Research

Mechanics Seminar

Spectral Optimization for Implicit Finite Volume Formulation

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Microsoft Teams - https://tinyurl.com/48fqbv82

Abstract.

In this work, the interpolation for the reconstruction of fluid flow primitive variables along the faces of control volumes in the scope of the Finite Volumes method is considered. A regular structured numerical mesh type is considered for the development of the proposed interpolation. The Taylor series expansion is carried in compact Padé schemes to define the maximum precision order of the compact scheme. An analysis in the spectral space domain is then performed to obtain the compact scheme relations of the finite difference truncation error. From the minimized error and by using at least one degree of freedom in the spectral domain of the compact scheme, the coefficients of finite differences superimposed into the control volumes mesh are obtained. From the Divergence Theorem, an equivalence between the Finite Differences and Finite Volumes is formally obtained for the determination of the compact interpolation scheme coefficients. Preliminary studies with linear and non-linear prototype governing equations show advantages over the explicit form and the finite difference method, preserving the prescribed order of precision with greater resolution for small scales, also maintaining at least one order of precision more than the finite differences method in nonlinear problems with discontinuities. The obtained interpolation method can be transposed into conformed structured meshes and of the multiblock type for multidimensional problems.