Sources of Cartesian Mesh induced asymmetries based upon the Lagrangian + Remap Method

A.S. Dawes[1]
[1]Computational Physics Group, AWE plc, Aldermaston, Berkshire, RG7 4PR, UK

Partial Differential Equations (PDE's), such as the Euler equations from fluid dynamics, can be solved analytically for simple idealized problems. However, for more general applications an approximate solution must be found by discretizing the PDE's. For Computational Fluid Dynamics (CFD) there are a wide variety of methods in use, both in academia and at AWE. For example, finite differences, finite volume, finite element and the Arbitrary Lagrangian Eulerian (ALE) method to name but a few.

It is well known that the discretization of the PDE's can produce inaccuracies. Experience has shown that simulating converging flow fields (such as Inertial Confinement Fusion or Noh's Problem), where Cylindrical or Spherical is important, on an Orthogonal Cartesian mesh does not maintain radial symmetry. At AWE schemes are based upon the Lagrangian + Remap method. In this paper we will consider the sources of the numerical asymmetries and ways to eliminate them.