RUHR-UNIVERSITÄT BOCHUM

Masterthesis

Integration of an automated acceleration method into a framework of a nonlinear system identification

DESCRIPTION:

New system identification methods are needed to consider the increasingly complicated nonlinear phenomena. Black-box models are pure mathematical models that parameterize a causal transfer from an excitation to a structural response. Even though these models are very suitable for real-time and process-oriented applications, the equations of the mathematical models consist of a high number of nonlinear monomials. To reduce the number of nonlinear monomials and thus make the mathematical model manageable, the accerleration surface method (ASM) plays an important role in the semi-physical framework of nonlinear system identification. ASM is employed to qualify the nonlinear interactions within the structure.

Within the scope of the master thesis, a research on the state of the art regarding semi-physical modeling and the ASM sould be performed. Existing codes about semi-physical modeling and the ASM are to be traced. In the ASM, polynomial equations are used to describe the nonlinear motion of the system, and degrees and coefficients of the equations are determined via the ASM method. So far, all possible polynomial equations calculated via the ASM method are listed according to their order and their norm of residuals is calculated. The equation with the lowest norm of residual is used to describe the nonlinear motion of the system. This manual process should be automated and integrated into the framework of nonlinear system identification.

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

Contact:
M.Sc. Umaaran Gogilan
AG Mechanik adaptiver Systeme
Ruhr-Universität Bochum
E-Mail: umaaran.gogilan@rub.de

Mechanik adaptiver Systeme

Prof. Dr.-Ing. Tamara Nestorović

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