



Master Thesis Work

of Choose title Name, Surname

Entwicklung eines miniaturisierten Sensorpakets für planetare Oberflächenexploration mit dem kabelgebundenen Microrover Nanokhod

Development of a Miniaturized Sensor Package for Planetary Surface Exploration by Tethered Microrover Nanokhod

Motivation:

The Microrover Nanokhod is a robotic Platform for planetary surface exploration and the design was selected by the European Space Agency (ESA) for the Mission BepiColombo. However, the Mercury Surface Element (MSE) was cancelled, since this the Nanokhod has been further developed at the University of Stuttgart in cooperation with von Hoerner und Sulger GmbH (vH&S) for Moon applications. The Nanokhod consists of two encapsulated tracks for locomotion, a slewable Payload Cabin, a 100 m tether and a mechanism for spooling. The tether transfers power as well as data to and from a surface element. The Nanokhod system mass is 3.2 kg including the 1 kg Payload. The next step is the development of a sensor package for detailed terrain mapping. This will allow the Microrover to navigate around obstacles and towards the point of interest on the Moon's surface. The requirements and constraints of this low-resource space systems and the environmental conditions on the Moon are to be integrated into the design of the sensor system. For developing the mapping methods this thesis will be conducted in cooperation with IFR (Institut für Flugmechanik und Flugregelung). The goal of this thesis is the commissioning, operation and evaluation of the sensor package. A lightweight, low-resource and reliable software to read sensor data is to be implemented and tested. A demonstrator mission intended to be performed on Earth will not use space-verified components, however the resulting concept should be feasible using such components, in the best case without modification. Extensive knowledge in sensory technology and space electronics necessary. (Latest Start: February 2023)

Task description of the Master thesis work:

- Familiarization: Nanokhod, State-of-the-Art sensor elements (Earth and Space Technology), SLAM.
- Recognition of interfaces, definition of requirements for integrating sensor package into Nanokhod.
- Analysis of possible sensor elements and configurations, concept and detailed development.
- Integration, Testing and Verification of the sensor package within laboratory conditions.
- Documentation.

Supervisor: Patrick Winterhalder, Moritz Gewehr, Marlin Kanzow

Starting date: [Click for date](#)

Submission until: [Click for date](#)

Acknowledgement of receipt:

I hereby confirm that I read and understood the task of the master thesis, the juridical regulations as well as the study- and exam regulations.

 Date
 Prof. Dr.-Ing. Sabine Klinkner
 (Responsible Professor)

 Date
 Signature of the student

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