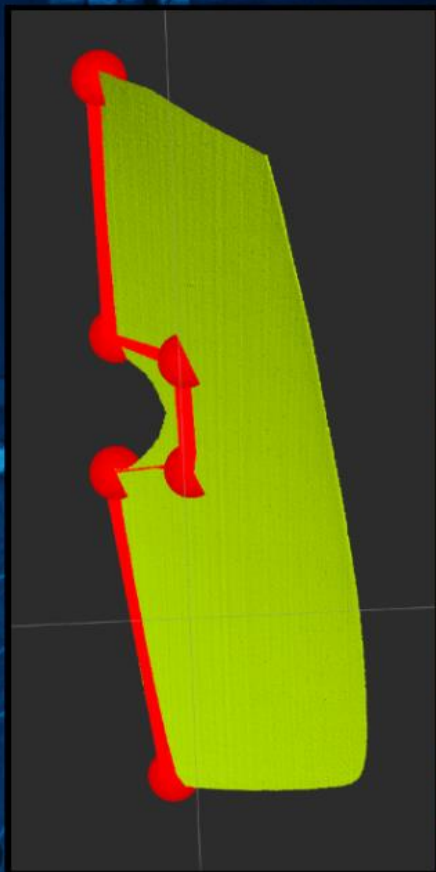
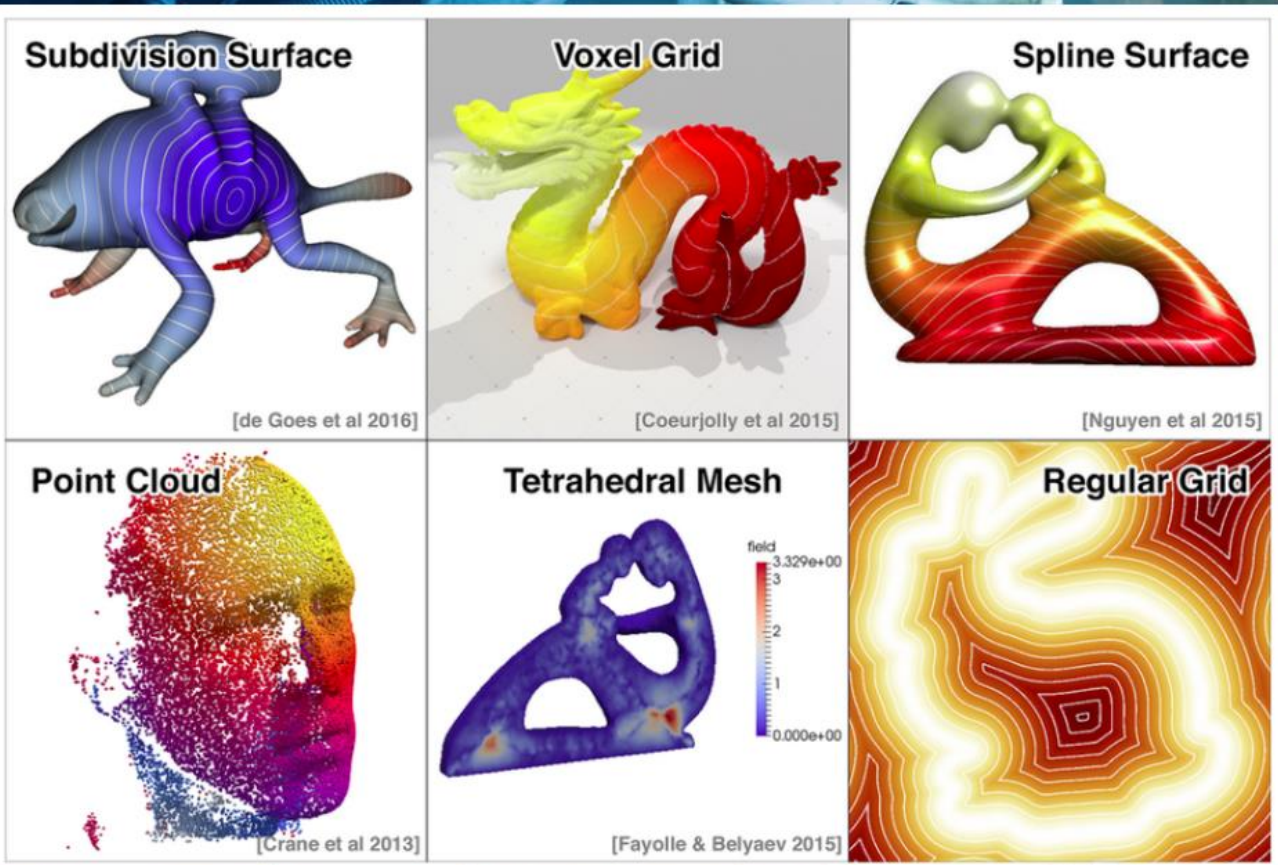


