

Title: Non-newtonian fluid flow simulation using lattice Boltzmann method

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Abstract: The aim of this thesis is to find and establish a modification to the Lattice Boltzmann Method, allowing it to simulate non-newtonian behaviour of fluids. In the theoretical part of thesis, there is introduced a derivation, based on the work of [22], that is capable of arriving to macroscopical Navier-Stokes equations completely *a priori* from the Boltzmann equation, utilizing the Hermite basis expansion. This derivation is afterwards applied to the method suggested by [11], that uses the changed equilibrium distribution to fine-tune the local fluid viscosity according to the non-newtonian model. In the last part of thesis, this method is implemented in the form of lattice kinetic scheme and tested on three sample problems.

Keywords: Lattice Boltzmann Method, non-newtonian fluids, Hermite expansion, lattice kinetic scheme