![realtime ROBOTICS]

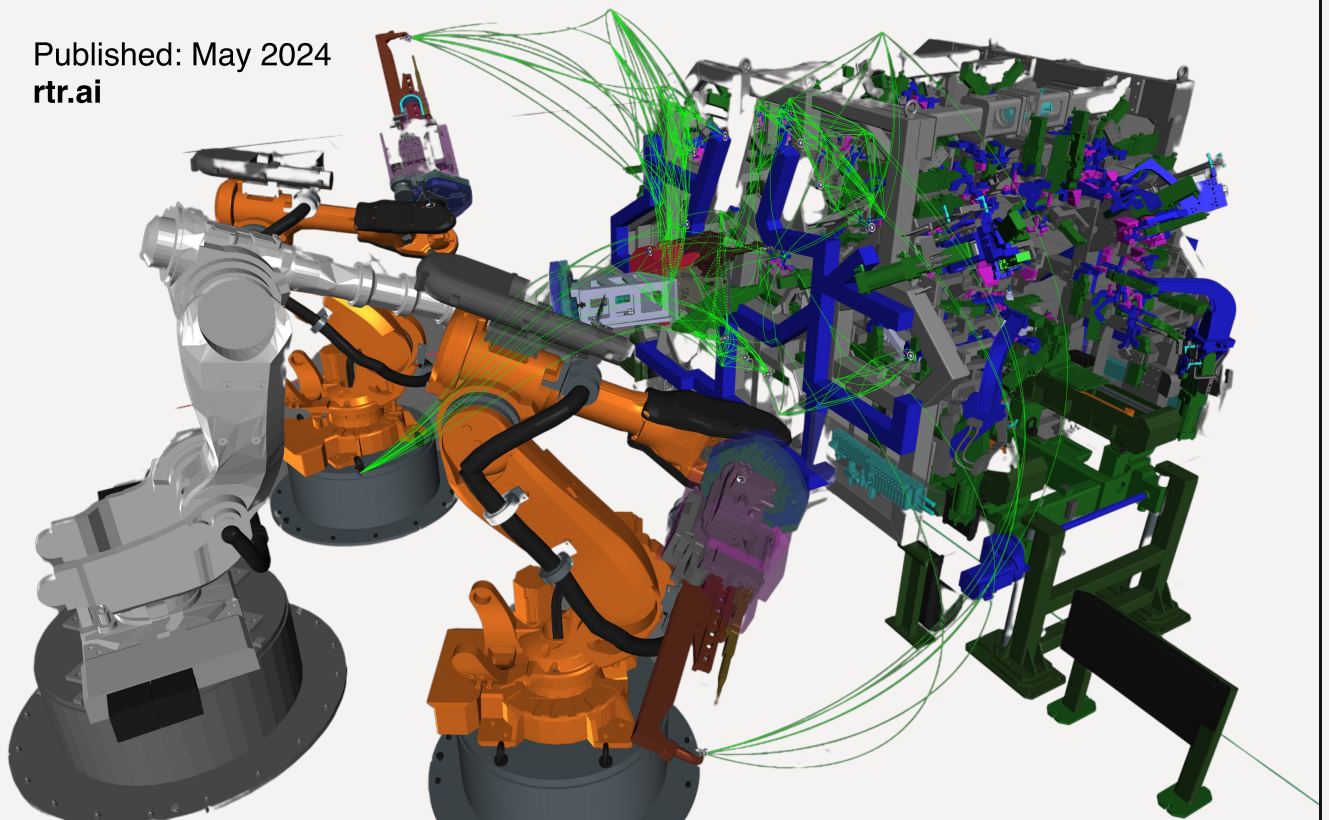# Driving Efficiency Through Optimization

How Realtime Robotics Reduced an Automotive OEM's Robotic Cell's Cycle Time by 23 seconds

Introduction

Realtime Robotics is the leader in automatic, collision-free motion planning for industrial robots. Realtime Robotics and its cutting-edge RapidPlan Optimize software **helps major automotive companies and suppliers increase throughput of robotic cells by unlocking the lowest possible cycle time.**

The BMW Group and VW Commercial Vehicles are just two of the leading OEMs that have streamlined their production with Realtime Robotics. RapidPlan Optimize computes the most efficient robot paths and corresponding interlocks, allowing manufacturers to optimize cycle time from the start on a new cell or finally shave off those few stubborn seconds needed to hit takt time on an existing cell.

