日独共同大学院プログラム Mini-Cource

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講義題目 ： Mathematical modelling and numerical simulation of complex non-Newtonian fluids with application in hemodynamics.

Abstract:

In the minicourse we discuss some mathematical questions arising in modelling and simulation of hemodynamical flows. Due to the fact that blood is a suspension of flexible particles in plasma one typically uses non-Newtonian models to describe blood flow. In addition, coupling between motion of blood and the vessel wall is essential for realistic models. For the structure problem the generalized string equation for radial symmetric pipes and its extension to a stenosed vessel will be presented. This problem falls into a class of the so-called fluid-structure interaction problems.

We present the combined finite volume-finite element method that is used for approximation of non-Newtonian fluids. The kinematical splitting techniques will be applied in order to approximate efficiently the fluid-structure interaction. At the end we present numerical experiments for some non-Newtonian models, comparisons with the Newtonian model and the results for hemodynamical wall parameters; the wall shear stress and the oscillatory shear index.