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POSSIBILITIES OF REAL-TIME SOLUTIONS IN COMPUTATIONAL FLUID DYNAMIC

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Abstract. The main target of this lecture is to look for algorithms to simulate CFD problems as fast as possible, improving the current performance of general-purpose commercial codes. This goal does not mean yet obtaining Real Time CFD solution but this goal is on this way, with the aim of changing days of simulations for hours of simulations making feasible the present challenging demands of engineering design.

Even though implicit time integration schemes are preferred in the literature against explicit ones, the latter are in a better position attending to the present of hardware technology that is oriented to the usage of general purpose graphic processor units (GPGPU).

On the other hand it is not obvious that an Eulerian approach is better in terms of efficiency and accuracy than a Lagrangian one. At least in this presentation we will try to put into question this asseveration.

For this purpose we will present a pressure---segregation method with an explicit time integrator for the momentum equations without the CFL<1 restriction for stability. This allows large time steps independent of the spatial discretization having equal or better precision that an implicit integration. The method is based on a Lagrangian formulation that may be used with moving or fixed meshes.

Other technique to achieve Real Time solutions like Reduced Order Models (ROM), or solutions with regular meshes and a Fast Fourier Transform (FFT) will be also presented and compared.

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