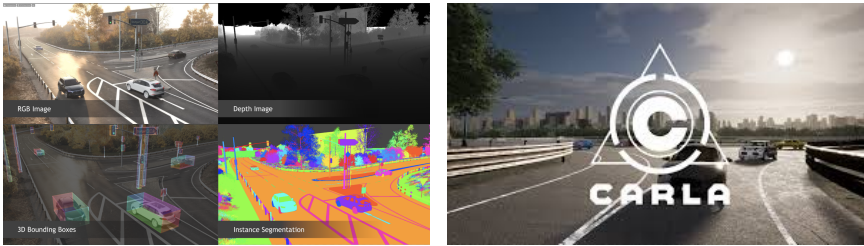Karlsruhe Institute of Technology

Master Thesis

Nvidia Omniverse[1] (left), CARLA[2] (right)

Evaluation and Integration of Nvidia Omniverse into a CARLA-based Simulation Framework

In automated driving, simulation platforms are indispensable tools for developing, validating, and optimizing safety-critical functions. The Nvidia Omniverse platform offers a state-of-the-art development environment for physics-based real-time simulation, AI-based sensor data generation, and collaboration in virtual worlds.

The goal of this Master's thesis is to evaluate and integrate Nvidia Omniverse into an existing simulation-based testing framework, such as CARLA. The focus is on investigating co-simulation and the generation of synthetic sensor data for scenario-based testing in automated driving. The thesis will analyze the technical interfaces and advantages of Omniverse and provide a foundation for its integration into existing test environments.

The close collaboration with Porsche Engineering as part of this external Master's thesis provides valuable insights into practice and offers the opportunity to work temporarily in Bietigheim-Bissingen, with travel costs covered. The supervision by MRT ensures that students receive comprehensive support and simultaneously gain access to a network of highly qualified students.

The proposed thesis consists of the following parts:

+ Analysis of the state-of-the-art in automated driving related to simulation, automotive sensors, and sensor modeling
+ In-depth analysis of Nvidia Omniverse, including its application in automated driving for scenario-based testing, sensor data generation, co-simulation, and all limitations
+ Analysis of sensor modeling and sensor integration possibilities in Nvidia Omniverse (e.g., camera, Lidar)
+ Conceptualization and development of an interface/co-simulation between an extended CARLA simulator and Nvidia Omniverse
+ Execution of scenario-based tests in the developed co-simulation
+ Comparison of virtual data from the modeled sensors in Nvidia Omniverse with real sensor data
+ Discussion, evaluation, and documentation of the approach and results

I am happy to answer any questions you might have. Feel free to ask for an appointment or directly ask at my office!

[1] https://www.nvidia.com/en-us/use-cases/autonomous-vehicle-simulation/
[2] https://carla.org/

Institute of Measurement and Control Systems (MRT)
Prof. Dr.-Ing. Christoph Stiller

Advisor:
Kaiwen Wang, M.Sc.

Lars Töttel, M.Sc.

Programming language(s)[1]:
C++   advanced
Python   advanced
Scripting   advanced

System, Framework(s):
Linux, ROS2, git, Docker, CARLA

Required skills:
- Work on your own

Language(s):
English, German

For more information please contact:

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Or directly send in your application including your current grades as well as our questionnaire!

[1]**skill levels:**
beginner   < 500 lines of code (LOC)
advanced   500 – 5000 LOC
proficient   > 5000 LOC