RUHR-UNIVERSITÄT BOCHUM

Master thesis

Development and implementation of a feedback control system into the observer-based conditioned reverse path (OBCRP) method

DESCRIPTION:

The conditioned reverse path (CRP) method is a method for the frequency response estimation of a nonlinear system to extract the properties of an underlying linear model (ULM). This method recalculates the nonlinearity coefficients by using spectral techniques and recovers the frequency response function (FRF) of the ULM. However, applying the CRP method is challenging if the system states are not accessible for measurement. For this reason, a state estimation process is integrated into the CRP method and thus the CRP method is extended to an OBCRP method. The state estimation process based on the Kalman filter technique is employed to reconstruct the system states.

In the actual framework of the OBCRP method the state estimation problem is based on a simple non-steady-state Kalman filter and covariance resetting. The update of Kalman gain is based on the matrices of the ULM and may take a long time to converge to the sub-optimal solution. The deviations between the estimated and measured states are shown in figure 1. To improve the estimation of system states, the idea of a feedback control system should be implemented. In order to have a faster convergence, first, a steady-state Kalman filter should be designed. The simulative work of the master's thesis should be done in Matlab/Simulink and the validation of the developed method should be performed on a clamped-clamped beam.

REQUIREMENTS:
Good knowledge of MATLAB.
Interest in experimental work.
Basic knowledge of Abaqus.

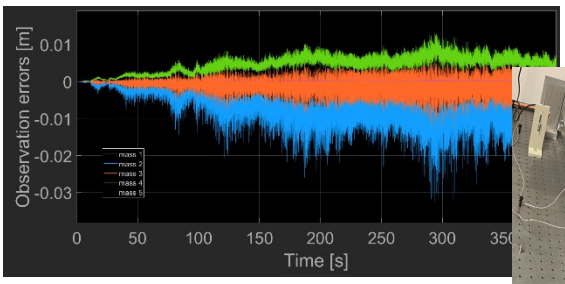

Figure 1

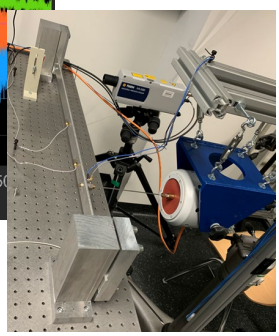

Figure 2

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https://www.ruhr-uni-bochum.de/mas/lehre/arbeiten.html.de