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Masterarbeit - *Master thesis*

für

Vorname Nachname

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Data-driven simulation of Gaussian and non-Gaussian random fields

Modeling, quantifying and propagating uncertainties have become an important part of practical engineering design. As an important part, uncertainty modeling is particularly significative in many problems. In most current numerical frameworks, uncertainty modeling is achieved by means of the random fields with specified covariance functions and Gaussian/non-Gaussian marginal distributions. Methods for simulating Gaussian/non-Gaussian random fields have been developed, e.g., the spectral representation method, the Karhunen-Loève expansion and the Polynomial Chaos expansion, etc [1,2,3]. With the development of experimental techniques and the accumulation of actual data, we can consider the influence of these actual data in uncertain models to simulate more realistic random fields and reduce the uncertainty of models. There is still little research on this topic.

The main goal of this thesis is to simulate Gaussian and non-Gaussian random fields under the constraints of limited data, with special emphasis on embedding actual data into classical random field simulations. The study of the influence of measured data on random field simulations will also be highlighted.

Literatur:

[1] M. SHINOZUKA, G. DEODATIS (1991): Simulation of stochastic processes by spectral representation. Applied Mechanics Reviews.

[2] R. GHANEM, P. SPANOS (2003): Stochastic finite elements: a spectral approach.

[3] Z. ZHENG, H. DAI, Y. WANG, W. WANG (2021): A sample-based iterative scheme for simulating non-stationary non-Gaussian stochastic processes. Mechanical Systems and Signal Processing.