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Quality and safety, a challenge for traditional and new space (1)

Author: Mr. Philipp Wüstenberg
TU Berlin, Germany

Mr. Lennart Kryza
Technische Universität Berlin, Germany
Mr. Kosuke Ikeya
Tokyo Institute of Technology, Japan
Mr. Jens Großhans
Technische Universität Berlin, Germany

QUALIFICATION READY FLIGHT SOFTWARE USING MODULE-IN-THE-LOOP VERIFICATION AND AUTOMATED TEST EXECUTION AT THE EXAMPLE OF SALSAT SATELLITE SOFTWARE

Abstract

Quality assurance is of utmost importance for the success of any commercial software application. Consequently, companies and developers put a lot of effort into software verification and validation methods. Writing software tests is an essential part of any reliable development approach, while the implementation overhead can cause additional stress. This is particularly the case for small project teams with tight development schedules. Adverse effects might be project constraints allowing only a limited amount of testing such as development and final qualification tests. This particular issue is of major interest for applications such as satellite or rover missions where consecutive updates may be impossible due to operational constraints. Consecutive testing during development has thus become an integrated part of research projects at the Chair of Space Technology at the Technische Universität (TU) Berlin. Communication times with ground-based systems are a valuable resource, independent of the application, such as satellite operation, rover communication or machine to machine (M2M) communication. Contact times are determined in early phases of every mission. Mission planning tools however are isolated applications which do not necessarily offer the integration of self-developed software modules or interfaces to flight software.

This paper will propose a novel approach for software product assurance by developing module-in-the-loop based simulation frameworks usable for both mission planning and software verification purposes. It is meant to be integrated into a test server and run different test cases automatically. This includes the unit tests but features majorly automated module-in-the-loop tests, consisting of long-term simulations as well as induced failure cases. The simulations will be based on several tools developed either at TU Berlin or by utilizing major open source projects. Features included are an orbit simulation, middleware layer, hardware abstraction as well as an environment analysis tool. Examples of the utilized open source project are the Robot Operating System (ROS) (http://www.ros.org/), the python framework poliastro (https://docs.poliastro.space) and Jenkins (https://jenkins.io/).

The concept will first be applied and developed within the SALSAT satellite mission, scheduled to launch in 2020, and planetary rover projects of TU Berlin.