Positivity-Preserving and Symmetry-Preserving Conservative Lagrangian Schemes for Compressible Euler Equations in 2D Cylindrical Coordinates

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In applications such as astrophysics and inertial confinement fusion, there are many three-dimensional cylindrical-symmetric multi-material problems which are usually simulated by Lagrangian schemes in the two-dimensional cylindrical coordinates. For this type of simulation, the critical issues for the schemes include keeping positivity of physically positive variables such as density and internal energy and keeping spherical symmetry in the cylindrical coordinate system if the original physical problem has this symmetry. In this talk, we will introduce our recent work on high order positivity-preserving and symmetry-preserving Lagrangian schemes solving compressible Euler equations. The properties of positivity-preserving and symmetry-preserving are proven rigorously. One- and two-dimensional numerical results are provided to verify the designed characteristics of these schemes. This is a joint work with Dan Ling and Chi-Wang Shu.