Realtime Robotics collaborated with a renowned automotive OEM, "the Company" (for this paper), and their preferred integrator to optimize a cell's cycle time, meaningfully increasing its throughput.

The Company's bottleneck framing cell posed a complex challenge for optimization including:

// 7 robots
- 3 of which were material handling robots
- 4 on a mezzanine
- 3 on linear rails

// 11 tool changes

// 6 vehicle variants

// About 100 weld points

By optimizing robot motions, Realtime Robotics reduced an automotive OEM's cell cycle time by 23 seconds.

Objective

The company was struggling to meet production quotas and needed to shave off every second they could through optimizing their existing cells.

This complex interplay of robotic motions in a constrained space had made it difficult for the Company and integrators to identify robot paths and interlocking that would yield the lowest possible cycle time.

Since the production quotas were not being met, it was imperative that the entire optimization project be completed quickly without disrupting the Company's existing processes or production schedule.

Methods

To drive success for the Company, Realtime Robotics worked with the Company's preferred systems integrator to update the existing digital twin, optimize the robot paths and interlocks, then deploy the new offline programs (OLPs) to the robots in production.

To start, Realtime Robotics compared the cell's existing digital twin in Tecnomatix Process Simulate with robot program backups, and concluded that there were significant discrepancies between the two. Some differences included missing or misrepresented fixtures and tooling that were modified in the physical cell but not updated in the simulation file.

Next, Variation Reduction Solutions, Inc (VRSI), one of Realtime Robotics' scanning partners, completed 3D scanning of the physical cell. VRSI captured scan data of the entire cell and the parts that flow through it. The scanning effort was completed over

one weekend, without impacting the Company's production schedule. Then, Realtime used the scan data, along with accurate interlocks, wait times, and process times supplied by the Company's integrator, Realtime Robotics worked with VRSI to create an up-to-date, representative Process Simulate file.

Realtime Robotics then used the updated simulation file to optimize the cell using RapidPlan Optimize. The software automatically generates and evaluates hundreds of thousands of collision-free paths to determine the most optimal sequences, via points, poses, end-of-arm-tool (EOAT) rotations, and interlocks for multiple robots. Until now, it has been cost-prohibitive for humans to generate and test multiple solutions to find the lowest cycle time.

The Company reviewed and approved the simulation-based results to be deployed to the physical cell. Realtime Robotics partnered with the Company's integrator to convert the optimization outputs into robot OLPs that conform to the Company's programming standards. The integrator then deployed optimized OLPs into the physical cell, with only minor touch-ups required. Finally, production was resumed with the cell now meeting cycle time.

Results

Deploying Realtime's optimized OLPs resulted in a cycle time reduction of 23.88 seconds, representing a 10.32% improvement.

Realtime Robotics RapidPlan Optimize software made all this happen by:

// Evaluating hundreds of thousands more solutions than would be possible, even by expert robot programmers

// Conducting a risk-free assessment to confirm feasibility, with only a simulation/ CAD file

// Knowing if a robot software optimization will yield results on existing hardware

// Generating an optimized solution compatible with existing company standards

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Conclusion

For many automotive OEMs and suppliers, increasing throughput of existing automation is a costly, daunting task full of uncertainty. In this study, the methods and results demonstrate that Realtime Robotics' RapidPlan Optimize software takes the risk out of optimization because the improvements can be first demonstrated in simulation. Realtime is able to optimize complex cells by evaluating hundreds of thousands of solutions for motion paths and interlocks of multiple robots. This revolutionary software helps manufacturers unlock peak performance and meet ever-changing market and supply chain demands.

About Realtime Robotics

Realtime Robotics is the leader in automatic, collision-free motion planning for industrial robots. Its innovative technology generates optimized motion plans and interlocks to achieve the shortest possible cycle time in multi-robot cells. Realtime Robotics' solutions expand the potential of automation, empowering robots to function together in unstructured and collaborative workspaces, reacting to dynamic obstacles the instant changes are perceived.