Simulation Of Cell Deformation Inside A Microfluidic Channel Using Fluid-Structure-Interaction

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Abstract

The mechanical characterization of certain cell types is important to obtain physiological insights. For instance, tumor and normal cells can be distinguished by elasticity, indicated by the amount of deformation under given stress. Simulations help to understand, verify and improve the analysis of deformation-based cell characterization such as flow-based cytometry. We achieve efficient computations by using a 2D-rotational symmetric model, based on Fluid-Structure-Interaction with a hyper-elastic material. The influence of different parameters on the deformation is evaluated and will be presented. The deformation of a cell along an entire microfluidic channel can be tracked for a variety of elasticities, viscosities, cell sizes, channel geometries and flow rates. One aim is to model typical experimental conditions and compare simulated and measured results. The results help to identify appropriate parameters and correlations to describe and interpret the behavior of certain cell types.