Mimetic Discretizations for Computational Fluid Dynamics: One-Dimensional Case

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Preliminary results in One-dimensional fluid flow simulation based on conservative methods are presented. We exhibit six numerical schemes to solve Navier-Stokes and artificial compressibility equations, three of them are explicit and three implicit. The first uses Support-Operators method [1]; the second scheme mixes this method with Crank-Nicolson's; and the others uses Castillo-Grone 1-2-1 and 2-2-2 methods [2]. To solve the systems of linear equations obtained through implicit methods, we use the UCSparceLib library [3] which has been developed on ANSI C. Furthermore, we developed a set of tools to display results in a graphic way using OpenGL.

Referencias:

[1] M. Shashkov (1996). *Conservative Finite-Difference Methods on General Grids*. CRC Press. Florida, USA.

[2] J. Castillo and R. Grone (2003). *A Matrix Analysis Approach to Higher-Order Approximations for Divergence and Gradients Satisfying a Global Conservation Law*. SIAM J. Matrix Anal. Appl. Vol 25, No. 1, pp. 128-142.

[3] G. Larrazabal (2002). *UCSparceLib: Una Librería Numérica para la Resolución de Sistemas Lineales Dispersos*. Facultad Experimental de Ciencias y Tecnología, Departamento de Computación, Universidad de Carabobo.