Expanding Scan-N-Plan Capabilities



Heat Method

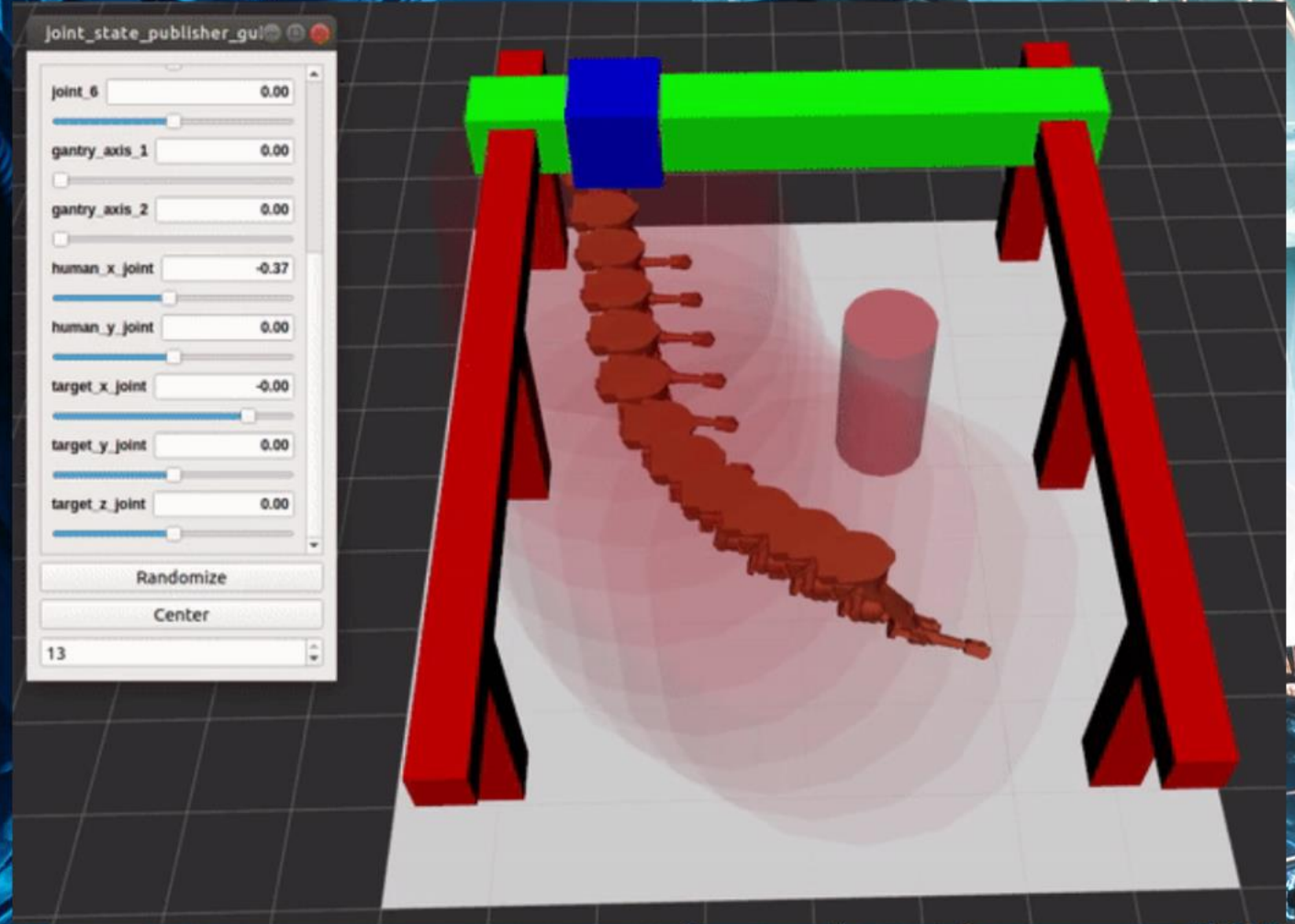
The heat method is a general principle that can be applied to any geometric data structure, as long as one knows how to take the gradient of a scalar function.



Online Planning

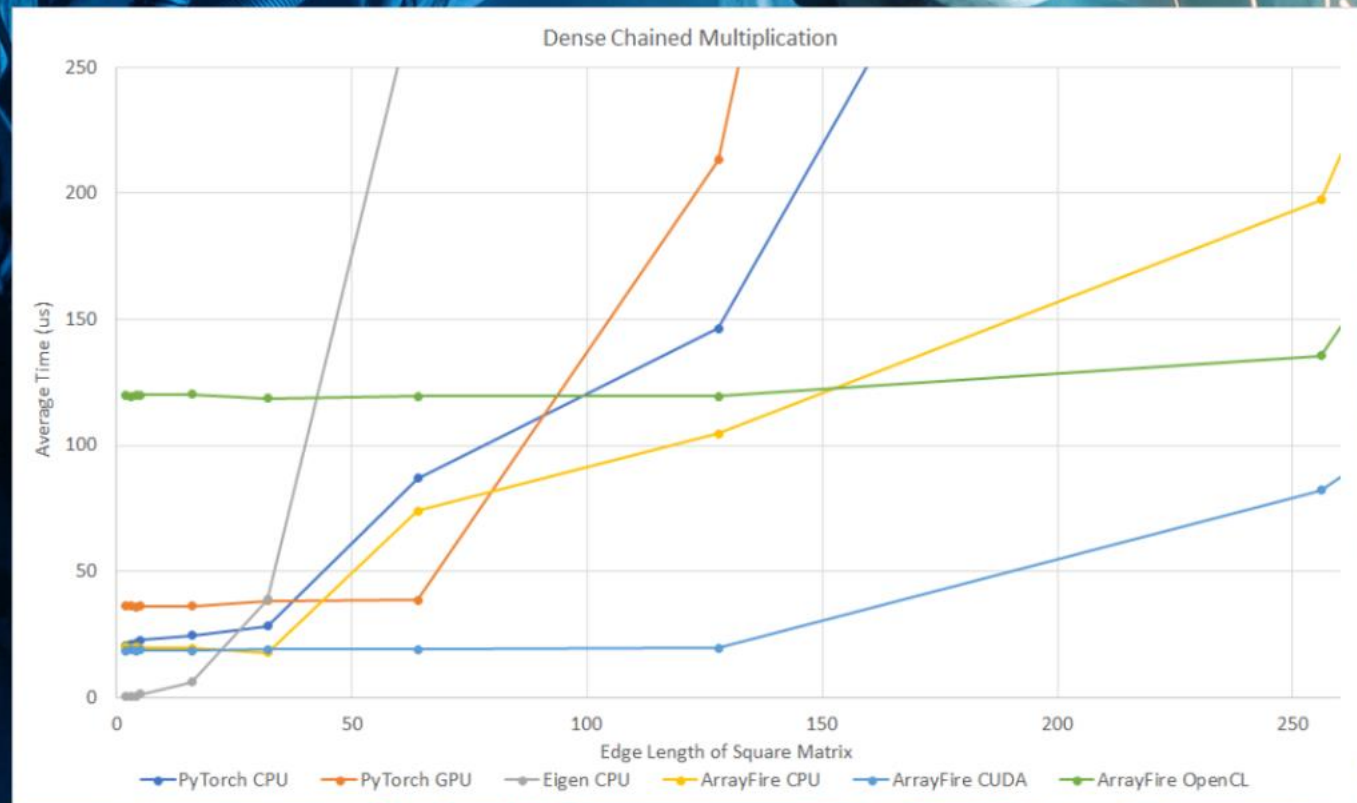
The path to realtime motion planning leveraging optimization.

