



## Bachelor / Master Thesis

### „Open Simulation Interface (OSI) compliant Development of a Raytracing-based Flash LiDAR Sensor Model in C++“

#### Summary

The thesis focuses on the C++-based implementation of a real-time capable sensor model of an Automotive Solid-State LiDAR (*Light Detection and Ranging*). Due to its highly precise 3D environmental detection and mapping capabilities, LiDARs constitute a crucial part of future Advanced Driving Assistance Systems (ADAS). By that, this specific kind of optical sensor is not only one of the big cost and market drivers in the future Automotive sector, but also highly safety relevant, with potentially hazardous consequences in case of failure. Having this said, there is a strong need to ensure its functionality in a wide range of different traffic scenarios, but also under adverse environmental conditions like rain, snow and fog, or progressed component ageing. Since, in case of purely physical ADAS testing, the manual test effort grows to an infeasible level, there is a strong trend towards virtual validation of ADAS functions. This calls for high-fidelity sensor models (also referred to as digital twins), which can – by standardized interfaces - be embedded as a functional mockup unit (FMU) into a respective driving/environment simulator in order to generate realistic sensor raw data based on the simulated virtual scene and sensor characteristics. The goal of the thesis is, to implement a raytracing-based, modular sensor model of the Continental Flash LiDAR sensor and to embed it as FMU into IPG Carmaker as a market leader for driving simulators. The thesis will be organized as an industrial research thesis at Fraunhofer IVI, within the research group of optical sensor technology and directly contributes to the further development of the ASAM OSI standard for sensor models.

#### Task description

- Introduction to IPG Carmaker including the custom OSI-interface for independent sensor model development
- Implementation and test of an OSI-compliant Flash LiDAR model based on previous works
- Literature research on LiDAR sensor modeling, specifically w.r.t. standardized interfaces
- Validation of the model iterations by in-field measurement campaigns and data from previous works
- Qualitative and quantitative model demonstration by contrasting virtual and real measurement data for specific scenes and quality metrics

#### Profile

- Student in Computer Science, Electrical Engineering or similar with an interest in working with LiDAR sensors and Sensor Modeling
- Good programming skills in C++ and Python
- Ideally experience with git, Cmake, ASAM OSI and IPG Carmaker
- The ability and interest to work independently in a scientific environment
- Fluent German and/or English

**Are you interested? Do you have questions? – Contact us!**

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