Robotics, Artificial Intelligence
and Real-time Systems

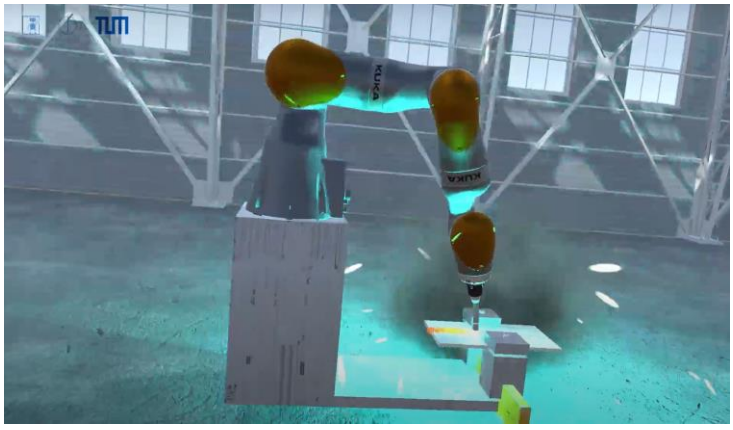
Guided research

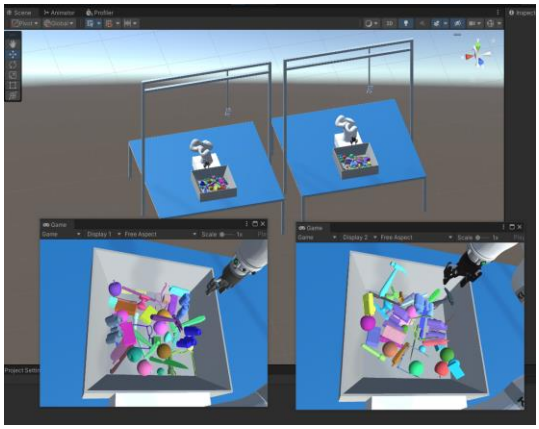
Background

Machine learning models are widely and successfully applied in fields like natural language processing or computer vision, where large amount of domain data exists for model training. However, training such models for robotic tasks using real robots is impractical and unsafe. Simulations seem like a viable alternative for training robots – with the ever-increasing simulation accuracy and computational speedup, virtually unlimited training data is available. However, simulations are an approximation of the real environment, due to which the models trained in simulation often fail in the real world or their performance decreases considerably (the reality gap problem). How can we improve the simulations and achieve efficient and photorealistic rendering or accurate physics, in order to reduce the reality gap and improve the transferability of simulation-trained models to control real robots?

Goal and Methods

The goal of this guided research is to explore options on how to improve the rendering quality and physics accuracy of game-engine-based simulations for robotic tasks. Given initial robotic environments in Unity (see figures below), how to improve the photorealism of the generated images from simulated cameras, or the correctness of the interactions between rigid/soft bodies without sacrificing too much on efficiency, by using SOTA methods from computer graphics / computer vision / machine learning? Throughout the semester you will work on this topic closely with researchers at our chair and contribute to potential publications at scientific conferences. Based on the results, the topic can be extended to bachelor / master thesis.





Your Background

- Very good understanding of the Unity game engine and experience with the HDRP
- In your master studies or at the end of your bachelor studies in Games Engineering / Informatics / RCI or similar
- Highly motivated, organized and independent in your work, previous experience in ML is a plus

Supervisor: Prof. Dr.-Ing. habil. Alois Christian Knoll
Advisor: Josip Josifovski

Please send an email to Josip Josifovski with your recent ToR and a few words on how your background is relevant to this project, with title “Research Application”