NextSim: Next generation of industrial aerodynamic simulation code

Description

NextSim partners, as fundamental European players in Aeronautics and Simulation, recognise that there is a need to increase the capabilities of current Computational Fluid Dynamics tools for aeronautical design by re-engineering them for extreme-scale parallel computing platforms. The backbone of NextSim is centred on the fact that, today, the capabilities of leading-edge emerging HPC architectures are not fully exploited by industrial simulation tools. Current state-of-the-art industrial solvers do not take sufficient advantage of the immense capabilities of new hardware architectures, such asstreaming processors or many-core platforms. A combined research effort focusing on algorithms and HPC is the only way to develop and advance simulation tools to meet the needs of the European aeronautical industry. NextSimwill focus on the development of the numerical flow solver CODA (Finite Volume and high-order discontinuous Galerkinschemes), that will be the new reference solver for aerodynamic applications inside AIRBUS group, having a significantimpact in the aeronautical market. To demonstrate NextSim market impact, AIRBUS has defined a series of market relevant problems. The numerical simulation of those problems is still a challenge for the aeronautical industry and their solution, requiring accuracy and affordable computational costs, is still not possible with the current industrial solvers. Following this idea, three additional working areas are proposed in NextSim: algorithms for numerical efficiency, algorithms for data management and the efficiency implementation of those algorithms in the most advanced HPC platforms. Finally, NextSimwill provide access to project results through the mini-apps concept, small pieces of software, seeking synergies with opensourcecomponents, which demonstrate the use of the novel mathematical methods and algorithms developed in CODA butthat will be freely distributed to the scientific community.

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