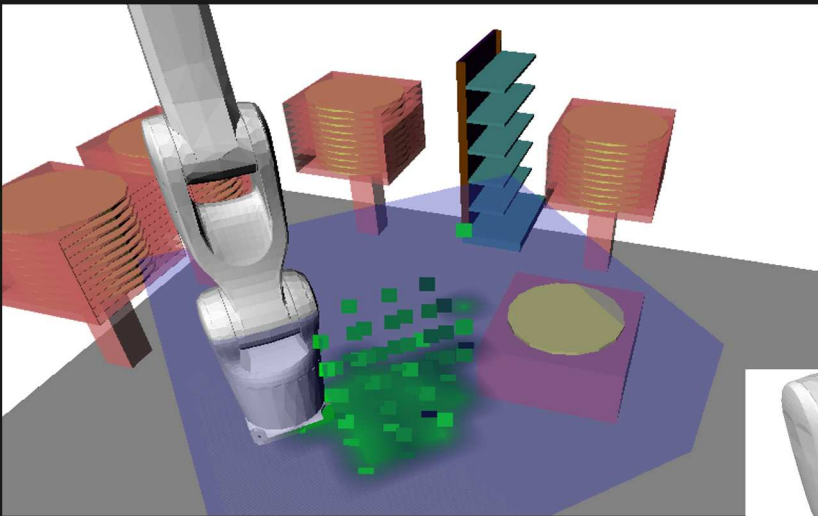


Cutting-Edge Automated Robot Programming

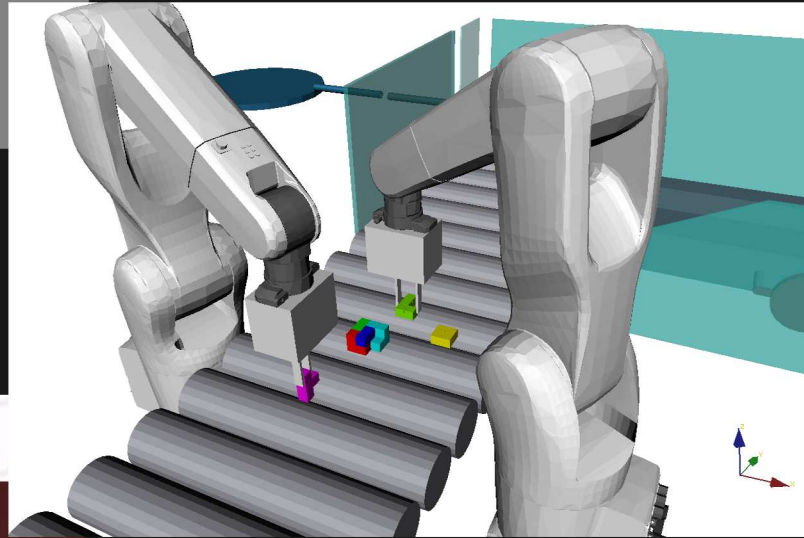
MUJIN *Controller*

**Increase Productivity by Motion Path
& Robot Placement Optimization**



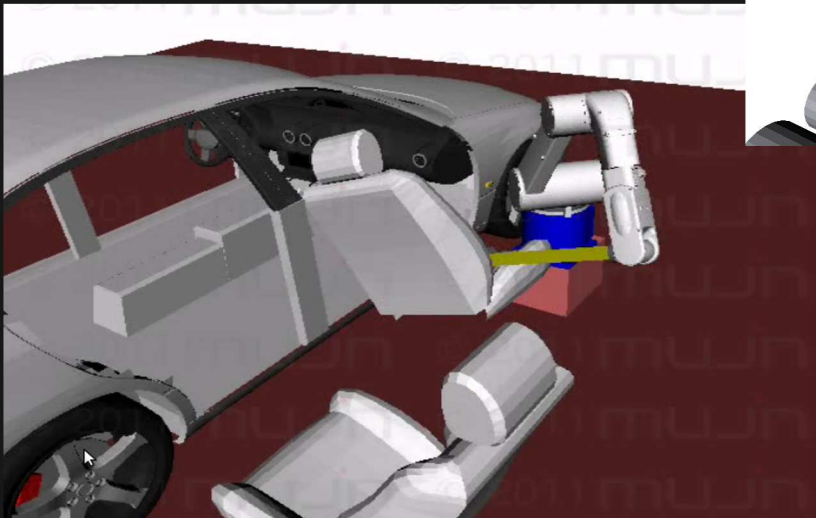
Optimize Robot Placement

Out of thousands of robot placement possibilities, compute the one that allows the robot to achieve the task most efficiently.



Plan for Multiple Robots Simultaneously

Reduce the time and resources for a task by co-operative movement.



Generate Optimal Path Automatically

Automate collision avoidance and constraint handling.

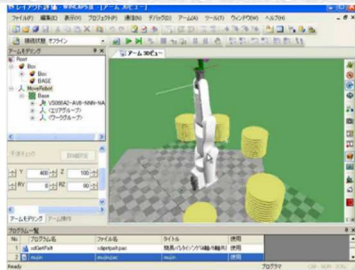
MUJIN Corporation

Tachibanayabiru 3F, 2-12-12, Ginza, Chuo-ku,
Tokyo-to, 〒123-4567, Japan
