Damage detection and localization based on outlying residuals

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Abstract

A method based on outlier identification in model prediction errors is introduced for locating damage in space and time. The technique eliminates the need for explicit information about the response of a healthy system. It only requires that the healthy system be described by a predictive model. This technique can be combined with a previously published method based solely on moment statistics of the prediction errors. In combination, these techniques provide extremely reliable damage identification and localization without explicit baseline information. The power of the method lies in the ability to incorporate virtually any predictive model to adequately characterize the measured signals. Once this adequate model is available, and prediction errors are calculated, outlier tests can be used to pinpoint the location in space and time where that damage signature occurs. The technique is illustrated using benchmark data from Los Alamos National Laboratory available through the internet.