Comparison of probability and evidence theories in the identification of damage reinforced concrete beam

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This work considers the problem of damage assessment of a concrete reinforced bridge. The problem requires to identify the mechanical properties of the bridge, e.g. Young modulus of the reinforced concrete beams, from the measurement data of the structure responses. That problem is classified as the inverse problem and usually treated using probability framework. Under that framework, Bayesian rule is applied to calculate the posterior distribution of quantities of interest by combining the prior distribution with the likelihood function modeling the measurement errors. An alternative framework that can be applied for inverse problem is the Dempster-Shafer theory (DST) of evidence. An important aspect of this theory is the combination rule of the evidences from multiple sources, e.g. expert knowledge and measurement data, together with the modeling of the conflict between them. In this work, we compare the two frameworks in the context of the considered bridge problem.