- Solver running at 500-1000Hz
- Adjustable step size



TrajOpt IFOPT

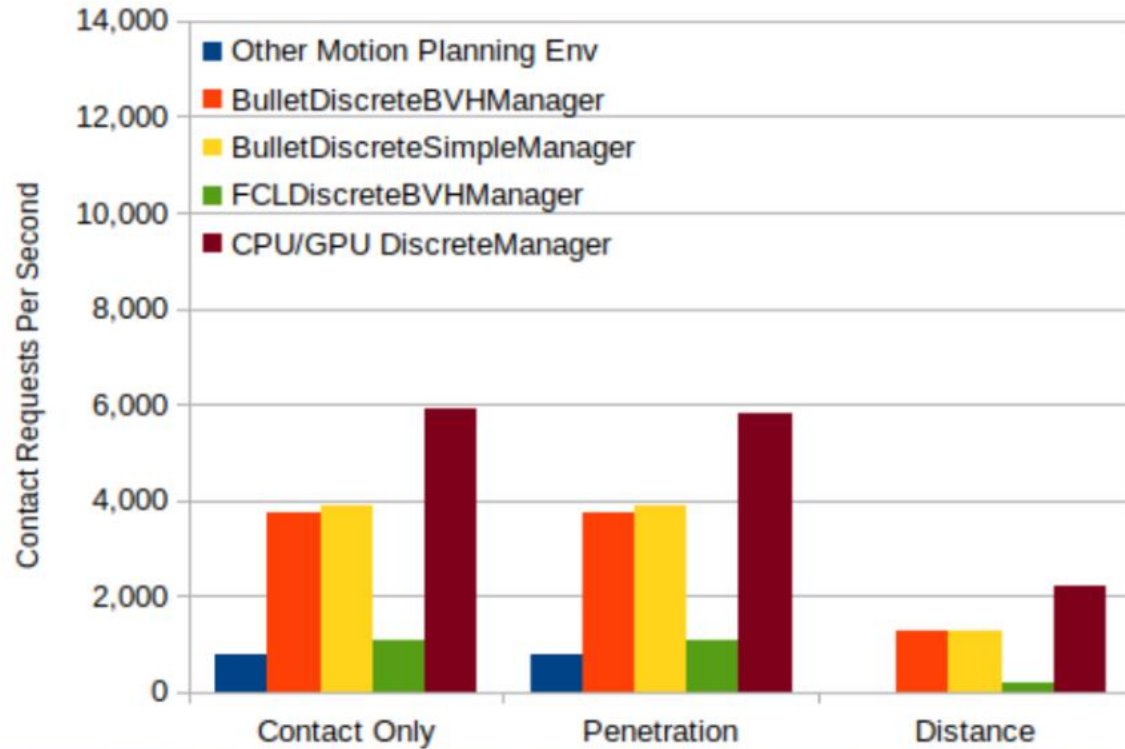
IFOPT: A modern, light-weight, Eigen-based C++ interface to Nonlinear Programming solvers, such as Ipopt and Snopt.