TEL: 080-6173-7371 (Takino)
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Increase Productivity by Optimizing Robot Placement

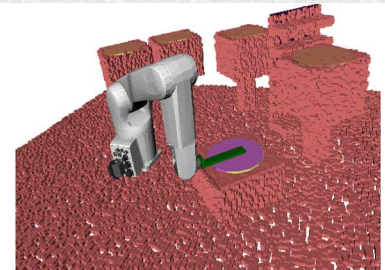
Wafer Handling Example (DENSO WINCAPS)

1 Input Environment Model



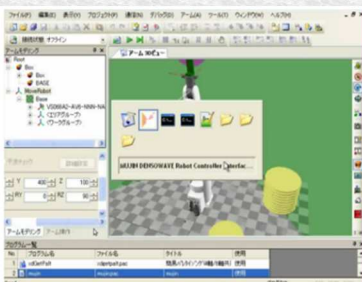
Input environment model into DENSO-WAVE WINCAPS

Even if there is no CAD environment model.....

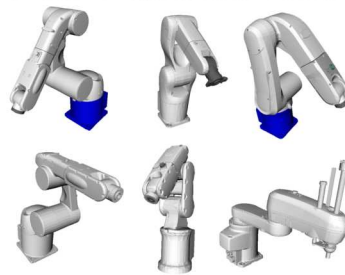


Can easily capture using latest 3D sensors.

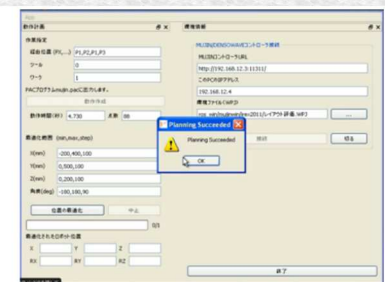
2 Choose Robot and Input Task



Open MUJIN interface.

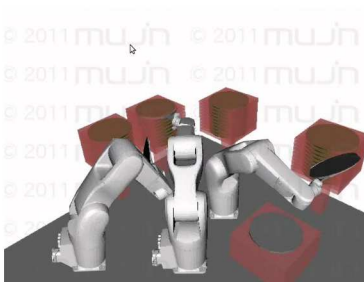


Choose robot type
(All DENSO WAVE robots supported)

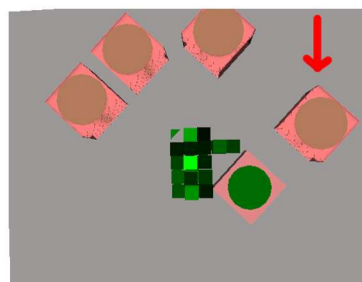


Input task, constraints, and optimization area.

