

Reliability Estimation of Bridge Structures with Updated Finite Element Models

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Abstract : Assessment of structural reliability is essential for efficient use of civil infrastructure which is subjected hazardous events. Dynamic analysis of finite element models is a commonly used tool to simulate structural behavior and estimate its performance accordingly. However, theoretical models purely based on preliminary assumptions and design drawings may deviate from the actual behavior of the structure. This study proposes up-to-date reliability estimation procedures which engages actual bridge vibration data modifying finite element models for finite element model updating and performing reliability estimation, accordingly. The proposed method utilizes vibration response measurements of bridge structures to identify modal parameters, then uses these parameters to calibrate finite element models which are originally based on design drawings. The proposed method does not only show that reliability estimation based on updated models differs from the original models, but also infer that non-updated models may overestimate the structural capacity.

Keywords : earthquake engineering, engineering vibrations, reliability estimation, structural health monitoring

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