COMPARISON OF IMPLICIT LU-SGS SCHEMES FOR HYPERSONIC FLOWS

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Abstract. The focus of the current paper is the comparison of several types of LU-SGS schemes with explicit methods to seek out the most suitable method for various conditions and requirements. The computational efficiency and memory requirement of all the methods used in this study are investigated. Effects of mesh spacing at the wall and free-stream conditions such as density are discussed. Numerical results of 2D cylinder-wedge body and 3D complex aerodynamic configurations show that the implicit methods converge significantly faster than the class of explicit methods at the expense of additional memory requirement. The low-storage requirement, numerical stability and fast convergence rate make the DP-LUR scheme attractive for large-scale complex simulation in hypersonic viscous flows.

REFERENCES

[1] R F Chen, Z J Wang. *AIAA Journal*, Vol. 38, No. 12, 2000, pp. 2238-2245.
[2] Wright M J, Candler G V, et al. *AIAA Journal*, Vol. 34, No. 7, 1996, pp. 1371–1377.
[3] Meister A. *Journal of Computational Physics*, Vol. 140, No. 2, 1998, pp. 311–345.