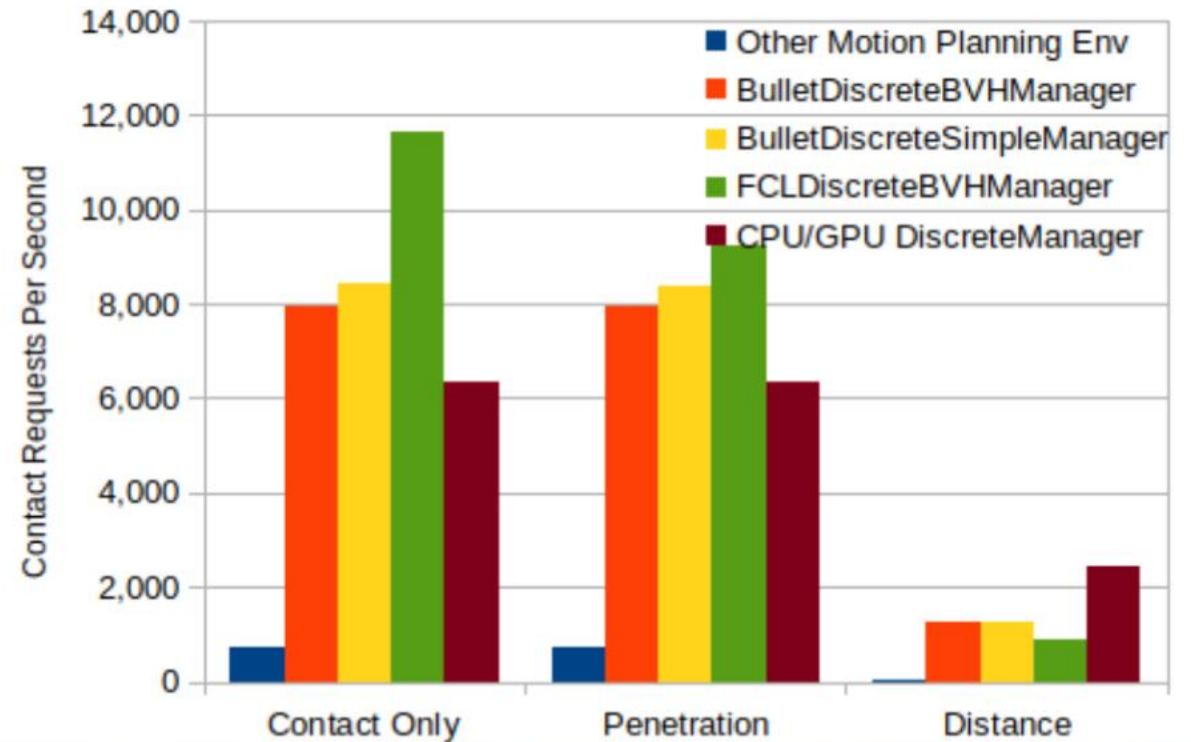
 IFOPT
optimizer interface

Collision Benchmarking

Contact Test Type (ALL)



Contact Test Type (ALL)



Tesseract Command Language



```
1 // Define poses
2 Waypoint wp1 = CartesianWaypoint(Eigen::Translation3d(1, -1, 1));
3 Waypoint wp2 = CartesianWaypoint(Eigen::Translation3d(1, -0.4, 1));
4 Waypoint wp3 = CartesianWaypoint(Eigen::Translation3d(1, -0.2, 1));
5 Waypoint wp4 = CartesianWaypoint(Eigen::Translation3d(1, 0.0, 1));
6 Waypoint wp5 = CartesianWaypoint(Eigen::Translation3d(1, 0.2, 1));
7 Waypoint wp6 = CartesianWaypoint(Eigen::Translation3d(1, 0.4, 1));
```

PROFILE1

- Avoid Collision 2cm
- Shortest Path
- Acceleration Smoothing



COPY

```
1 enum class InstructionType
2 {
3     PLAN_INSTRUCTION,
4     MOVE_INSTRUCTION,
5     COMPOSITE_INSTRUCTION,
6     IO_INSTRUCTION,
7     ANALOG_INSTRUCTION,
8     VARIABLE_INSTRUCTION,
9     COMMENT_INSTRUCTION,
10    USER_DEFINED = 1000
11 };
```



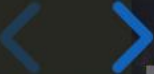
```
1 // Define plan instruction
2 PlanInstruction plan_f1(wp1, PlanInstructionType::FREESPACE, PROFILE1);
3 PlanInstruction plan_c1(wp2, PlanInstructionType::LINEAR, PROFILE2);
4 PlanInstruction plan_c2(wp3, PlanInstructionType::LINEAR, PROFILE2);
5 PlanInstruction plan_c3(wp4, PlanInstructionType::LINEAR, PROFILE2);
6 PlanInstruction plan_c4(wp5, PlanInstructionType::LINEAR, PROFILE2);
7 PlanInstruction plan_c5(wp6, PlanInstructionType::LINEAR, PROFILE2);
```

PROFILE2

- Avoid Collision
- Tol. X 1mm
- Z Rot. Free



```
1 // Create a program
2 CompositeInstruction program;
3
4 program.push_back(plan_f1);
5 program.push_back(plan_c1);
6 program.push_back(plan_c2);
7 program.push_back(plan_c3);
8 program.push_back(plan_c4);
9 program.push_back(plan_c5);
```

