A new data assimilation framework using the modified Constitutive Relation Error for online structural monitoring: application to shaking-table experiments

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Recently, a first step towards the integration of numerical models in shaking-tables control strategy has been performed in [1] where an offline model updating framework based on the minimization of a *modified Constitutive Relation Error* functional (mCRE) has been tailored to low-frequency dynamics. Following the strategy proposed by [2], we address here sequential data assimilation by integrating the mCRE as new observer within a dual Unscented Kalman filter, leading to a new *modified Dual Kalman filter* algorithm (MDKF). After being validated using synthetic data, the methodology has successfully processed actual measurements of the SMART2013 benchmark. In the latter is emphasized the possibility to perform real-time monitoring of complex structures undergoing nonlinear phenomena (see FIG. 1). The good correlation with former identification results [1] illustrates the relevance of this new approach for online structural monitoring and suggests promising use of MDKF for adaptive control design purposes.
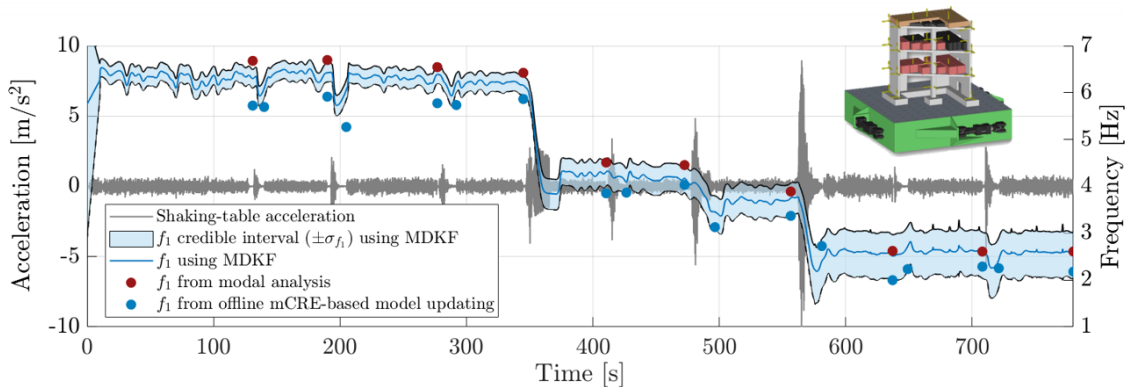

Figure 1: Tracking the first eigenfrequency of the SMART2013 specimen using MDKF.

REFERENCES

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