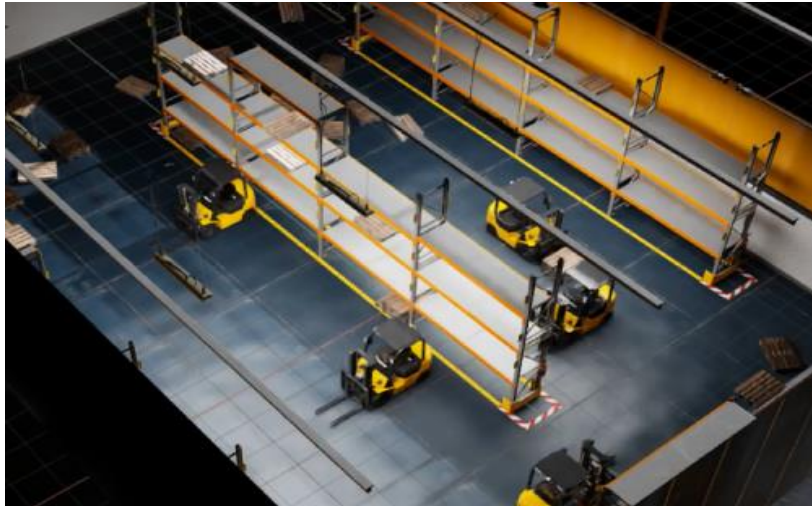**Bachelor/Master thesis**

Generation of Synthetic Warehouse Environments Using a Scene Graph

Background: Modern automation and robotics rely on large-scale data for training, testing, and development. However, in specialized environments such as warehouses, collecting and annotating real-world data is extremely costly. Synthetic data offers a promising alternative by significantly reducing the reliance on real data. Currently, the design of 3D scenes still mainly depends on manual work by domain experts.

Problem: The major barrier to scaling high-quality, designed 3D scenes lies in the vast diversity of objects and the complexity of their spatial arrangements. In this thesis, the student will investigate how to describe warehouses using a scene graph, and how to generate diverse synthetic scenes by randomizing scene graph parameters.

Tasks: Your tasks include:
- Research methods of using a scene graph to represent 3D environments
- Design a warehouses scene graph structure and define rules for randomized generation
- Collect or create CAD models of warehouse-related objects
- Implement an automatic pipeline to generate synthetic warehouses within the ISAAC SIM simulation environment

Requirements:
- Programming experience in **Python**
- Familiarity with CAD modeling and **Isaac Sim** is beneficial

Forschungsbereich:
Robotik und Assistenzsysteme

Ausrichtung:
- [ ] Experimentell
- [ ] Theoretisch
- [x] Praktisch
- [x] Simulation
- [x] Konstruktion (CAD)
- [ ] Sicherheitstechnik
- [ ] Graphische Gestaltung

Studiengang:
- [x] Maschinenbau
- [x] Mechatronik
- [x] Elektrotechnik
- [ ] Informatik
- [ ] Wirtschaftsingenieurwesen

Beginn: ab sofort

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