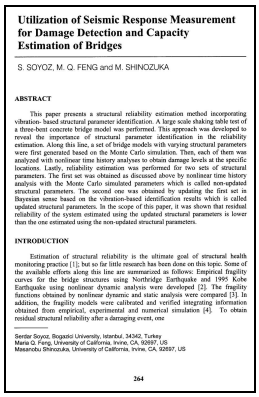

Utilization of Seismic Response Measurement for Damage Detection and Capacity Estimation of Bridges

S. SOYOZ, M. Q. FENG and M. SHINOZUKA

ABSTRACT

This paper presents a structural reliability estimation method incorporating vibration- based structural parameter identification. A large scale shaking table test of a three-bent concrete bridge model was performed. This approach was developed to reveal the importance of structural parameter identification in the reliability estimation. Along this line, a set of bridge models with varying structural parameters were first generated based on the Monte Carlo simulation. Then, each of them was analyzed with nonlinear time history analyses to obtain damage levels at the specific locations. Lastly, reliability estimation was performed for two sets of structural parameters. The first set was obtained as discussed above by nonlinear time history analysis with the Monte Carlo simulated parameters which is called non-updated structural parameters. The second one was obtained by updating the first set in Bayesian sense based on the vibration-based identification results which is called updated structural parameters. In the scope of this paper, it was shown that residual reliability of the system estimated using the updated structural parameters is lower than the one estimated using the non-updated structural parameters.

INTRODUCTION

Estimation of structural reliability is the ultimate goal of structural health monitoring practice [1], but so far little research has been done on this topic. Some of the available efforts along this line are summarized as follows: Empirical fragility curves for the bridge structures using Northridge Earthquake and 1995 Kobe Earthquake using nonlinear dynamic analysis were developed [2]. The fragility functions obtained by nonlinear dynamic and static analysis were compared [3]. In addition, the fragility models were calibrated and verified integrating information obtained from empirical, experimental and numerical simulation [4]. To obtain residual structural reliability after a damaging event, one

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Ключевые слова:

Содержание.