NON-UNIFORM COMPACT SCHEMES FOR PARALLEL COMPUTING

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Abstract

Here, the performance of a sixth order accurate Non-Uniform Compact Scheme (NUCS6) in a parallel framework using the domain decomposition method is analyzed. Traditional compact schemes are used for uniform grids. However, study of flows involving complicated geometries requires transformation of computational domain onto a uniform grid. Compact schemes developed for physical plane computations eliminate the need for such grid transformations. The first successful implementation of uniform compact schemes on a parallelized framework with Schwartz domain decomposition demonstrated the effect of overlap points in eliminating spurious signals at inter-processor boundaries Sengupta et al. [Jour. Comp. Phy. 220 (2007)]. This paper presents the performance of a high order non-uniform compact scheme (NUCS6) in parallel computations with the domain decomposition method. The results of the benchmark problem of flow in a 2D square lid-driven cavity at post-Hopf bifurcation Reynolds number of 10000 is presented to show how the width of overlap region affects the growth and evolution of gyrating polygonal vortex at the centre of the cavity.

Keywords: Non-uniform Grids, Compact Schemes, Parallel Computing, DNS, LDC