
Preface

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The reliability and safety assessment of structures and systems requires appropriate models and simulation techniques. The uncertainty quantification of the corresponding model parameters is important to obtain reliable results. Whereas stochastic approaches are beneficial in case of aleatoric uncertainties, interval or fuzzy approaches can deal with epistemic uncertainties. Both stochastic and non-stochastic approaches can be combined within polymorphic uncertainty modelling.

This special issue on ‘Computing with Polymorphic Uncertain Data’ is based on the 7th International Workshop on Reliable Engineering Computing held at Ruhr University Bochum, Germany, in June 2016. The 11 papers of this special issue present new developments for the consideration of stochastic and non-stochastic uncertainties in various engineering and associated disciplines, with the kernel areas of civil, mechanical and electrical engineering, computer science, and mathematics. Specific structural engineering applications are presented in six papers, such as damage detection in masonry dams, numerical simulation of wooden structures, traffic load effects on cable-stayed bridges, fatigue of short-span concrete bridges, the influence of snow measurement uncertainties on the structural reliability, and real-time simulations in mechanised tunnelling. Two papers deal with applications in electrical engineering, i.e. power flow analysis of electrical systems and the power allocation problem. New interval approaches for beam and truss structures are presented in three papers, which are related to linear interval equilibrium equations, the solution of linear systems of equations with probability-box parameters, and dynamic response in the time domain.