

Synthetic Data and Digital Twin for Warehouse Simulation

SoftServe + NVIDIA + Toyota Material Handling Europe

Toyota Material Handling Europe, a leader in the material handling business offering AGVs (automated guided vehicles) in addition to other logistics solutions and services, collaborated with SoftServe and NVIDIA to develop an innovative digital twin initiative to revolutionize material handling. To begin, Toyota targeted collaborative picking, a complex interaction between AGVs and workers. The project undertook two parallel streams of work:



A digital twin built using the NVIDIA Omniverse™ to simulate real-world scenarios



Training of AI models on synthetic data enhanced with NVIDIA Cosmos-Transfer

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“Toyota Material Handling’s achievement clearly demonstrates how advanced simulation and synthetic data propels autonomous systems to new heights. At SoftServe, we are passionate about sharing this expertise and fueling innovation for our partners.”



Lyubomyr Demkiv

Director, Robotics & Advanced Automation, SoftServe

OBJECTIVES

- ◆ Accelerate the development and deployment cycle for autonomous forklifts.
- ◆ Reduce reliance on costly, time-consuming physical testing.
- ◆ Simulate intricate warehouse environments to enhance AGV navigation and human-robot interaction.
- ◆ Improve efficiency and safety through robust, scenario-driven validation.
- ◆ Close the gap between virtual and real-world system performance.

CHALLENGES

- ◆ High cost, risk, and delays of on-site scenario testing and prototype validation.
- ◆ Complex, dynamic interactions between humans and robots affecting sensors and safety logic.
- ◆ Significant operational and environmental variability across real warehouses.
- ◆ Scarcity of large-scale, high-quality labeled data to train AI models.
- ◆ Ensuring virtual results are transferable to real-world implementation.



SOLUTION: ACCELERATED BY NVIDIA



HIGH-FIDELITY DIGITAL TWIN

Built using NVIDIA Omniverse, these precise digital replicas of Toyota's forklifts and operational environments enable comprehensive software-in-the-loop (SIL) simulations of material handling and human-robot collaboration scenarios.



HIGH-FIDELITY DIGITAL TWIN

SoftServe generated and enhanced synthetic data on the DGX Cloud Lepton platform with NVIDIA Isaac Sim™ and NVIDIA Cosmos™, producing photorealistic, richly annotated training datasets to substantially boost AI model precision and recall for warehouse object detection.

OBJECTIVES

Time Savings: Virtual commissioning and risk-free scenario testing reduce warehouse disruption and accelerate rollout.

AI Robustness & Accuracy: NVIDIA Cosmos-enhanced models achieved 99.5% precision and 92.8% recall on real-world data, exceeding simulator-only models (49.4% recall).

Cost Reductions: Fewer physical prototypes and on-site failures lead to notable savings in development and deployment.

Enhanced Efficiency & Safety: Predictive digital twins allow proactive identification and mitigation of operational risks.

STAKEHOLDER PERSPECTIVE



"Developing digital twin applications with Omniverse allows us to replicate and explore various testing environments in a way that is very hard to do in the real world. Being able to train and virtually test our physical AI solutions and perform much of the commissioning in the digital twin, truly increases our speed of innovation."



Johan Brynås

Director Research & Innovation, Toyota Material Handling Europe

KEY TECHNOLOGIES

- **NVIDIA Omniverse™:** Real-time, collaborative digital twin creation and simulation
- **NVIDIA Isaac Sim™:** High-fidelity, physics-accurate robotics simulation
- **NVIDIA Cosmos™:** Enhanced synthetic data for bridging sim-to-real performance
- **Physical AI & Generative AI:** Smart data generation and complex system modeling
- **Computer Vision:** Advanced perception and navigation for AGVs
- **ROS/ROS2, C++, Python:** Robust development and robot integration stack

SOFTSERVE COLLABORATING WITH NVIDIA

SoftServe brings Physical and Agentic AI to life by leveraging the full breadth of NVIDIA's technology stack, enabling enterprises to move beyond AI experimentation and into production with scalable, outcome-driven solutions. As **NVIDIA's 2025 Service Delivery Partner of the Year** and an Advanced Technology Partner, SoftServe delivers real-world impact through high-fidelity simulation, robotics and automation, intelligent collaborative agents, and computer vision at scale. As AI complexity grows across technologies and use cases, our value lies in helping customers prioritize and integrate the right capabilities into end-to-end architectures.



Reach out to learn more!