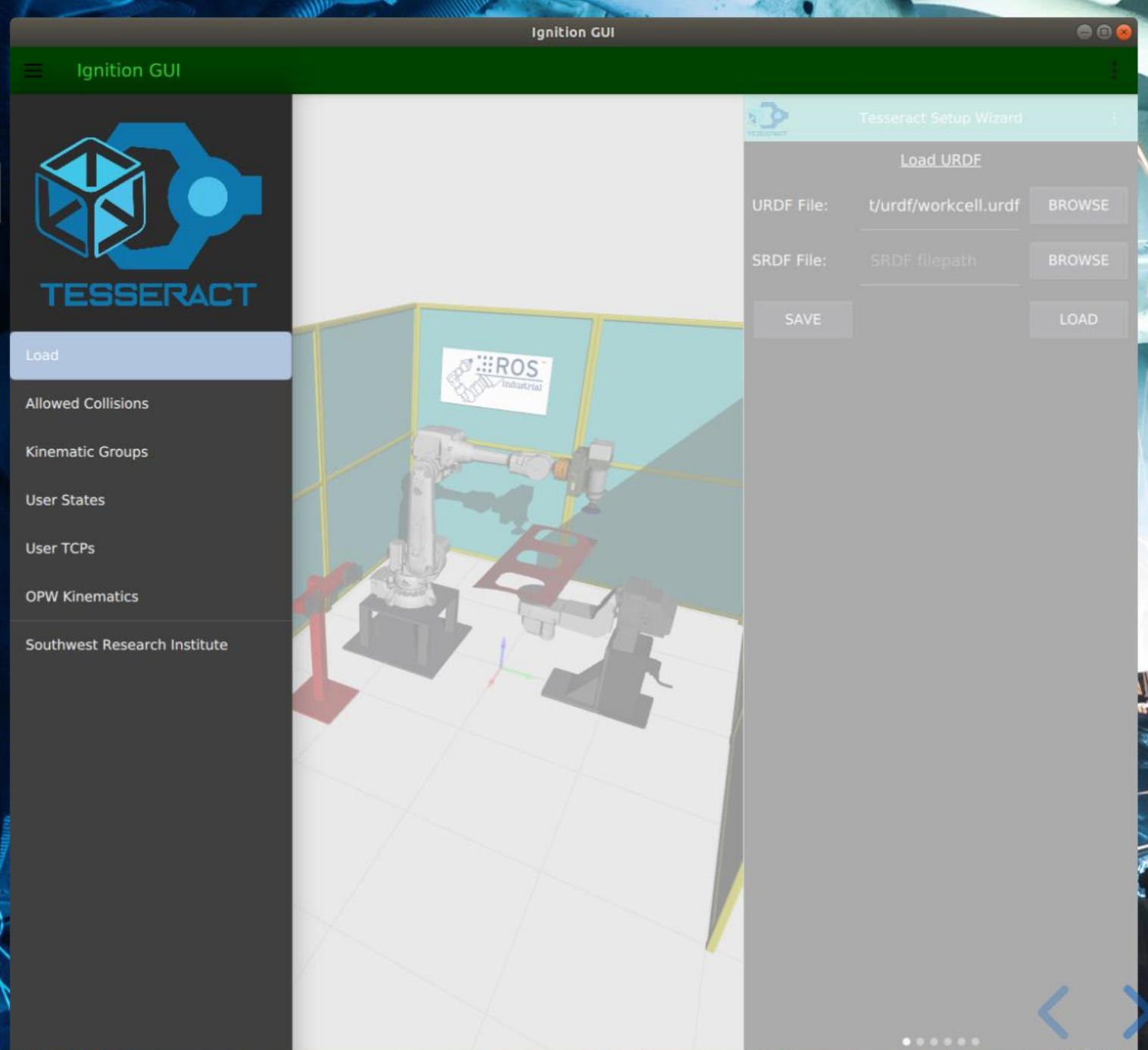


Tesseract Wizard

Tesseract has adopted Ignition Robotics as the visualization and simulation framework

Acknowledgements:

- Louise Poubel (Open Robotics)
- Kyle Fazzari (Canonical)

