Plan of research

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（1） Clarification of stationary solution for radially symmetric Burgers equation

Recent years, we sturdy the asymptotic behavior of the solution for radially symmetric problem for Burgers equation in multidimensional space. For $n \geqq 3$, we succeed to obtain the classification of stationary wave in terms of the boundary condition. Through this research, we clear up there exist many different property of stationary wave between 1-D and multi dimensional space. But in 2-D, we do not have complete classification of stationary wave. By using characteristic curve's method and comparison theorem, we study the properties the 2-D stationary wave for radially symmetric Burgers equation. After we obtain the classification of stationary wave, we proceed to study the asymptotic stability of 2-D stationary wave.

（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.