Monotone finite volume schemes for radiation diffusion equations

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In this thesis, monotone finite volume scheme is proposed for radiation diffusion equations. First, we propose a kind of positivity preserved decomposition of normal vector, and construct a nonlinear finite volume (FV) scheme for diffusion equation on star-shaped polygonal meshes which is proved to be monotone, i.e., it preserves positivity of analytical solutions for diffusion problems. The scheme has only cell-centered unknowns, treats material discontinuities rigorously, and offers an explicit expression for the normal flux. In the construction of discrete normal flux on each cell-edge, both the geometric character of distortion of cells and the feature of physical variables on that cell-edge are taken into account. Numerical results demonstrate our monotone scheme doesn't produce negative values on distorted meshes, and its accuracy is not lower than one order.

References (optional)


