14th World Congress on Computational Mechanics (WCCM XIV)
8th European Congress on Computational Methods in Applied Science and Engineering (ECCOMAS 2020)
July 19- 24, 2020, Paris, France

MULTILEVEL/MULTIFIDELTY STRATEGIES FOR UNCERTAINTY QUANTIFICATION, CONTROL AND DESIGN UNDER UNCERTAINTY OF EXPENSIVE COMPUTATIONAL SYSTEMS

TRACK NUMBER 800

GIANLUCA GERACI[*], ALEX A. GORODETSKY[†], MICHAEL S. ELDRED[*] AND JOHN D. JAKEMAN[*]

[*] Sandia National laboratories
P.O. Box 5800, Albuquerque, NM 87185
{ggeraci,mseldre,jdjakem}@sandia.gov

[†] University of Michigan
1320 Beal Avenue Ann Arbor, MI 48109-2140
goroda@umich.edu

Key words: Uncertainty Quantification, Multilevel, Multifidelity, Optimization Under Uncertainty

ABSTRACT

In the last decades, the advancements in both computer hardware/architectures and scientific computing algorithms enabled engineers and scientists to more rapidly study and design complex systems by heavily relaying on numerical simulations. Uncertainty Quantification (UQ) evolved as a task within the most comprehensive Verification and Validation framework which aims at obtaining truly predictive numerical simulations. Despite the recent efforts and successes in advancing the algorithms' efficiency, the combination of an extremely large computational cost associated to the evaluation of an high-fidelity model and the presence of a moderate/large set of uncertainty parameters (often correlated to the complexity of the numerical/physical assumptions) still represents a formidable challenge for UQ. One of the possible ways of circumventing this difficulty and copying with a limited computational budget is to rely on the multilevel/multifidelity concepts. The core idea of these strategies is to increase the accuracy of the UQ analysis (and therefore of any workflow based on UQ) by adding a possibly large set of lower fidelity/lower expensive evaluations to a limited set of high-fidelity evaluations.

In this minisymposium we welcome contributions related to the broad area of multifidelity UQ. We welcome contributions related to both surrogate- and sampling-based approaches. The scope of the minisymposium is also to represent more general workflows in which multifidelity UQ is also a key enabler. For instance, we will also consider contributions focused on control under uncertainty, optimization under uncertainty and sensitivity analysis of complex engineering systems.