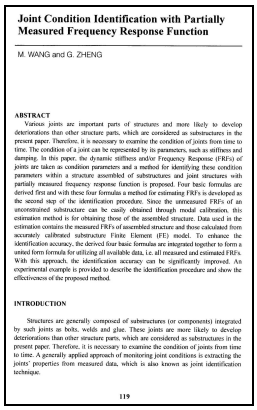
Joint Condition Identification with Partially Measured Frequency Response Function

M. WANG and G. ZHENG

ABSTRACT

Various joints are important parts of structures and more likely to develop deteriorations than other structure parts, which are considered as substructures in the present paper. Therefore, it is necessary to examine the condition of joints from time to time. The condition of a joint can be represented by its parameters, such as stiffness and damping. In this paper, the dynamic stiffness and/or Frequency Response (FRFs) of joints are taken as condition parameters and a method for identifying these condition parameters within a structure assembled of substructures and joint structures with partially measured frequency response function is proposed. Four basic formulas are derived first and with these four formulas a method for estimating FRFs is developed as the second step of the identification procedure. Since the unmeasured FRFs of an unconstrained substructure can be easily obtained through modal calibration, this estimation method is for obtaining those of the assembled structure. Data used in the estimation contains the measured FRFs of assembled structure and those calculated from accurately calibrated substructure Finite Element (FE) model. To enhance the identification accuracy, the derived four basic formulas are integrated together to form a united form formula for utilizing all available data, i.e. all measured and estimated FRFs. With this approach, the identification accuracy can be significantly improved. An experimental example is provided to describe the identification procedure and show the effectiveness of the proposed method.

INTRODUCTION

Structures are generally composed of substructures (or components) integrated by such joints as bolts, welds and glue. These joints are more likely to develop deteriorations than other structure parts, which are considered as substructures in the present paper. Therefore, it is necessary to examine the condition of joints from time to time. A generally applied approach of monitoring joint conditions is extracting the joints' properties from measured data, which is also known as joint identification technique.

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Ключевые слова:

Содержание.