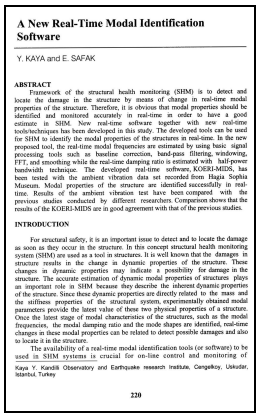

A New Real-Time Modal Identification Software

Y. KAYA and E. SAFAK

ABSTRACT

Framework of the structural health monitoring (SHM) is to detect and locate the damage in the structure by means of change in real-time modal properties of the structure. Therefore, it is obvious that modal properties should be identified and monitored accurately in real-time in order to have a good estimate in SHM. New real-time software together with new real-time tools/techniques has been developed in this study. The developed tools can be used for SHM to identify the modal properties of the structures in real-time. In the new proposed tool, the real-time modal frequencies are estimated by using basic signal processing tools such as baseline correction, band-pass filtering, windowing, FFT, and smoothing while the real-time damping ratio is estimated with half-power bandwidth technique. The developed real-time software, KOERI-MIDS, has been tested with the ambient vibration data set recorded from Hagia Sophia Museum. Modal properties of the structure are identified successfully in real-time. Results of the ambient vibration test have been compared with the previous studies conducted by different researchers. Comparison shows that the results of the KOERI-MIDS are in good agreement with that of the previous studies.

INTRODUCTION

For structural safety, it is an important issue to detect and to locate the damage as soon as they occur in the structure. In this concept structural health monitoring system (SHM) are used as a tool in structures. It is well known that the damages in structure results in the change in dynamic properties of the structure. These changes in dynamic properties may indicate a possibility for damage in the structure. The accurate estimation of dynamic modal properties of structures plays an important role in SHM because they describe the inherent dynamic properties of the structure. Since these dynamic properties are directly related to the mass and the stiffness properties of the structural system, experimentally obtained modal parameters provide the latest value of these two physical properties of a structure. Once the latest stage of modal characteristics of the structures, such as the modal frequencies, the modal damping ratio and the mode shapes are identified, real-time changes in these modal properties can be related to detect possible damages and also to locate it in the structure.

The availability of a real-time modal identification tools (or software) to be used in SHM systems is crucial for on-line control and monitoring of

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A New Real-Time Modal Identification Software

Издательство DEStech Publications, Lancaster, 2010 год

6 стр; формат: 23,5 x 16 см; библиографический список: 10 единиц
ISBN: 978-1-60595-024-2

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Ключевые слова:

Содержание.

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