

FURTHER DEVELOPMENTS ON THE GEOMETRIC IMMERSED BOUNDARIES (GIB)

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Keywords: *Immersed Boundaries, Optimization, Unsteady simulation, ALE*

During the last year, the GIB framework has been extended to model moving objects. GIB is very powerful in applications with large motions such as topology optimization, rotating gears, FSI etc. Currently, in these applications, the mesh motion algorithm moves the boundaries until re-meshing is required. This method, in most industrial applications, is inefficient or unfeasible. Using GIB, the point coordinates of the faces near the interface are snapped on the interface. After the snapping, a faceZone which contains the faces which are located exactly on the interface is constructed. A new boundary is created based on the faceZone and boundary conditions are applied. All the required operations for the GIB treatment are parallelized and they don't increase the computational cost. For static boundaries, the matrix contributions of each OpenFOAM® operator (fvm::, fvc::) using GIB and body fitted meshes are the same which guarantees that the results will be identical. For moving boundaries, a mechanism for proper treatment of the freshly fluid/solid cells has been developed. This mechanism is based on the Arbitrary Lagrangian-Eulerian (ALE) Method and guarantees the conservation of the quantities. The implementation is generic and no additional numerical schemes or executables are required.

The present work has been conducted under the auspices of the ITN Aboutflow FP7 EU project [1].

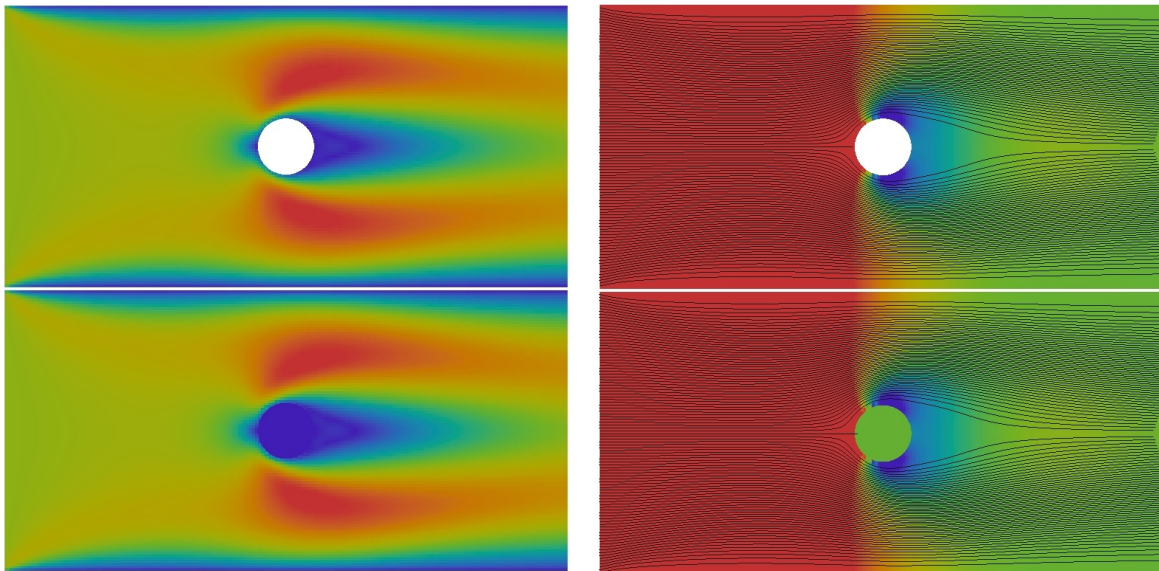


Figure 1: Velocity (left) and pressure (right) fields around a cylinder with classic boundaries (top) and the GIB (bottom). The results in the immersed boundaries case are identical with the bodyfitted approach.

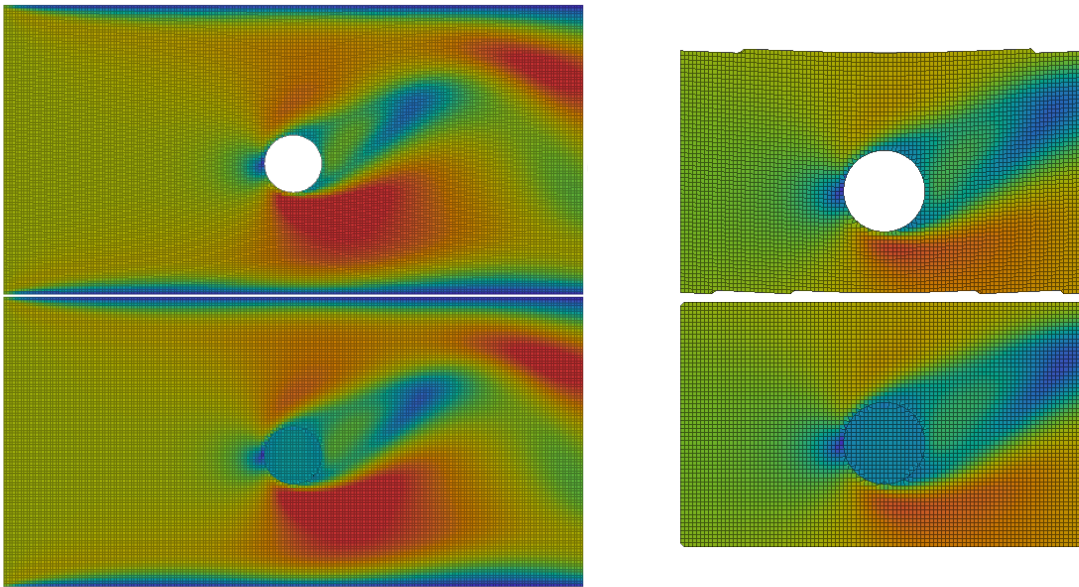


Figure 2: Velocity field around a moving cylinder with classic boundaries (top) and the GIB (bottom).

References

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