# Structural Condition Assessment Using Imprecise Probability

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## Abstract

Investigating the condition of a structural system requires an accurate estimate of the applied load and the current condition of the structure. As such, the presence of uncertainty becomes significant; because the variations inherent in design parameters will significantly affect the reliability of the structure. Therefore, it is crucial to appropriately quantify uncertainty in the design parameters as well as perform structural reliability analyses for determining the condition of the structure and its failure potential.

This paper presents a new method for condition assessment of structures, which exhibit polymorphic uncertainty in their design parameters. An imprecise probability approach is used to quantify the polymorphic uncertainty. Applying this technique to conventional methods, the reliability analysis of a structure is improved. By incorporating imprecise probability values in the reliability analysis process, bounds for the probability of failure are estimated and established. These bounds are then used as a measure for the condition assessment of the structure. A numerical example is provided to demonstrate the applicability of the developed method.