

Virtual charts for advanced engineering design of materials, processes and structures for aerospace applications

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In aerospace design many scenarios must be considered and this task is very expensive from a computational viewpoint. Moreover, the design space is too large for considering its exhaustive exploration. Only coarse samplings of the parametric spaces are performed. Thus designers consider very experienced materials, manufacturing processes and loading scenarios in order to guarantee a fast enough design and in consequence the resulting designs remain suboptimal. Nowadays, aerospace industry is using materials and processes that are, for most of them, 30 years old. New designs and new design framework are urgently needed, allowing exploring regions of the design space never until now explored. Real time analysis of complex systems is compulsory for making possible real time decision-making that needs the evaluation of many possible scenarios under the real time constraint. These apparently contradictory requirements, the real time evaluation of system responses based on high fidelity models and the suitability of running these applications and tools in light computational devices, could be possible if we generate off-line a sort of a virtual chart containing the solution of the model under consideration for all the possible design scenarios and then use it on-line for decision-making purposes. These virtual charts, defined by using the PGD that we introduced some years ago, allow real time optimization of complex problems, uncertainty quantification, simulation-based control and real-time simulation on deployed platforms.

Biography

Francisco Chinesta, born in 1966 in Valencia (Spain), is currently Professor of Computational Mechanics at Ecole Centrale of Nantes (France) and titular of the EADS Corporate Foundation International Chair on Advanced Modeling of Materials and processes. He received many awards. He is author of more than 200 papers and hundreds of contributions in international conferences, having given 70 plenary lectures. In 2011 he was nominated senior member of the prestigious "Institut Universitaire de France". He is editor in chief of the International Journal of Material Forming (Springer) and belongs to the editorial board of different journals.

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