Technische Universität Braunschweig

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Vortrag im Gästeprogamm des GRK 2075 -
Modelle für die Beschreibung der Zustandsänderung bei Alterung von Baustoffen

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Modelling of cyclic behaviour of reinforced concrete elements

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Institute für Baustoffe, Massivbau und Brandschutz – Fachgebiet Massivbau
Beethovenstraße 52, Konferenzraum, 3. OG

One of the main characteristics of RC structures is the highly non-linear response to cyclic loading, in particular seismic one. For this reason, realistic constitutive models are required to obtain reasonably accurate simulations of RC members.
Many models can be used to simulate non-linear response of RC elements: the first distinction concerns smeared and discrete crack models. The smeared models treat the cracked solid as a continuum by reducing stiffness properties while discrete ones represent cracks as a geometrical discontinuity. A further distinction can be done between smeared rotating crack model and smeared fixed crack model.
A reliable numerical model must be able to capture nonlinearity and plasticity introduced by cyclic loads. Existing commercial finite-element codes often have limitations in representing cyclic behaviour because of convergence problems. The typical example concerns the tensile behaviour of concrete that is commonly assumed to be secant in the unloading/reloading phases even if the experimental evidence demonstrates that irrecoverable tensile strains remain in concrete.
For this reason, a new crack model called PARC_CL 2.1 (Physical Approach for Reinforced Concrete subjected to Cyclic Loadings) has been elaborated for the prediction of the structural response of reinforced concrete (RC) structures subjected to cyclic and dynamic loading. The PARC_CL 2.1 allows to take into account plastic and irreversible deformations, that characterize the real behaviour of concrete and steel when subjected to seismic actions.
The presentation illustrates cyclic constitutive models adopted in the PARC_CL 2.1 crack model. Moreover, some applications to RC members and structures will be show.

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