

RECENT TRENDS IN SCIENTIFIC COMPUTING FOR COMPUTATIONAL FLUID DYNAMICS AND SOLID MECHANICS

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ABSTRACT

The aim of this minisymposium is to discuss and to share recent ideas from Scientific Computing, particularly w.r.t. special numerical techniques and computational algorithms for the efficient treatment of partial differential equations (PDEs) that arise in the simulation of problems from computational fluid dynamics (CFD) as well as computational solid mechanics (CSM). The presented approaches shall address new ideas regarding future high performance computing environments which will be in the exascale range and which will include massively parallel, heterogeneous architectures together with specific accelerator hardware (GPUs, TPUs, FPGAs) including reduced arithmetic precision. The minisymposium will also concentrate on methods and their foundations, such as advanced discretization techniques and efficient parallel solution algorithms, and will highlight the interplay of these aspects with computational and algorithmic tools and particularly their realization in software. We shall discuss, for instance, aspects regarding hardware-oriented numerics [1], energy-efficient mathematical approaches, numerical machine learning techniques together with artificial neural networks, numerical cloud computing, and massively parallel asynchronous solvers [2]. Other aspects to be discussed are nonlinear domain decomposition methods [3] and extremely scalable numerical homogenization methods.

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