



## Model reduction, data-based and advanced discretization in computational mechanics

## Foreword



The present volume groups a choice of contributions issued from the biannual encounters of the Franco–Spanish scientific community of computational methods in applied sciences and engineering, held in Jaca (Spain). During this third workshop (after the two first, held in Jaca in 2013 and Biarritz in 2015), we took the opportunity to pay tribute to our colleague and friend Pierre Villon, on the occasion of his retirement and subsequent appointment as emeritus professor at the “Université de technologie de Compiègne” (France).

The range of topics covers a vivid scope of recent research subjects, on the frontier between applied mathematics and computational mechanics. The contributions range from the fundamentals of solid mechanics, and PDE revisited, through the physical interpretation of numerical models, mathematical foundations of reduced-order modeling up to methodological developments in time and parametric domains.

The issue includes eleven contributions from both sides of the Pyrenees. Model order reduction methods play a fundamental role in many of them. For instance, proper generalized decompositions (PGDs) are the main topic of the works by A. Leon and coworkers, who present a PGD version based upon wavelets, or of the contribution by P. Díez et al., who describe an algebraic version of PGDs.

More fundamental issues of model order reduction are covered in the contributions by A. Falcó et al., who present a geometrical interpretation of reduction of dynamical systems, or the work by C. Paillet et al., who analyze the possibility of employing PGD for problems with a large number of parameters. A. Madra et al. present a work on diffuse manifold interpolation, while A. Cosimo et al. present a work on hyper-reduction methods.

Application of model order reduction to industrial processes is the main topic of the work by N. Bur et al., while, on a more general setting, A. Boujelben and A. Ibrahimovic present a paper on finite element formulation for large strains in nonlinear dynamics, E. Nadal and coworkers discuss the physical sense of fractional derivatives, while M.H. Malik et al. propose a new formulation of parametric dynamics within the PGD framework. Finally, J. Yang et al. present a work on the application of Taylor series to the derivation of fundamental solutions to PDEs.

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