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A LUBRICATED IMMERSED BOUNDARY METHOD IN TWO DIMENSIONS

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Abstract

We describe an immersed boundary method that uses elements of lubrication theory to resolve thin fluid layers between immersed boundaries. Such methods are useful for simulating the passage of deformable elastic capsules through narrow constrictions, such as the transit of red blood cells through the narrow slits in the spleen and the intracellular trafficking of vesicles into dendritic spines. Making use of simple two-dimensional flows with known exact solutions, we will show convergence results illustrating the increased accuracy in comparison to the standard immersed boundary method. We further apply this method to the case of an elastic vesicle moving through a fluid-filled channel.