11th World Congress on Computational Mechanics (WCCM XI)
5th European Conference on Computational Mechanics (ECCM V)
6th European Conference on Computational Fluid Dynamics (ECFD VI)
July 20 - 25, 2014, Barcelona, Spain

ON THE PGD-BASED MODEL ORDER REDUCTION IN STRUCTURAL AND FLUID MECHANICS: A STEP FORWARD PARAMETRIC FSI

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Key Words: *Model Order Reduction, PGD, FSI, Dynamics*

In this work we revisit the recent advances in the PGD-based model order reduction of structural mechanics models where both static and dynamic models will be solved in a parametric framework.

In the static case and in the case of a punctual load it can be represented from its intensity, direction and the point in which it applies. All these parameters could be considered as extra-coordinates and then computing the general parametric solution, that is the solution for each possible load applying on the structure, by applying the PGD technique whose separated representation allows circumventing the curse of dimensionality [1]. Material properties can be also added as extra-coordinates for calculating a more general computational vademecum.

In the dynamic case we can consider space-time or space-frequency descriptions. The first is suitable for computing transient responses whereas the second one is more appropriate in the case of loads evolving in time as soon as the initial transient response is no more present in the system response. In this case frequency, material parameters, … can be considered as extra-coordinates in both the linear and non-linear framework.

On the other hand when focusing in fluid mechanics we will discuss different approaches raging from the standard space-time separated representation of Navier-Stokes equations [2] to the solution of nonlinear complex and coupled fluid flow models combining many model order reduction ingredients (separation of the physical space, introduction of fluid and flow parameters as extra-coordinates, …).

From both bricks, we will discuss finally their potential coupling in a sort of parametric fluid-structure interaction model.

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