The sparse Proper Generalized Decomposition as a tool to generate response surfaces. - Coupled Problems 2019

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ABSTRACT

Design and prototyping of new components have become a crucial step in most research and development teams. For instance, a drastic drag force reduction can be achieved if the external body shape is optimized. Nevertheless, the more parameters controlling the design, the more evaluations are required to obtain a good candidate. This procedure can be solved by predicting a response surface from the information at certain points. Indeed, efficient interpolation techniques are of great interest when computing points of the response surface is very costly. The choice of a good basis plays an important role in the accuracy of the reconstructed response, i.e. if the basis is chosen in a smart way; the number of query points to achieve a certain amount of accuracy can be reduced drastically.

In the present work, we will explore the possibility of introducing model order reduction techniques in order to provide new interpolation methods to construct response surfaces. More in detail, the Proper Generalized Decomposition method, where a specific tensorial separated representation is purchased, allows to explore the parametric space in a very efficient way uncoupling each one of the parametric dimensions. The standard rationale of the PGD is adapted to work with randomly collocated points in order to create efficient response surfaces. Finally, some examples of the algorithm applied to industrial applications will be discussed.

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