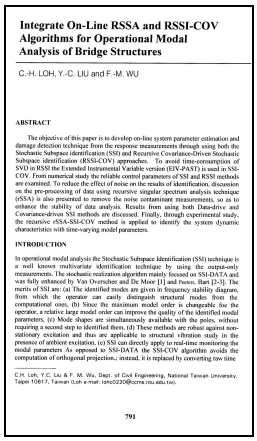

Integrate On-Line RSSA and RSSI-COV Algorithms for Operational Modal Analysis of Bridge Structures

C.-H. LOH, Y.-C. LIU and F.-M. WU

ABSTRACT

The objective of this paper is to develop on-line system parameter estimation and damage detection technique from the response measurements through using both the Stochastic Subspace identification (SSI) and Recursive Covariance-Driven Stochastic Subspace identification (RSSI-COV) approaches. To avoid time-consumption of SVD in RSSI the Extended Instrumental Variable version (EIV-PAST) is used in SSI-COV. From numerical study the reliable control parameters of SSI and RSSI methods are examined. To reduce the effect of noise on the results of identification, discussion on the pre-processing of data using recursive singular spectrum analysis technique (rSSA) is also presented to remove the noise contaminant measurements, so as to enhance the stability of data analysis. Results from using both Data-drive and Covariance-driven SSI methods are discussed. Finally, through experimental study, the recursive rSSA-SSI-COV method is applied to identify the system dynamic characteristics with time-varying model parameters.

INTRODUCTION

In operational modal analysis the Stochastic Subspace Identification (SSI) technique is a well known multivariate identification technique by using the output-only measurements. The stochastic realization algorithm mainly focused on SSI-DATA and was fully enhanced by Van Overschee and De Moor [1] and Peeters, Bart [2-3]. The merits of SSI are: (a) The identified modes are given in frequency stability diagram, from which the operator can easily distinguish structural modes from the computational ones. (b) Since the maximum model order is changeable foe the operator, a relative large model order can improve the quality of the identified modal parameters, (c) Mode shapes are simultaneously available with the poles, without requiring a second step to identified them, (d) These methods are robust against non-stationary excitation and thus are applicable to structural vibration study in the presence of ambient excitation, (e) SSI can directly apply to real-time monitoring the modal parameters As opposed to SSI-DATA the SSI-COV algorithm avoids the computation of orthogonal projection.; instead, it is replaced by converting raw time

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Ключевые слова:

Содержание.