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COUPLED MULTIPHYSICS PROBLEMS AND REDUCED ORDER METHODS APPLIED TO COMPUTE DIGITAL TWIN MODELS IN INDUSTRIAL APPLICATIONS

TRACK NUMBER 1200 - "MODELING AND ANALYSIS OF REAL WORLD AND INDUSTRY APPLICATIONS"

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ABSTRACT

Currently, the competitiveness of any product or process in the industry depends strongly on efficient and optimal design, production, and deployment phases in any area of key technologies. To obtain these goals, simulation and optimization of virtual products and processes (also known as "digital twins") are highly and intensively used. Hence, the mathematical representation of real physical products and processes via partial differential and algebraic equations is the basis for this kind of reliable and accurate simulation and optimization methodology.

However, to handle real-world scenarios which are relevant for industrial applications, the required mathematical models involve coupled multiphysics problems (such as fluid-structure interactions, aeroacoustics phenomena, thermo-mechanical behaviours, etc.). Due to their complexity, the coupling features should be modelled adequately, and consequently, the numerical methods used to compute accurate approximated solutions demand high computational costs. Moreover, standard numerical methods fail to provide real-time simulation tools and hence, the use of reduced order models is a must for designing computational tools, which are potentially applicable in real-world industrial problems.

This minisymposium is focused on the last advances of mathematical modelling techniques to handle coupled multiphysics phenomena and the use of reduced order techniques to design efficient numerical methods to compute real-world scenarios. A particular emphasis is on those discrete algorithms combining analytical techniques with data driven approaches.