

Model reduction for numerical simulation and real-time data assimilation

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Predicting the behaviour of certain phenomena, when they evolve freely or when one tries to control them, is important in many situations, particularly within industries. Numerical simulation is one of the tools whose importance was certified and amplified in the second half of the last century. However, we are still trying to be more accurate, faster and more reliable. In this context, the multiplication of data associated with the phenomenon of interest feeds in the models as a substantial asset: whether these data are incorporated in real time or before implementation. The reduced basic techniques that we will present are one of the means to gain in speed and reliability by preserving accuracy, combined with data assimilation, even noisy, they allow to propose paradigms that supplement the imperfection of the models and thus allow to gain in relevance for the state description prediction and control. Their effective implementation allows them to be integrated into digital twins, which are important for predicting, optimizing and controlling processes.