CERTIFICATION OF SIMULATIONS & MODEL ADAPTATION

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ABSTRACT

Advances in computational science and engineering have allowed scientists to perform simulations that involve increasingly complex multi-physics and multiscale problems. However, in order to make reliable predictions and suitable decision-making, an essential task is to assess the accuracy of the predictions and design suitable adaptive strategies.

The topic of error estimation and adaptation, globally referred to as model verification, goes now far beyond classical discretization error assessment and mesh refinement. It also encompasses adaptive modeling, whose main objective is to adaptively enrich surrogate models derived, for instance, from homogenization techniques, model reduction, or response surface techniques. It further involves novel topics relevant to engineering applications, such as goal-oriented procedures, the assessment of errors due to the modeling of uncertainty, the control of simulation complexity in order to perform real-time simulations for optimization or online command of systems, or model adaptation from experimental data.

Objectives of the mini-symposium will be to present both latest fundamental contributions to error estimation and adaptive methods, as well as new developments in all aspects of computational mechanics and applied mathematics, in relation to emerging applications in which model adaptivity and control are of primal importance. We anticipate contributions on the following topics:

- Estimation of discretization and modeling errors for linear, nonlinear, coupled, or time-dependent problems;
- Stability, convergence, and optimality analysis of adaptive methods;
- Goal-oriented approaches;
- Control of hierarchical, reduced-order, and multiscale modeling strategies;
- Error estimation and adaptive schemes for uncertainty quantification and optimal control;
- Applications of methods to linear, nonlinear, coupled, or time-dependent problems;
- Model enrichment from data (e.g. full-field measurements and data assimilation);
- Use of adaptive techniques in the industrial context and for specific applications such as biomedical engineering.