MakinaRocks

MRX Robotics

AI solution for intelligent industrial robots

Unlock peak performance with MRX Robotics—an advanced AI-driven robotics solution optimizing industrial capabilities through precise motion quality analysis, anomaly detection, and automated welding programming, delivering unparalleled efficiency and value.

As manufacturing companies increasingly adopt industrial robots to automate production lines and enhance efficiency, the global industrial robot market is projected to grow from USD 18.19 billion in 2023 to USD 41.02 billion by 2030.

The integration of artificial intelligence with industrial robots boosts their business value by enabling real-time analysis of sensor data and visual information, facilitating predictive maintenance, and anomaly detection. Through extensive simulations, AI-powered robots efficiently allocate complex tasks and optimize paths to maximize productivity.

MRX Robotics specializes in enhancing the reliability and productivity of industrial robotic arms. By leveraging advanced analysis of motion quality and joint loads, we minimize downtime and automate task paths, ensuring seamless operations and preventing collisions.

Applicable Equipment

• Automotive • Steel • Shipbuilding • Display • Electronics • Construction • Packaging • Logistics

Use Case | Automotive

Advancing from 2 to 300 units :
AI-powered motion quality analysis and degradation prediction for articulated robots

Challenges

- Over 50 unexpected breakdowns annually in automotive assembly and paint lines, impacting productivity
- Existing maintenance approaches are inadequate, leading to frequent failures and significant downtime
- A need for a system that can adapt to over 10,000 different robot models for consistent maintenance

Approach

- Developed a deep learning-based anomaly detection system to identify early signs of failure
- Conducted an in-depth analysis of robot motion quality to optimize performance
- Utilized an enterprise AI platform(MakinaRocks Runway), for scalable AI operations across diverse robots

Value Delivered

- Successfully implemented across 300 robots in two automobile production plants
- Achieved over 90% accuracy in predicting failures, reducing downtime by 5 days in advance
- Optimized overloaded robot motion to minimize wait times and task durations, thereby enhancing operational efficiency

Key Features

- Enhanced process efficiency using robot joint load factor data
- Downtime reduction through data-driven failure prediction
- Extended robot longevity via reduced load factor
- Informed decision-making empowered by visual data

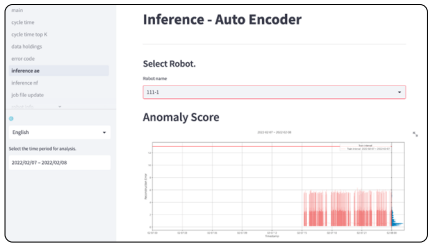


Figure1. ML-based motion quality scoring

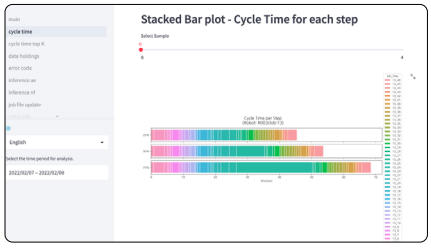


Figure2. Identifying bottlenecks via cycle time analysis

Robotics

Use Case | Automotive

Slashing time by 90% and reducing labor costs:
AI-powered offline programming automation

Challenges

- Operating 300 robots to perform over 2,000 welds required automated task and motion planning in the automotive welding process
- Manual offline programming for each new vehicle launch by field engineers typically took up to six weeks
- **Technical hurdles included:**
  ① Balancing robot workloads to minimize movement paths
  ② Generating collision-free trajectories in densely packed environments
  ③ Refining motion plans iteratively when initial attempts were not successful

Approach

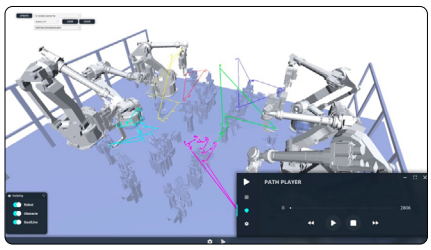
- Employed inverse kinematics for welding positioning accuracy and robot reachability
- Enabled field engineers to validate path planning algorithms using 3D simulations
- Integrated complex algorithms (genetic algorithm, MOVEit, swept volume analysis, etc.) for seamless system functionality

Value Delivered

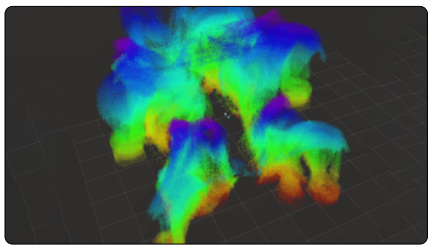
- Achieved a 50% reduction in labor costs through the complete automation of offline programming
- Reduced programming time from a range of 4-6 weeks to just 3 days or less
- Streamlined workflows and shortened production cycles, significantly improving unit-per-hour (UPH) output

Key Features

- Enhanced visualization through Unity Engine-powered 3D simulations
- Integrated simulations including RCS(robot control system) for PLC-compatible robot programming
- Optimization algorithms for smart weld spot assignment and reachability prediction
- Collision-free optimal path planning for all welding robots
- Workload minimization for robots with tailored steps, speed, and interpolation



OLP 3D simulation



3D Visualization of the robot path's swept volume

MakinaRocks

Accelerating the industries' transition to AI

MakinaRocks is a pioneering leader in enterprise AI software for the global manufacturing industry. Dedicated to accelerating the industries' transition to AI, MakinaRocks integrates its enterprise MLOps platform with cutting-edge AI technology to empower businesses in optimizing operations and unlocking value with its end-to-end AI solutions. Specializing in advanced anomaly detection and process optimization, our offerings are meticulously crafted for sectors, including automotive, semiconductor, battery, and chemicals.

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Trusted by global manufacturing leaders

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