Professorship of Autonomous Vehicle Systems
TUM School of Engineering and Design
Technical University of Munich

SA/FP/IDP

Development and Evaluation of Application Scenarios for a Quadruped Manipulator in NVIDIA Isaac Sim

This thesis focuses on building realistic, deployable application scenarios for a quadruped manipulator robot using NVIDIA Isaac Sim.

Background

Quadruped robots equipped with manipulators are emerging as highly versatile platforms capable of operating in complex, unstructured environments. By combining mobility with manipulation, these systems can perform tasks that are difficult for traditional wheeled robots or fixed robotic arms. Recent advances in simulation platforms such as NVIDIA Isaac Sim enable efficient development, testing, and training of robotic systems in realistic virtual environments before deployment in the real world.

A key challenge, however, is the lack of well-defined **application scenarios** that demonstrate the practical value of such systems. While research often focuses on locomotion or manipulation separately, real-world use cases such as retail assistance, home service, and warehouse logistics require tight integration of both.

This thesis aims to address this gap by designing and implementing **practical, real-world-inspired application scenarios** in simulation, and evaluating how effectively a quadruped manipulator can perform within them. These scenarios will serve as benchmarks for future development and potential real-world deployment.

Language

English/German

Your Role

- **Scenario Design & Research:** Define application scenarios (retail, home, warehouse) based on existing service robotics use cases
- **Development & Implementation:** Build simulation environments in NVIDIA Isaac Sim, define tasks (navigation, picking, assistance), and integrate the quadruped manipulator
- **Training & Evaluation:** Implement baseline or learning-based methods and evaluate performance (success rate, efficiency, robustness)

Was should you bring along?

- Interest in robotics / autonomous systems
- Hands-on motivation for simulation and real-world applications (Isaac, Mujoco)
- Programming skills (Python, C++, ROS2)
- Basic robotics knowledge (plus)
- Independent and structured working style

If you are interested, please send me a grade sheet with your CV!

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