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PERFORMANCE ANALYSIS OF PARALLEL-IN-TIME TECHNIQUES IN MODERN SUPERCOMPUTERS

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Being able to simulate faster and bigger cases in Computational Fluid Dynamics (CFD) is one of the main priorities within the field, and is usually faced with an increment in the number of computing units. As the benefit ceases with a large enough number of nodes, some alternatives should be considered.

To increment the number of usable computing units while maintaining a similar parallel efficiency, applying ensemble averaging in the framework of a parallel-in-time simulation can be used, following the works from Krasnopolsky [1]. Opposite to this paper, where only the solution of the Poisson equation was solved for all right-hand sides (RHS) simultaneously, here it is applied to the whole simulation by converting all sparse matrix-vector products, `SpMV`, to sparse matrix-matrix products, `SpMM`, following the approach from Alsalti-Baldellou et al. [2]. This concept, together with the minimal algebraic kernel set approach from the in-house code Termo Fluids Algebraic (TFA) with HPC^2 [3], allows exporting the implementation to both CPU and GPU-accelerated nodes, thus allowing testing in multiple devices without the need to change the implementation.

In the conference, an analysis of the performance of the method in different architectures, as well as discussing its pros and cons, will be provided after testing under different canonical cases in different devices.

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