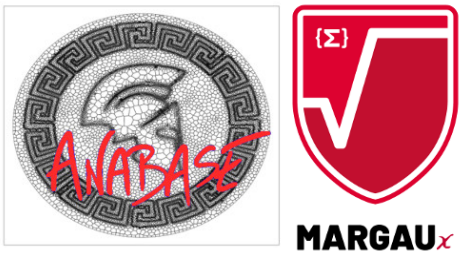

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An entropic asymptotic preserving scheme for the M1 model based on the Unified Gas Kinetic Scheme

Monday, December 5, 2022 2:30 PM (30 minutes)

Kinetic equations appears in many field of study (radiative transfer, rarefied-gas dynamics, etc) to model particles transport. The multi-scale nature of those equations leads to numerical challenges in terms of asymptotic behaviour to recover all Knudsen number flows. Considering this challenge, the UGKS (Unified Gaz Kinetic scheme) has been developed by K. Xu for the BGK model. This characteristic based scheme correctly captures both the continuum and rarefied flow regimes, with a time step much larger than the collision time. However, the problem's dimension induces a huge computational cost.

Under certain assumptions, moments models of those kinetic equations allow to reduce the velocity space dimension by assuming the distribution function shape. Elaborating robust asymptotic preserving schemes for those models is also challenging. Following L. Mieussens work on an adaptation of UGKS to a linear kinetic model of radiative transfer theory, we propose a new numerical scheme based on UGKS for the associated M1 model. We prove that this new scheme preserves the moments achievability and ensures the entropy decreases.

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