



Master's Thesis

Data Fusion in AirSim Utilizing AI-based Image Detection Results

The IABG Innovation Centre is a development incubator for the IABG's portfolio, which includes major trends in digitization, artificial intelligence, robotics, and sensor networks in the mobility and security sectors.

AirSim¹ is an open-source simulator for drones, cars, and more, built on the Unreal Engine and designed as a platform for AI research to experiment with deep learning, computer vision, and reinforcement learning algorithms for autonomous vehicles. AirSim is currently used in the project **safeAI** at the IABG Innovation Centre to develop safety and robustness evaluations of AI-based image detection algorithms applied to the vertical landing of flight vehicles. In addition, state-of-the-art probabilistic object detection techniques are applied to quantify the uncertainty of image detection outputs.

The goal of this Master's Thesis is to develop an Extended Kalman Filter for AirSim that provides the integration of AI-based image detection outputs into the data fusion with traditional measurements such as GNSS, accelerometers, gyroscopes, and a magnetometer.

Your Responsibilities

- Evaluation of the current state estimation techniques in AirSim
- Implementation of an Extended Kalman Filter that provides the integration of AI-based image detection results
- Utilization of available IABG sensor models and further components
- Development of strategies to incorporate the uncertainty estimations originating from the probabilistic object detection algorithms
- Integration of the Extended Kalman Filter into the open-source environment AirSim

Your Profile

- Motivated student of Aeronautical Engineering, Mathematics, Computer Science, or related engineering disciplines
- Strong programming skills (Python, MATLAB, Simulink, C++)
- Experience with data fusion techniques and Kalman Filter algorithms

¹ <https://microsoft.github.io/AirSim/>

- Interest in open-source software projects and collaborative working using Git version control
- Excellent communication skills in English

Supervisors

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