

20.12.2018, K. Bondoky

Setup and Integration of a Hardware-In-The-Loop (HIL) Simulation Testbed for the Validation of Docking Contact Dynamics.

Objective:

The aim of this project is to set up and integrate the software and hardware components of a HIL simulation testbed.

The goal of the HIL simulation testbed is to validate contact dynamics model. This will be done by comparing the results of this HIL simulation, to the predicted results (which we got from the Simulink model that we have built already). The results of this HIL testbed, will be used by “Airbus DS GmbH” to test and validate the docking contact dynamics of small and rigid satellites.

The HIL testbed (which is using a “dSpace” real-time system) consists of a piezoactuator and a force sensor. The displacement of the open-loop controlled piezoactuator increases, until its tip collides with a force sensor. The force sensor then measures the actual amount of force applied on it. Accordingly, we analyze the force and displacement measurements from the HIL test, to the predicted ones. Consequently, we validate the contact model.

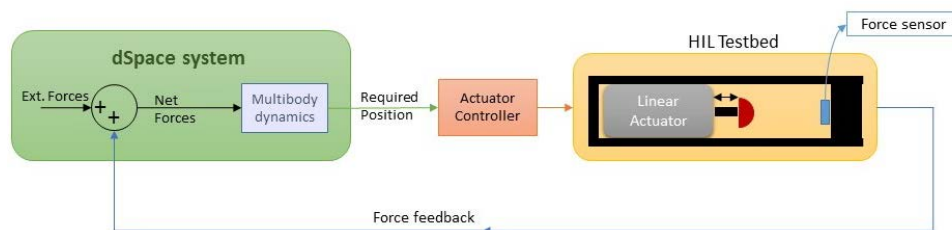


Figure 1 HIL testbed Blockdiagram

After introduction and familiarization with the dSpace system, a (ready-made) Simulink model of the rigid-bodies spacecraft shall be modified to adapt to the HIL test-bed framework. Afterwards, the whole models shall be uploaded on the dSpace real-time system in order to run the experiment.

Detailed work content:

Goal: Setup and Integration of HIL simulation test-bed for validation of contact dynamics model

- Introduction to the dSpace real-time system.
- Familiarize with the interface of dSpace with Matlab/Simulink
- Familiarize with the hardware components (Piezoactuator, force sensor) and its interfaces
- Polishing of an existing multibody dynamics simulink model to adapt to the HIL test
- Run HIL simulation.
- Repeat the simulation but with the three body system.
- Documentation of thesis

Tools:

- dSpace shall be used as the real-time system
- Simulink/Matlab shall be used

Language:

- English (preferred) or German



**TECHNISCHE
UNIVERSITÄT
DRESDEN**

Contact:

Karim Bondoky

Karim.Bondoky@tu-dresden.de