Structural Damage Assessment Through A New Generalized Autoencoder With Features In Quefrency Domain

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Recently, powerful and efficient data-driven approaches have been increasingly employed in Structural Health Monitoring (SHM) to extract Damage Sensitive Features (DSFs) from the monitored dynamic response of structures. In the present study, a New Generalized Auto-Encoder (NGAE) architecture, integrated with a statistical-pattern-recognition-based approach that uses the power cepstral coefficients of structural acceleration responses as DSFs, is proposed for the structural damage assessment. The NGAE is able to be well-generalized in terms of the component of the cepstral coefficients that represent the structural properties of the overall system thanks to a newly defined input-output mapping. The cepstral coefficients used can greatly simplify the structure of the network, and therefore, significantly accelerate the training speed with very few computational requirements. The effectiveness of the proposed method has been validated by both simulated and real-life examples.