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Operational modal analysis for slow linear time-varying structures based on moving window second order blind identification

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Abstract:

Second order blind identification (SOBI) attracts widespread attention and becomes a promising method for the estimation of operational modal parameters. However, it is a statistical modal analysis method and only suited for time invariant operational modal parameters identification of stationary random vibration response signal from linear time invariant (LTI) structures. In consideration of non-stationary random vibration response signal from linear time variant (LTV) structures, a new algorithm based on moving-window second order blind identification (MWSOBI) is presented for time-varying transient operational modal parameters identification for LTV structures. After the appropriate size of moving window had been selected, the time-varying transient modal frequencies and mode shapes could be identified effectively only from non-stationary vibration response signals. The simulation results of mass time-varying three-degree-of-freedom (DOF) and cantilever beam prove that this new method can identify the modal shapes and natural frequencies of LTV structure only from non-stationary vibration response signals and the performance of identification is much better than moving window independent component analysis (ICA).

Keywords: Operational modal analysis; Time-varying transient; Liner time-varying structure; Second order blind identification; Moving-window; Independent component analysis

1. Introduction

Operational modal analysis (OMA) copes with the extraction of modal parameters (mode damping ratio, mode shape and modal frequency) from vibration data acquired

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