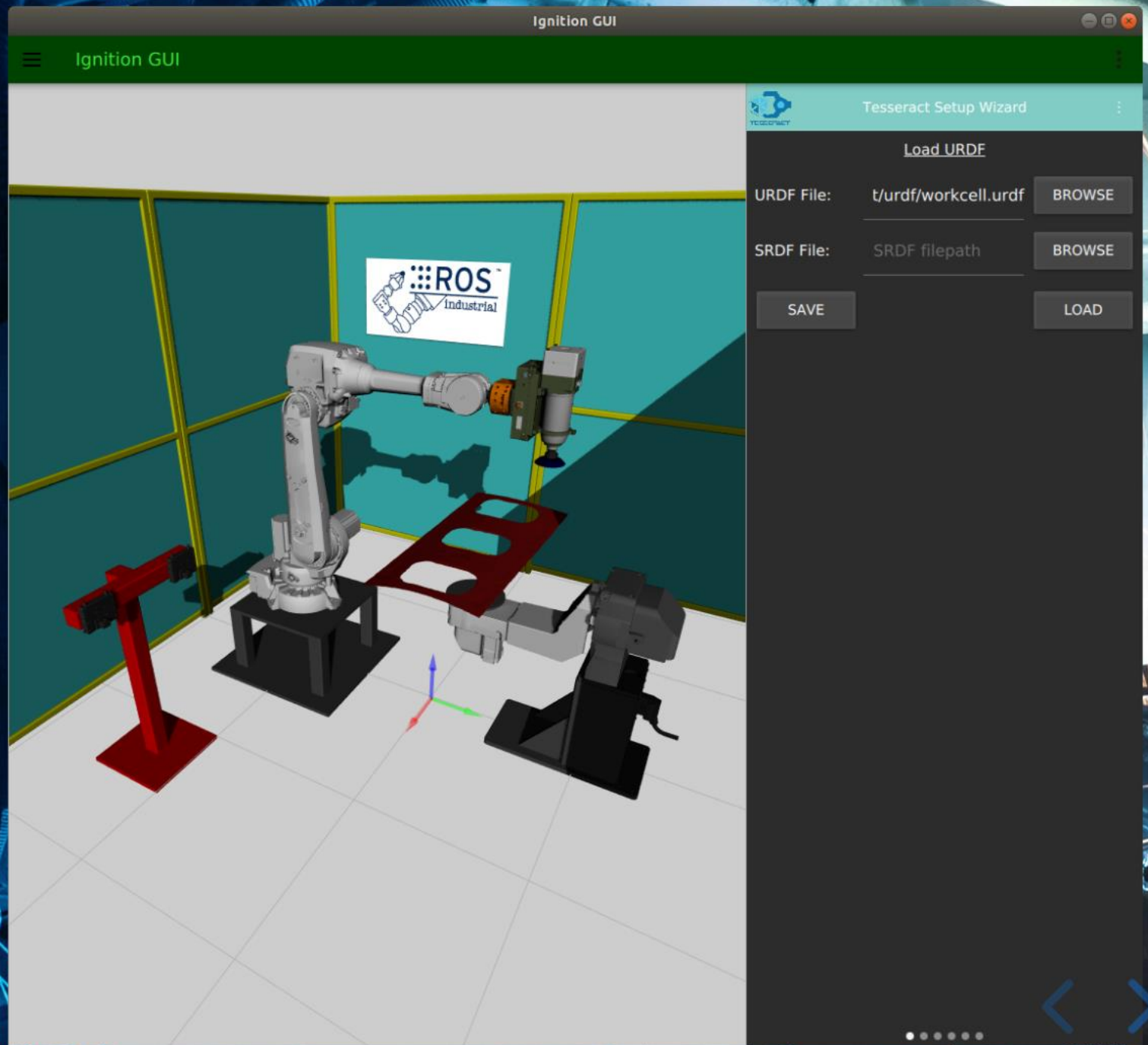


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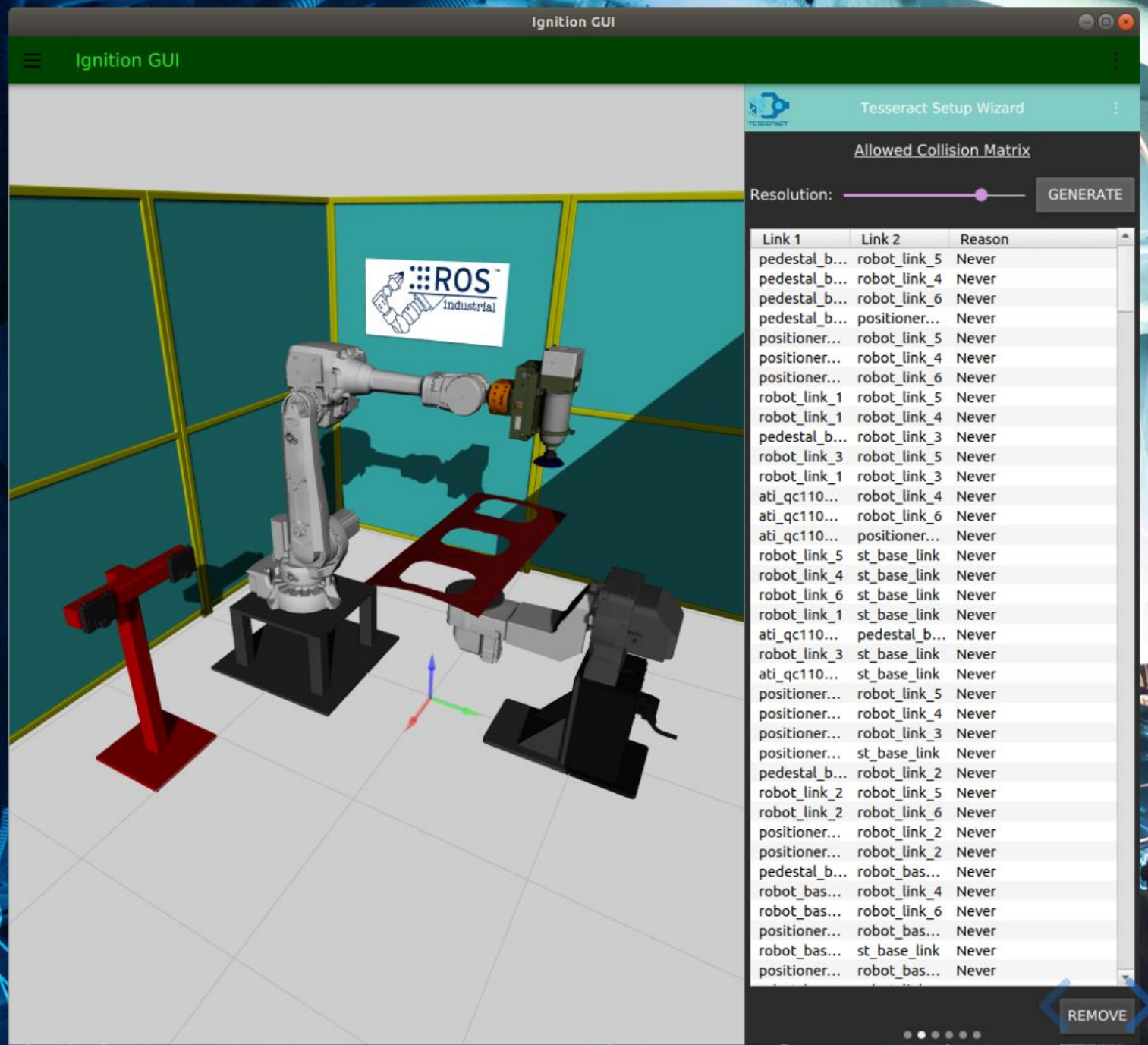


