# Fluid-rigid body interactions with large motion and contact

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We consider a simple problem: a solid, e.g. a sphere, is falling towards the bottom in a container filled with a liquid. First, we present efficient simulation methods that cope with this large-displacement problem. The fundamental problem is that the solid is moving substantially and therefore the flow domain undergoes strong changes. This situation is difficult to grasp numerically. We introduce different modeling and discretization approaches, both classical ones and those that are based on neural networks to depict the forces between fluid and solid. We present numerical benchmarks, which are also backed by experimental data.

Then we deal with the contact of the solid with the bottom of the container. Analytically this problem is already well studied and here the unpleasant result is that contact in finite time is not possible if the fluid will be assumed to be incompressible. In reality, however, we will find that the ball bounces off the ground and comes to rest only after a few contacts.

References:

[1] https://arxiv.org/abs/2102.11636

[2] http://dx.doi.org/10.1007/s10013-021-00477-9

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