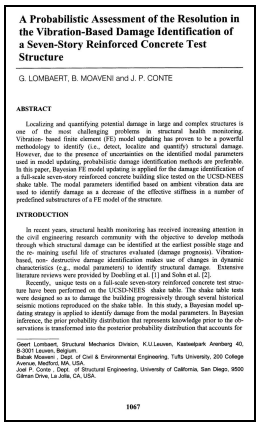

A Probabilistic Assessment of the Resolution in the Vibration-Based Damage Identification of a Seven-Story Reinforced Concrete Test Structure

G. LOMBAERT, B. MOAVENI and J. P. CONTE

ABSTRACT

Localizing and quantifying potential damage in large and complex structures is one of the most challenging problems in structural health monitoring. Vibration- based finite element (FE) model updating has proven to be a powerful methodology to identify (i.e., detect, localize and quantify) structural damage. However, due to the presence of uncertainties on the identified modal parameters used in model updating, probabilistic damage identification methods are preferable. In this paper, Bayesian FE model updating is applied for the damage identification of a full-scale seven-story reinforced concrete building slice tested on the UCSD-NEES shake table. The modal parameters identified based on ambient vibration data are used to identify damage as a decrease of the effective stiffness in a number of predefined substructures of a FE model of the structure.

INTRODUCTION

In recent years, structural health monitoring has received increasing attention in the civil engineering research community with the objective to develop methods through which structural damage can be identified at the earliest possible stage and the re- maining useful life of structures evaluated (damage prognosis). Vibration-based, non- destructive damage identification makes use of changes in dynamic characteristics (e.g., modal parameters) to identify structural damage. Extensive literature reviews were provided by Doebling et al. [1] and Sohn et al. [2].

Recently, unique tests on a full-scale seven-story reinforced concrete test structure have been performed on the UCSD-NEES shake table. The shake table tests were designed so as to damage the building progressively through several historical seismic motions reproduced on the shake table. In this study, a Bayesian model updating strategy is applied to identify damage from the modal parameters. In Bayesian inference, the prior probability distribution that represents knowledge prior to the observations is transformed into the posterior probability distribution that accounts for

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Ключевые слова:

Содержание.