Projection and Finite Difference Schemes in Combustion Problems

Lung-an Ying

It is known that the Chapman-Jouguet model for combustion wave in fluids generates strong and weak, detonation and deflagration waves, and the solutions to initial value problems are highly non-unique. Since the system of equations is stiff, the projection method is applied to separate the mechanism of chemical reaction and convection, which leads to the Chapman-Jouguet model. To prevent from non-physical solutions, the problem has been the subject of many authors. We study Majda's model and the Euler system for this problem and investigate the qualitative behaviour of the limits of solutions as the mesh sizes tend to zero. To Majda's model and the Euler system it is proved that only two kinds of solutions are possible. Some sufficient conditions are given for Majda's model on different limits. We will also show some numerical examples.