

Chang, Sin-Chung

The method of space-time conservation element and solution element – a new approach for solving the Navier-Stokes and Euler equations. (English) [Zbl 0847.76062](#)
J. Comput. Phys. 119, No. 2, 295-324 (1995).

A simple unified numerical framework for solving conservation laws has been proposed. It enforces both local and global flux conservation in space and time with flux evaluation at an interface being an integral part of the solution procedure with interpolation or extrapolation. Space and time are unified and treated on the same footing. The method uses only local discrete variables. The mesh values of dependent variables and their derivatives are taken as independent variables solved simultaneously. The solution elements and conservation elements are defined in such a manner so as to result in a simplest stencil. In order to minimize numerical dissipation, a numerical analogue is constructed which is compatible with the space-time invariant properties of the corresponding physical equations. It excludes the use of characteristic-based techniques and avoids the use of adhoc techniques to a limited extent.

The approach developed has been used to solve the convection-diffusion equation and Euler equations. To illustrate the simplicity of the method, a computer program of the shock-tube-problem solver using proposed method also has been presented.

Reviewer: [S.C.Rajvanshi \(Chandigarh\)](#)

MSC:

76M25 Other numerical methods (fluid mechanics) (MSC2010)
76R99 Diffusion and convection

Cited in **5** Reviews
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Keywords:

[interpolation](#); [extrapolation](#); [local discrete variables](#); [convection-diffusion equation](#); [shock-tube-problem solver](#)

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