

**Smoothed Particle Hydrodynamics for real gas with approximate Riemann Solver.**

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Smoothed Particle Hydrodynamics (SPH) is a Lagrangian particle method which computes fluid motion. This method is a powerful tool for problem with large deformations and large empty regions. However, classical and widely used SPH named Standard SPH has some disadvantages. Standard SPH needs artificial viscosity to calculate a shock wave precisely, and many time steps. To overcome these disadvantages, Inutsuka (2002) has presented new SPH named Godunov SPH. In this method, the force acting on each particle is determined by solving the Riemann Problem exactly. However, Godunov SPH has been applied only to ideal gas. In this presentation, we present the improved version of Godunov SPH, which can treat real gas. In this code, Riemann Problem for real gas is approximately solved. Some numerical 1D tests for real gas (e.g., water) are presented. This code is more powerful in engineering fields as well as scientific fields.