Non-intrusive Reduced Order Modelling Approaches

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ABSTRACT

In the last decade, Reduced Order Modelling (ROM) methods have captured the attention of many researchers thanks to their potential for easing the solution of practical engineering problems such as part design, process optimization or inverse model fitting [1,2]. They have been applied to a wide variety of fields in computational mechanics achieving in many cases impressive time savings. However, a number of open questions remain unsolved, one of them being their high *algorithmic intrusivity*. ROM methods usually require of specific codes not always easy to implement within standard simulation codes, based in the finite elements method for instance. This issue precludes ROM methods from being massively used at the industrial scale. In this work, we formulate new ROM techniques so as to reduce or even suppress the *algorithmic intrusivity*. These are based on the use of local-global separated representations thus yielding a compact representation format for the solution. We also show the connections of these approaches with domain decomposition methods and show their suitability for parallel implementations.

REFERENCES

[1] A. Quarteroni, A. Manzoni and F. Negri, *Reduced Basis Methods for Partial Differential Equations: An Introduction*, Springer International Publishing (2015).
[2] F. Chinesta, A. Leygue, F. Bordeu, J.V. Aguado, E. Cueto, D. Gonzalez, I. Alfaro, A. Ammar and A. Huerta, "PGD-based Computational Vademecum for efficient design, optimization and control", *Arch. Comput. Methods Eng.*, **20**, 31-59 (2013).