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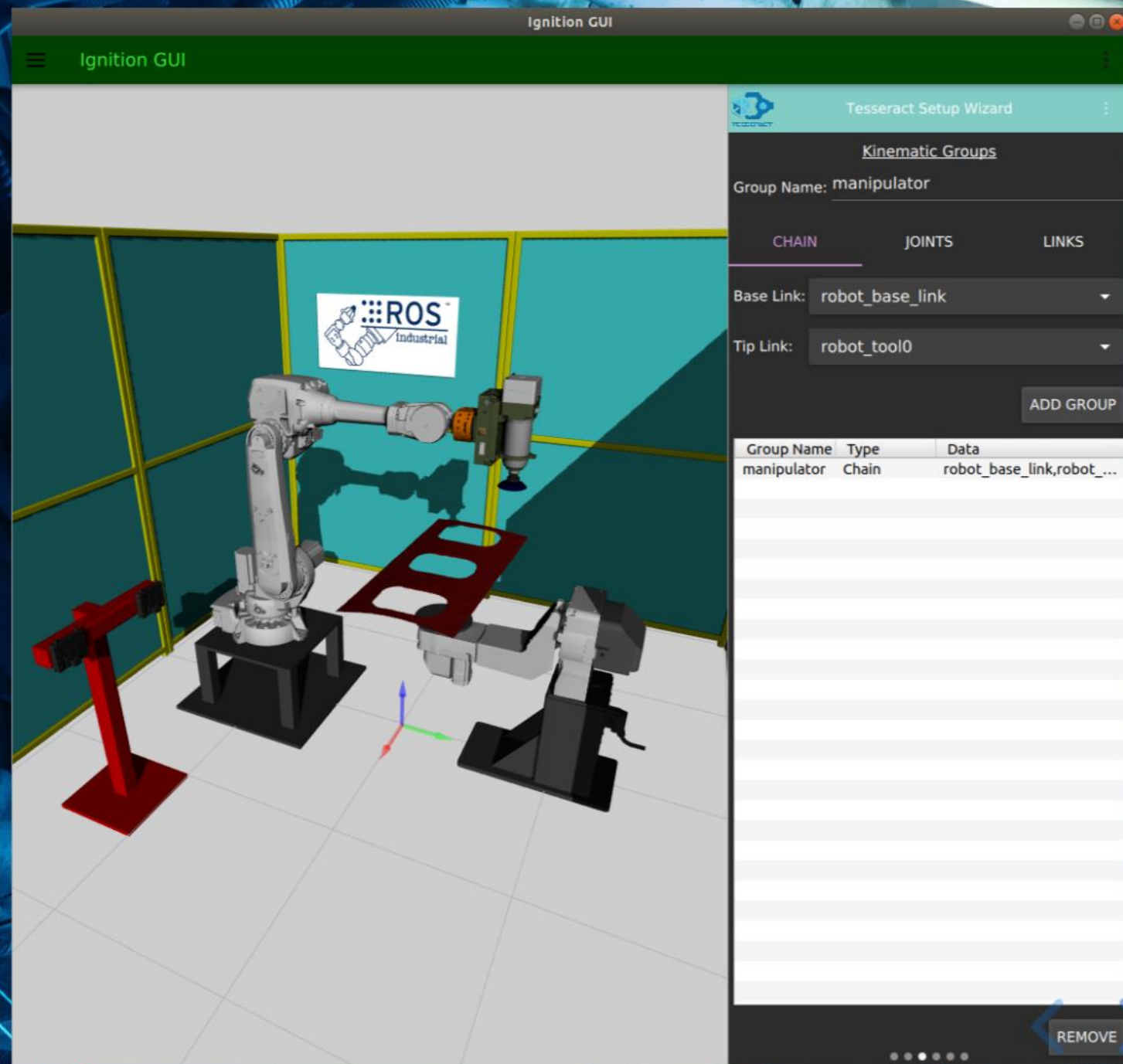


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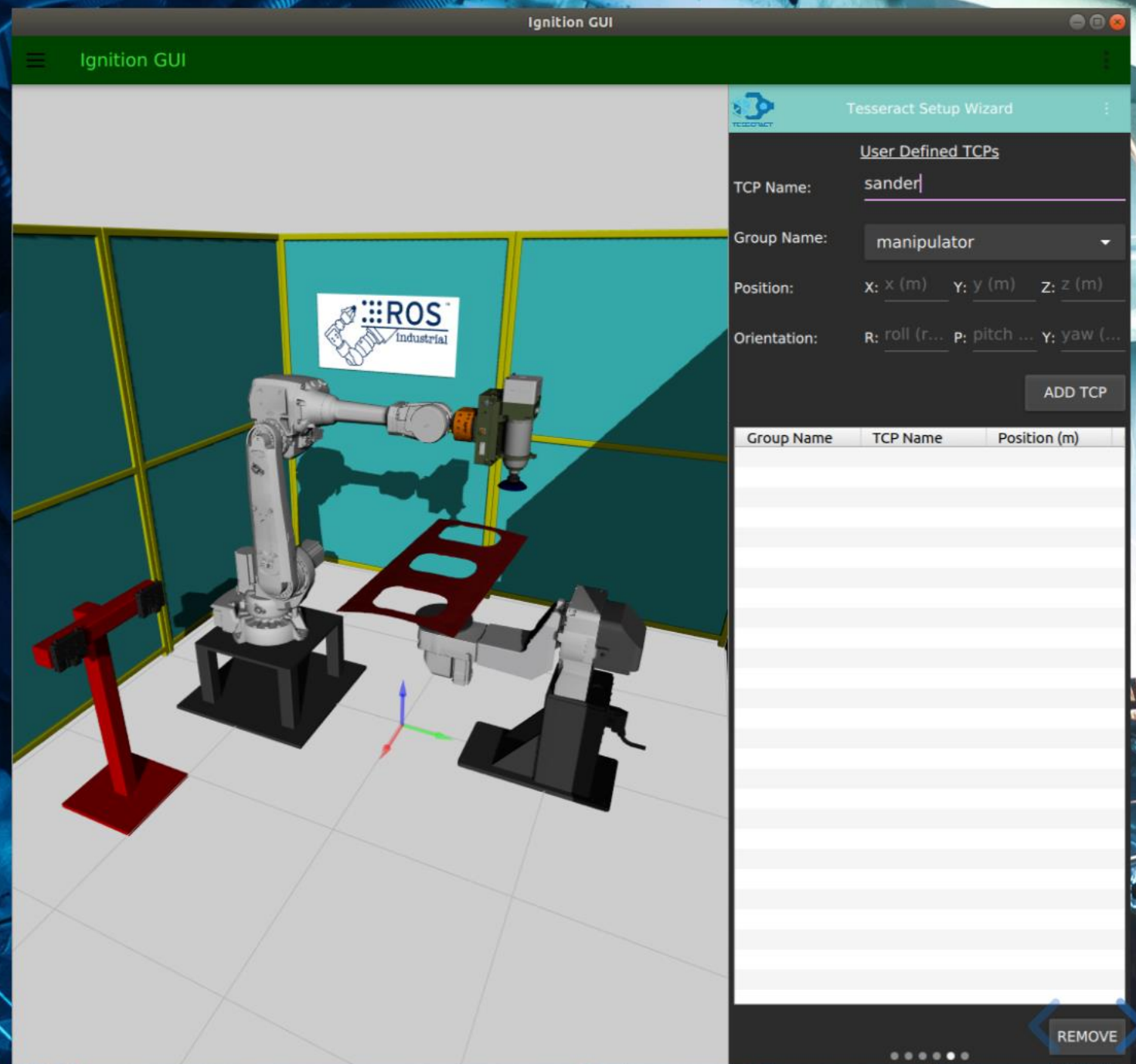