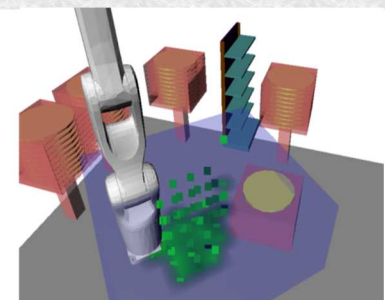
3 Optimize Robot Placement and Analyze Results



Up to 13,000 possible candidates.



Task completion time of feasible placements

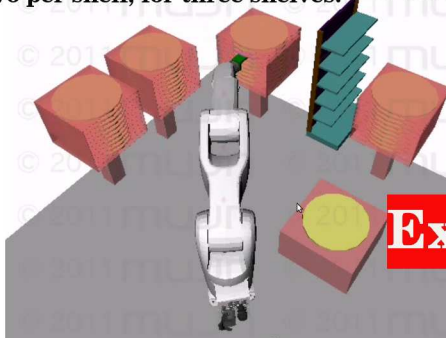


X,Y, Z, and rotation are optimized.

4 Increase Productivity

Inserting six wafers.
Two per shelf, for three shelves.

Before



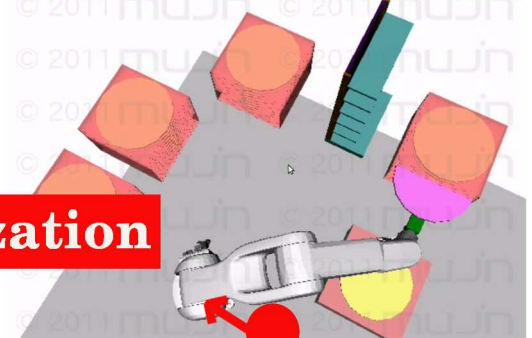
Task Completion Time
12s

Execute Optimization



Increase productivity by 25%!!

After



Task Completion Time
9s!!

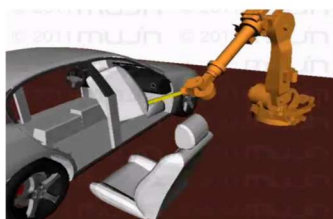
Innovative Functionality of MUJIN CONTROLLER

1 Automatic Generation of Motion Plans that Avoiding Collisions and Singularities

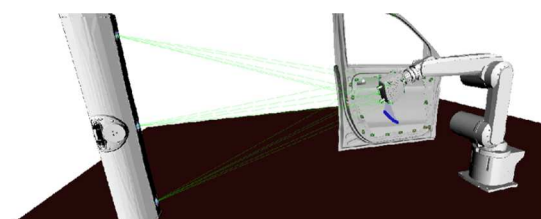
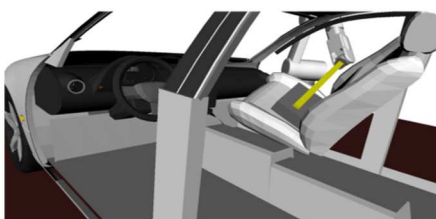
Although existing offline programming packages can check for collisions of the workpiece and robot, they still require users to manually specify waypoints to move the robot out of collision. In comparison, the MUJIN CONTROLLER automates all collision avoidance and constraint handling processes. We provide customers with very clean, simple, and customized interfaces that just handle high-level parameters.

