

CEMRACS '08

Modelling and Numerical Simulation of Complex Fluids
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Contacts between vesicles

Project proposed by

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The behavior of many fluids can be hugely modify by the addition of particles. If the particles are small enough, their influence on the behavior of the fluid can be “averaged” so that the fluid can be considered as homogeneous. Nevertheless, determining the homogenized law driving the fluid could revealed itself quite difficult in particular when the particles are deformable. Moreover, in some cases, scales of the particles and of the domain in which the fluid flows are of the same order and such an approach can not been applied: No homogenization can be performed and each particle has to be taken individually into account. In this context, the treatment of contacts between the different particles and the boundary of the domain (which is usually deformable too) has to be taken into account. The aim of this project is to propose numerical(s) method(s) capable to ensure the non intersection constraints between the particles and compute contact forces between them in the two dimensional case.

A C++ and a Freefem++ implementation of the treatment of contacts between deformable bodies have already been implemented for elastic bodies in the static case, without friction forces and without interactions with a surrounding fluid. The aim of this project will be to adapt (one of) those scripts to the case of small vesicles surrounded by a fluid. The first task will be to enrich the mechanical elastic laws currently implemented (and which are not realistic for vesicles). In a second step, the codes will have to be extend to the dynamic case. Finally the action of the surrounding fluid on the vesicles will eventually be added.