A Polyatomic Model for Rarefied Gas Dynamics

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Abstract:
The Boltzmann equation is used to simulate rarefied gas dynamics. Because of its computational cost, models such as BGK or ES-BGK models have been developed simplifying the collisional operator. However, the classical form of these models is valid only for monoatomic gases. We propose a novel model based on BGK or ES-BGK model taking into account additional energy degrees of freedom (in particular, rotational degrees of freedom) to simulate polyatomic gases. Moreover, thermodynamic non equilibrium effects are added in the model. We present the case of diatomic gas flows with simulations in 2D and 3D.