TU Clausthal

Kolloquium zur Masterarbeit

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„RESTful ROS-based software architecture for onboard mission computer in UAS"

European Aviation Safety Agency (EASA) defines a drone as "an aircraft without a human pilot onboard, whose flight is controlled either autonomously or under the remote control of the pilot on the ground or in another vehicle." Nowadays, drones are actively used both in military and civilian domains, which renders several use cases like surveillance, aerial photography or video recording, traffic monitoring, and package delivery. Many of the applications require high levels of autonomy, especially when the Drone is flying beyond the visual line of sight scenario. High levels of autonomy can be achieved with a framework that allows systems to evolve with the increasing complexity of tasks within a mission. The three-layer autonomy architecture promotes managing complexity while executing various autonomous missions.

Recent advances in digitalization require the drones to be integrated with other platforms for integrated planning and execution of missions. Integration, however, is not for free. System design needs to provide abstract interfaces for the capabilities of the drones to its consumers and utilize the capabilities from the collaborating entities. Service-oriented architecture (SOA) is a popular paradigm used for exposing functionality as a service while hiding the underlying details of the system. Recently it has gained popularity with mobile robots, especially drones with the term Drone as a Service (DaaS). DaaS drones that provide abstract interfaces that hide drones technicalities, and enables achieving higher levels of interoperability.

This thesis investigates software architecture for drones that enable easy integration with Service Oriented Architectures while supporting autonomy. It extends an existing architecture with a web service layer and a Robot Operating system (ROS) environment that allows drones to accept missions consisting of simple commands through a REST interface and gets executed in the ROS environment. This system enables us to use the many capabilities of ROS for perception and motion for drone applications while hiding its complexities. Exposing this functionality over web services make this system interoperable with other RESTful clients. We tested our platform on a gazebo simulation consisting of all Drone components in interfacing with an onboard computer as Raspberry Pi with remote execution of missions through web services.

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