# Masterarbeit

Neural network-based control systems for in-space servicing missions

Satellites use control systems to control their orientation, as well as relative position, velocity and acceleration when performing proximity operations. For these control systems to be well tuned, the spacecraft itself must be well characterised. In particular, it is useful to know the spacecraft's centre of mass and inertia properties. However, when refuelling or docking with other spacecraft, these properties may change in unknown ways. Additional uncertainties are further introduced during proximity operations, where imperfect sensors are used to determine the distance and orientation difference between the two spacecraft.
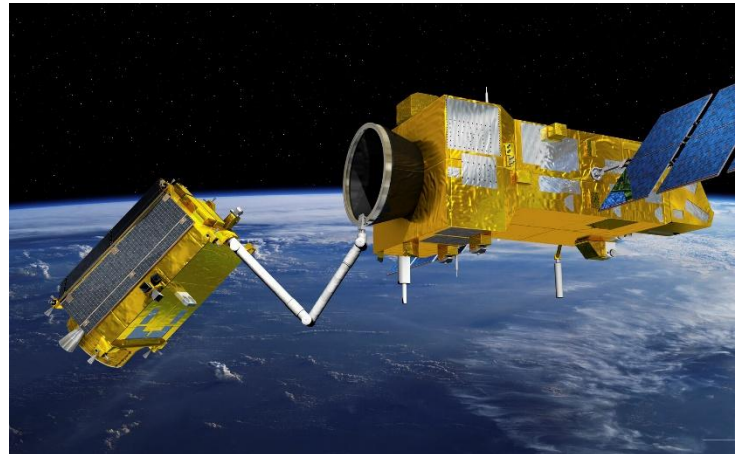
A novel way to deal with these uncertainties is to implement a neural network as part of the control system. Simulations have shown this approach can be used to produce robust control systems for spacecraft manipulator control. However, until now this approach has not been experimentally tested. The task of this thesis topic is to experimentally validate and test a neural network-based control system using the Experimental Lab for Proximity Operations and Space Situational Awareness (ELISSA).

In detail the following subtasks have to be performed:

1. Develop a software-in-the-loop module for the ELISSA codebase to enable simulation testing of neural network-based control algorithms
2. Implement an existing neural-network based algorithm into ELISSA
3. Conduct experiments to evaluate the performance of the algorithm

If interested, please send Declan Jonckers your CV and grade transcript.

Contact: M.Eng. Declan Jonckers
Tel. 0531 / 391-9972, E-Mail: d.jonckers@tu-braunschweig.de
Hermann-Blenk-Str. 23, 38108 Braunschweig