

# On the Dynamic Data-Driven Simulation of Coupled Models

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## ABSTRACT

Dynamic Data-Driven Application Systems – DDDAS – appear as a new paradigm in the field of applied sciences and engineering, and in particular in simulation-based engineering sciences. By DDDAS we mean a set of techniques that allow the linkage of simulation tools with measurement devices for real-time control of systems and processes.

DDDAS entails the ability to dynamically incorporate additional data into an executing application, and in reverse, the ability of an application to dynamically steer the measurement process. DDDAS needs for accurate and fast simulation tools making use if possible of off-line computations for limiting as much as possible the on-line computations.

We could define efficient solvers by introducing all the sources of variability as extra-coordinates in order to solve off-line only once the model to obtain its most general solution to be then considered in on-line purposes. However, such models result defined in highly multidimensional spaces suffering the so-called curse of dimensionality.

We proposed recently a technique, the Proper Generalized Decomposition – PGD-, able to circumvent the redoubtable curse of dimensionality. The marriage of DDDAS concepts and tools and PGD off-line computations could open unimaginable possibilities in the field of dynamics data-driven application systems.

In this work we explore some possibilities in the context of coupled models. The parametric modeling of coupled models constitutes an opportunity for addressing on-line inverse analysis of optimization of usual multiphysics models. In our former works we have investigated the DDDAS applied to linear [1] or non linear [2] dynamical systems as well as to models described by linear or non-linear partial differential equations [3]. In the present work we generalized the approach for addressing coupled models.

## REFERENCES

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