The role of model order reduction in ICME

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ABSTRACT

The current and potential role of model-order reduction (MOR) techniques is analyzed within the ICME framework. The requirements in terms of computational power and memory needed to deal with ICME points to the use of efficient (compact, fast and accurate) computational approaches. MOR encompasses several techniques for achieving this efficiency. These techniques have been developed in several fields of Science and Engineering with specific aims and scopes. This heterogeneous origin hinders the generation of a systematic and global classification. The methodology applied here to review available techniques is based on the cross-correlation and critical overview of the state-of-the-art in Computer-Aided Engineering, Multiscale Material Modeling and Big Data Analysis. This global perspective should facilitate the exchange of MOR techniques across fields and the development of unified approaches. Due to the intrinsic multiscale nature of MOR techniques when applied to material engineering, this review may stimulate the development of new ideas to expand the definition of current simulation approaches by including information from other scales.