STRUCTURAL MECHANICS

SFB 1683 Modular Reuse

RUB

Master Thesis

Modelling of spatial variations in non-linear FE-Analysis by random fields

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(Thesis can be written in English or German)

Background: In the framework of the collaborative research center 1683 *Methods of interaction for the modular reuse of existing load-bearing structures*, the structural performance and reliability of reused reinforced concrete elements is investigated. In order to verify a sufficient reliability level over the intended service life, the influence of uncertainties regarding the material properties, ageing and degradation on the load-bearing capacity of a reused structural element need to be assessed.

Task: This master thesis should contribute to the overall project goal by investigating the usage of random fields in non-linear FE-Analysis (NLFEA) and evaluate the effect of spatial variations of the load-bearing capacity of reinforced concrete beams:

- Literature review regarding random fields, their usage for modelling spatial variations in reinforced concrete and how they can be generated based on available discrete measurement data.
- Implementation of a random field generator for spatial variations of concrete and rebar properties and coupling with the NLFEA platform KRATOS.
- Parametric study regarding correlation lengths of random fields and generating a set of random fields to model the spatial variation of concrete and rebar properties for selected cases
- Assessment of spatial variations of material properties on the structural response of reinforced concrete beams. Comparison of a deterministic NLFEA of benchmark problem with multiple random fields realizations to quantify its influence on the load-bearing behaviour.

A previously conducted thesis https://resolver.tudelft.nl/uuid:25780e9a-49c4-4085-9a65-af73119d97a7 provide a great overview and starting point of the involved topics and tasks.

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