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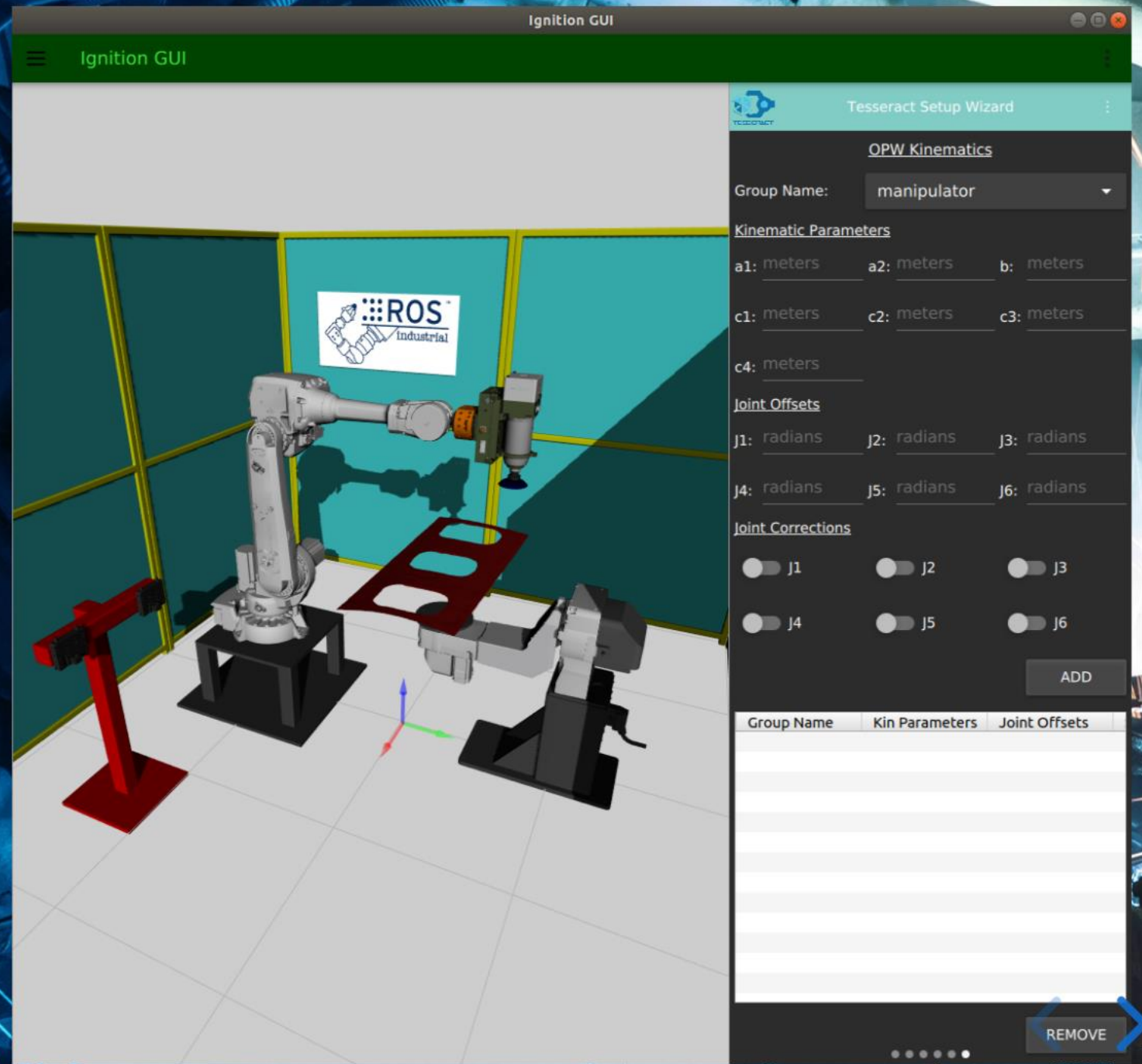


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Current IR&D

- Robot Calibration
- Process Orchestration