Plan of research

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（1） Derivation of asymptotic rate

In our previous works, we succeeded to obtain the new asymptotic states and derived the complete classification of asymptotic state for radially symmetric problem of Burgers equation in 3 dimensional spaces. As the next step, we make clear the optimal time convergence rate to radially symmetric solution of Burgers equation. We consider this problem in terms of superiority of spatial dimension and spherically-symmetric property of Burgers equation. For the proof, we grow together L2 energy method and L1 estimates.

（2）Asymptotic stability for self-similar solution

In cosmic fluid dynamics, it is known that shock wave arising by supernova explosion form self-similar solution. On the other hand, there is no mathematical analysis for self-similar solution for shock waves. Therefore, we study existence of self-similar solution for radially symmetric problem for Burgers equations in the eyes of partial differential equation. After we clear the existence of self-similar solution, we study the asymptotic stability of self-similar solution for radially symmetric problem for Burgers equations. We use the weighted energy method and the method which was developed by Liu-Nishihara in 1996 for the analysis of asymptotic stability for viscous shock wave for viscous conservation law.

（3） Analysis for radially symmetric problem for Barotropic Model

We study the asymptotic stability for radially symmetric problem for compressible Navier-Stokes equations by using the perception of radially symmetric problem for Burgers equation in higher-dimensional space. It is well known that Professor Nakamura considered the asymptotic stability of stationary wave for radially symmetric problem for Navier-Stokes equations. We try the classification of asymptotic stability for Barotropic Model by using our past results. And we set out to construct the mathematical theory for problem for supernova explosion.

（4） Radially- symmetric problem with 3-dimensional perturbation

In our results of radially symmetric problem for Brgers equations, we always suppose the radially-symmetric property on initial perturbation. But in actual exploding phenomenon, the initial perturbation should be asymmetry and we should treat the solution as 3-dimensional fluid but not 1-dimensional fluid. We construct the mathematical theory for radially symmetric problem for Brgers equations with asymmetric initial perturbation by applying the results developed by Kozono, Ogawa and Kawashima for Navier Stokes equations.