

An introduction to the analysis of lattice Boltzmann schemes

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In this short course, we follow a step by step approach in order to familiarize the beginner with the analysis of multirelaxation lattice Boltzmann schemes. We begin with a one dimensional case and present an asymptotic analysis of the D1Q3 lattice Boltzmann scheme for acoustics. In order to show the flexibility of the method, the previous asymptotic analysis is extended for thermal applications of the D1Q3. Then we propose a general nonlinear method for the analysis of an arbitrary scheme at second order accuracy. After this, we present the so-called “Berlin algorithm” able to explicit the equivalent partial differential equations of an arbitrary linear lattice Boltzmann scheme at any order of accuracy. If we have enough time, we will consider also the implementation of bounce-back and “anti-bounce-back” boundary conditions.

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