Advantages:

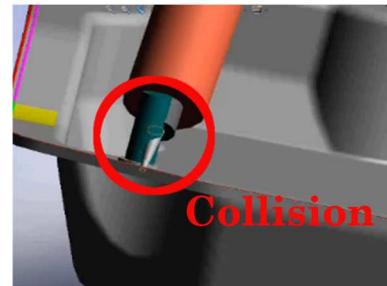
1. MUJIN can eliminate most of the manual teaching operations, which leads to reduced time and savings.
2. MUJIN can create plans for tasks that are difficult to manually teach. For example,



assembly of automotive seats that requires delicate motion paths to avoid collisions,



and door inspection that requires continuous tracking



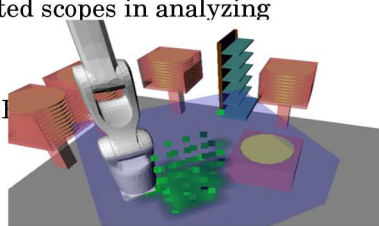
2 Optimal Robot Placement

What are all feasible locations of the robot where the task can be completed? Among these feasible locations, which allow the robot to perform the task the most efficient?

Because a robot can be placed in several thousand different locations, engineers spend a lot of resources to find the answer to these questions.

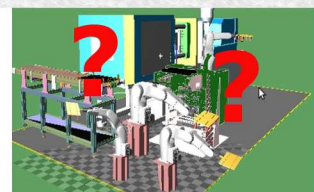
Unfortunately, performing such optimizations while maintaining task and safety constraints is very time consuming given the sheer amount of computation involved; an motion path has to be optimally solved for each robot position.

Although current automation tools have limited scopes in analyzing the workspace and task constraints, MUJIN's innovative technology has overcome this barrier. MUJIN CONTROLLER provides an efficient solution in a considerably short period of time that takes into account collision avoidance, singularities, and sensor-based visibility constraints.



4D Map - Task Completion Time

Lighter Green -- Location for faster solution
Darker Green -- Location for slower solution

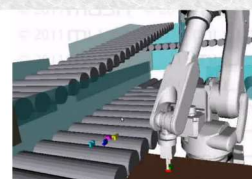


3 Multiple Robots

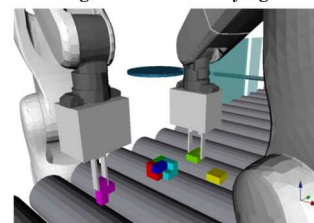
Most other robot simulation packages consider just a single robot and are not configured to compute solutions for multiple robots simultaneously. Because of this handicap, robot operators have a very difficult time producing non-colliding motions for all robots.

MUJIN has developed algorithms that can plan for multiple robots simultaneously while avoiding each other. It is also possible to compute the combined locations of all robots involved in the task.

Multi-robot functionality allow customers to use multiple robots together in an assembly line, which can result in a substantial gain in productivity. We can also optimize for cell-manufacturing scenarios where usually a dual-arm robot performs a complex assembly task. Compared to traditional teach-based approaches, MUJIN CONTROLLER can reduce time and resources involved in moving multiple robots.

