

A REGULARIZED ENTROPY-BASED MOMENT METHOD FOR KINETIC EQUATIONS

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ABSTRACT. We present a new entropy-based moment method for the velocity discretization of kinetic equations. This method is based on a regularization of the optimization problem defining the original entropy-based moment method, and this gives the new method the advantage that the moment vectors of the solution do not have to take on realizable values. We show that this equation still retains many of the properties of the original equations, including hyperbolicity, an entropy-dissipation law, and rotational invariance. The cost of the regularization is mismatch between the moment vector of the solution and that of the ansatz returned by the regularized optimization problem. However, we show how to control this error using the parameter defining the regularization. This suggests that with proper choice of the regularization parameter, the new method can be used to generate accurate solutions of the original entropy-based moment method, and we confirm this with numerical simulations.

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