Damage Identification Using Machine Learning And Data Assimilation Techniques

E. Lopez, G. Quaranta, E. Abisset-Chavanne and F. Chinesta
ICI Institute
Ecole Centrale Nantes
1 rue de la Noe, BP 92101, F-44321 Nantes cedex 3, France
elena.lopez-tomas@ec-nantes.fr

ABSTRACT

In spite of the very recent developments achieved by model order reduction techniques, real-time decision-making is still difficult to perform from modeling-based simulations.

Manifold learning techniques allow to take real-time decisions in order to control processes, but it is necessary to extract information and knowledge from real or synthetic data in order to build the solution manifold and to extract the non-correlated parameters defining the manifold dimensionality. Then, as soon as new data is available, it can be checked in real time if it belongs or not to the solution manifold; if yes, the solution can be interpolated from the neighboring data without requiring further calculation/simulation, allowing real-time decision making. Furthermore, data assimilation can be applied in the initial data in order to extend everywhere the information collected at some points (minimum number and optimally placed), reducing considerably the computation cost.

The following work is focused in the damage identification and location of a structure in the context of Health Monitoring, using manifold learning techniques. Data assimilation is used on the original time series (synthetic data) to be able to speed-up even more the process.

REFERENCES
