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INTERFACIAL FLOWS AND WETTING PHENOMENA MODELLING WITH SMOOTHED PARTICLE HYDRODYNAMICS APPROACH

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In the present work we focus on the development of boundary conditions for two-phase systems within a framework of the Smoothed Particle Hydrodynamics (SPH), which is a meshless, particle-based method for fluid flow computations. It is particularly useful in modelling of interfacial flows due to easy interface treatment - no specific reconstruction or tracking algorithm is required - and ability to handle large density and viscosity ratios [1]. The main difficulty is calculation of the vector normal to the interface near the solid boundaries, which is crucial for accuracy of the Continuum Surface Force (CSF) model used for surface tension treatment. The second problem is accounting for contact angles, allowing to model different types of surfaces and wetting effects. To tackle these issues we decided to improve the so-called ghost particles boundary conditions [2]. A desired contact angle is forced by direct modification of normal vectors near the triple line, used in CSF model [3]. The proposed method remains relatively simple, allowing for accurate results for static droplets cases without a computational overhead. The ongoing work focuses on further development and validation of model for the dynamic cases, see Fig. 1.

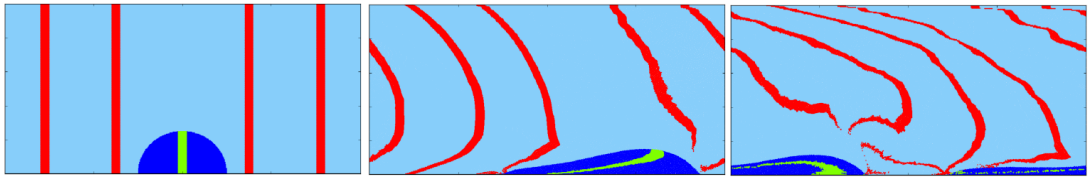

Figure 1: Water droplet smeared over hydrophilic surface in an air flow.

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