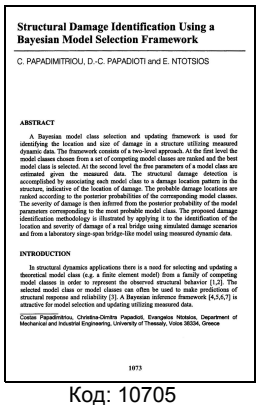
Structural Damage Identification Using a Bayesian Model Selection Framework

C. PAPADIMITRIOU, D.-C. PAPADIOTI and E. NTOTSIOS

ABSTRACT

A Bayesian model class selection and updating framework is used for identifying the location and size of damage in a structure utilizing measured dynamic data. The framework consists of a two-level approach. At the first level the model classes chosen from a set of competing model classes are ranked and the best model class is selected. At the second level the free parameters of a model class are estimated given the measured data. The structural damage detection is accomplished by associating each model class to a damage location pattern in the structure, indicative of the location of damage. The probable damage locations are ranked according to the posterior probabilities of the corresponding model classes. The severity of damage is then inferred from the posterior probability of the model parameters corresponding to the most probable model class. The proposed damage identification methodology is illustrated by applying it to the identification of the location and severity of damage of a real bridge using simulated damage scenarios and from a laboratory singe-span bridge-like model using measured dynamic data.

INTRODUCTION

In structural dynamics applications there is a need for selecting and updating a theoretical model class (e.g. a finite element model) from a family of competing model classes in order to represent the observed structural behavior [1,2]. The selected model class or model classes can often be used to make predictions of structural response and reliability [3]. A Bayesian inference framework [4,5,6,7] is attractive for model selection and updating utilizing measured data.

Costas Papadimitriou, Christina-Dimitra Papadioti, Evangelos Ntotsios, Department of Mechanical and Industrial Engineering, University of Thessaly, Volos 38334, Greece

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C. Papadimitriou, D.-C. Papadioti, E. Ntotsios

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Ключевые слова:

Содержание.