ICCM2014
28-30th July, Cambridge, England

The Robust Godunov type Upwinding Schemes To solve Multiphase Multi-Equation Models

Yang-Yao Niu

Department of Aerospace Engineering
Tamkang University, New Taipei City, Taiwan (ROC)

*Corresponding author: yyniu@mail.tku.edu.tw

The work here is proposed to solve the equilibrium and non-equilibrium multi-equation two phase flowmodel and hybrid flow model for compressible liquid-gas flows with the phase transitions effects based on the Guodnov type approximated Riemann schemes. As we know, effective field modeling of two-phase flow such as two-fluid models has provided a critical part of the foundation upon which light water (power) reactor technology was made to rest some years ago. We can envision a similarly significant role in the future as simulation capabilities are poised to meet new kinds of practical demands at the interplay between economics, safety assurance, and regulatory needs. The aim of this study is to propose a conceptual framework for addressing prediction of multiphase flows. The requirement that follows is a well-posed formulation and a high-fidelity numerical treatment that allows capturing of shocks and contact discontinuities over all flow speeds, consistently with what is physically allowable according to the density ratios involved. Also, we would like to propose robust multi-fluid scheme to simulate the flow motions of gas and liquid fluids universally. In our approach, by defining the fluids in different region and introducing inter-phasic force on cell boundary, the proposed flow models will allow the conservation laws to be applied on each phase and, therefore, it is able to capture fluid discontinuities, such as the fluid interfaces and shock waves, accurately. Several benchmark tests are included as the Ransom's faucet problem, multi-phase shock tube problems and the related complicated underwater nozzle flows.

Keywords: Two-phase flow, Two-fluid model, Godunov solvers