Computational Modelling of Elastic Cells with Nucleus

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20th September, 2019
Motivation and Context

CELL-IN-FLUID
• Modelling elastic objects immersed in fluid (such as RBC in blood flow)
• Development of open-source software package Object-in-Fluid for ESPResSo
• My research focuses on adding cells with nucleus

Motivation
• Microfluidic devices can be used to detect cancer cell
• Improving the design of these devices through simulations
• Early diagnosis – individualized treatment, better prognosis

http://espressomd.org/wordpress/
http://cellinfluid.fri.uniza.sk/
Objectives

Verification
• Comparison between the simulation and biological data
• First to calibrate the model to mimic the behavior of the biological cell
• Afterwards the calibrated model could be used to optimize design of a microfluidic device

First steps
• Learning basics about obtaining data from the experiments
• Fluid flow information seems to be a challenge, possibly using MicroPIV
• Depending on the quality of data gathered from experiments, possibly modelling the available microparticles and surfactant,
• Obtaining data of cell deformation when cell pass through hyperbolic channels
• Modelling these cells