1st February 2016

Master-Thesis – numerics

Simulate lubrication phenomena with Lattice-Boltzmann Method

Background

The lattice Boltzmann method is increasingly attracting researches in many areas from turbulence to low Reynolds number flow. This method can represent, from a computational point of view, a very good alternative to the typical Finite Volumes of Finite Elements methods. Particular interest has arisen also for possible application with lubricant flows.

Content of the Thesis

The main aim of this thesis is the development of a Lattice Boltzmann (LB) method for general fluid dynamics problems. This method will be applied to incompressible fluid dynamics in order to model gas and liquid flow at moderate speed. At the beginning simple kinds of 1D or 2D test cases will be considered (for example the flow past a cylinder figure 1(a)). Afterwards, more realistic geometry will be tested in order to study either tribological applications or turbulent channel flows. The suggested programming language is either MATLAB or Python. This thesis is available both in English and in German.
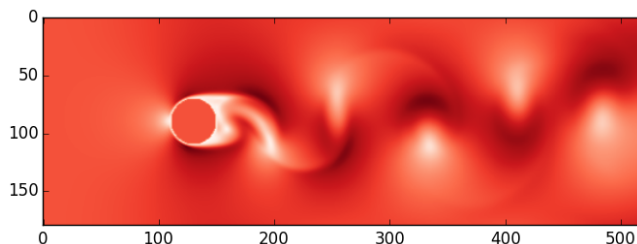
(a) Lattice Boltzmann simulation of a Von Kàrmàn wake past a cylinder at $Re = 220$
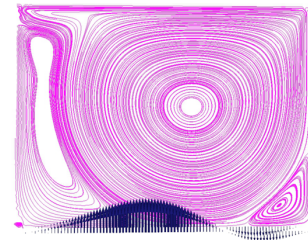
(b) Lattice Boltzmann simulation of the flow in a cavity

Requirements
Basic knowledge fluid mechanics
and programming in MATLAB or Python

Beneficial Skills
Knowledge about fluid phenomena.
Experience in computational fluid dynamics
and programming.

Start: immediately

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