Verification and validation for fast simulation of acoustics and electro-magnetics including data assimilation

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ABSTRACT

Fast, reliable and robust simulations are a major goal for industrial competitiveness. Once feasible computations for the desired problem are available, verification and validation (V&V) techniques assess reliability of both model and numerical approximation. V&V is an essential approach to modern computational mechanics for industrial problems, aiming at certifying that 1) the model corresponds to the physical reality (Validation) and 2) the numerical solution is accurate enough to meet the requirements of the end user (Verification). However, both input data and measurements used for validation are most times subject to uncertainties that have to be also accounted for in the model. The reduced order solutions in multi-parametric setups (*computational vademecums*) allow solving problems with a large number of stochastic dimensions describing uncertainty.

In this project we will develop a methodology able to estimate the verification and validation error [1] in a parametrized order reduction method, the Proper Generalized Decomposition (PGD) [2], for equilibrium engineering problems. This numerical strategy will then be validated by quantifying the uncertainty of the outputs in simulations of acoustics and electro-magnetics problems of industrial interest by means of software tools provided by ESI group and, particularly, in the framework of realistic problems for ADAS (Advanced Driver Assistance Systems).

The basic methodologies discussed in this research are

- Error estimation in the *computational vademecums* provided by PGD.
- Model adaptation via data assimilation in the *vademecum*.
- Uncertainty Quantification (UQ) for wave problems.

REFERENCES

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