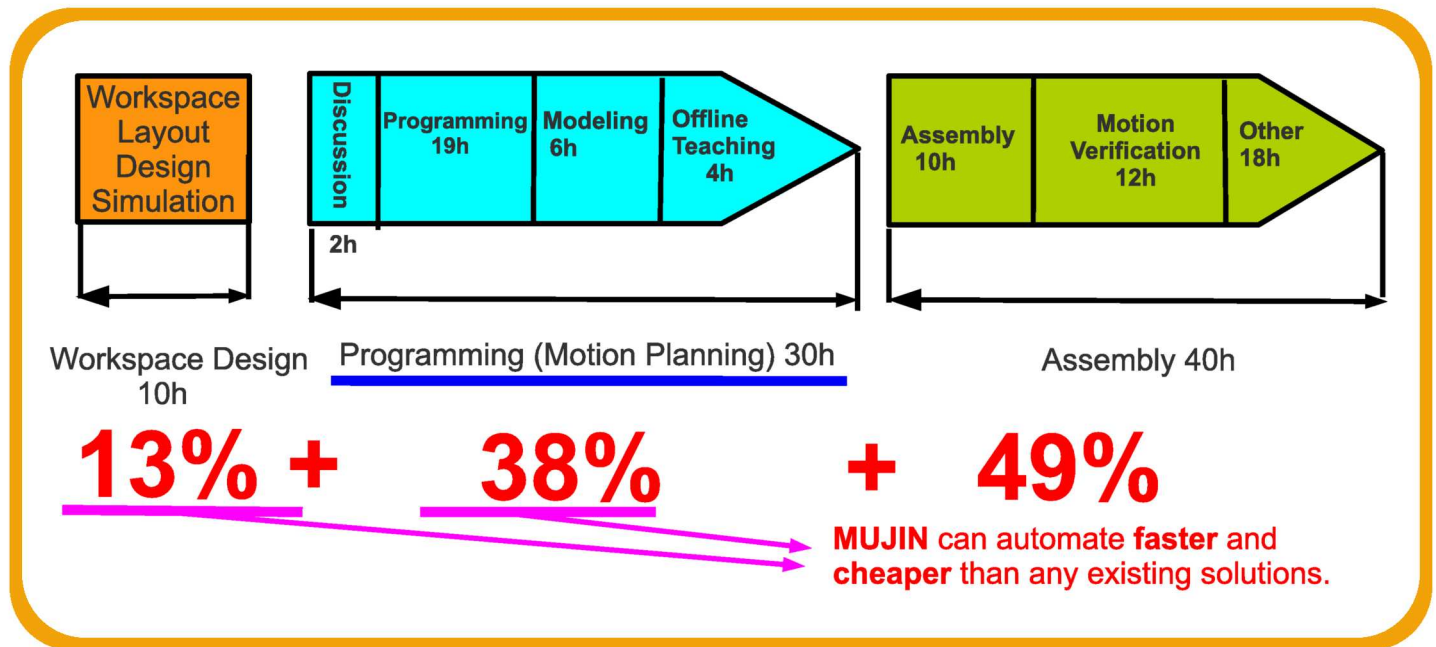


Single Robot Assembling a Part



Two Co-operative Robots Assembling a Part

We Will Accelerate Our Customer's Growth



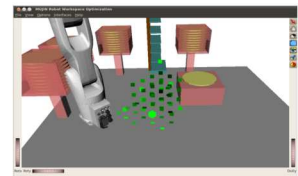
Sales & Customization of Robot Motion Controllers

Other simulation packages are prone to seek a broad range of functionalities, thus becoming very generalized tools. Unfortunately, generality does not always lead to best customer satisfaction when the customer is only interested in one task.



MUJIN is flexible to the needs of customers and provides rigorous, precise, and very low-cost robot motion controller solutions for automated generation of optimal motion plans or optimizing robot placement.

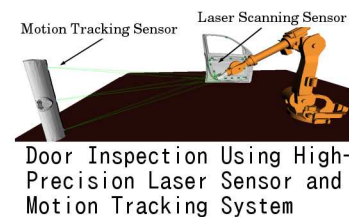
MUJIN can generate optimal paths in an incredibly short amount of time, which can result in big productivity gains as well as significant reduction in workcell development costs.



Design of Robot Systems

When planning and designing an automation system in a manufacturing plant, have you spent too much money and time in design and simulation?

If so, customers can outsource design and simulation processes to MUJIN. With our automated generation of optimal motion plans and layouts, we can provide design solutions in a very short period of time, even for complex sensor-based tasks that professionals can struggle to implement on a robot.



System Development for Robots & Machines

MUJIN's core engine is being developed by professionals who are leading the motion planning community of roboticists.

We apply our experiences from autonomous service robots functioning in dynamic complex environments to automate tasks in the industrial sector. Complete automation requires very sophisticated algorithms, system development skills, and IT infrastructure that few companies can implement into their products.