Simulation of Autonomous Airplane Inspection using Drones

In this project of the aviation research programme V (LuFo V) of the Federal Ministry for Economic Affairs and Energy the goal is to develop an autonomous drone for airplane inspection inside a hangar. The drone is expected to be equipped with a variety of sensors, such as LiDAR, stereo cameras, IMUs, compass and optionally active RGB-D sensors. The challenge in this environment are the large metal structures from the airplane, but also from the hangar itself, having a great influence on GPS signals and compass. In this GPS-denied environment the drone will collect data from the sensors and send them to a ground station, where SLAM algorithms map the environment and localize the drone precisely. The drone will follow preset inspection points at which it is capturing inspection images from the surface of the airplane. The images are then sent to the ground station, which performs machine learning techniques using IBM Watson in order to retrieve a damage classification result. The results are collected and an overall report is generated, documenting the current condition of the airplane.

The LMT will develop the software for module communication (ROS-based), sensor data acquisition and encoding, as well as data processing in the ground station, such as SLAM and drone control. In order to test the algorithms two test platforms are used at the LMT. Our small platform is based on "DJI Flame Wheel 550" for autonomous control and stability tests and the bigger drone is based on "DJI Spreading Wings S1000+" to mount all available sensors for data acquisition tests. During the development phase this data is then analyzed offline to adjust parameters and algorithms. This leads to an improvement of localization precision and better real-time control.

More information on the project can be found on the project's website:
https://www.ei.tum.de/en/lmt/research/bmwi-ki-inspektionsdrohne/

Tasks:
Working tasks can vary from week to week. Mainly we are looking for a working student to improve our drone simulation in Gazebo. So students with knowledge in Gazebo simulation will be preferred.

Interested students should send their current grade sheet and CV to the contact below.

Prerequisites
The student is required to have excellent knowledge in C++/Python and experience with the ROS framework. We are looking for an employment of a student assistant for a time frame of +6 months with at least 10 hours per week working time.

Advisors
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