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A new compressible and incompressible immersed interface method based on analytic continuation, level sets and smooth extension techniques HASIB UDDIN, RICHARD KRAMER, CARLOS PANTANO, University of Illinois at Urbana-Champaign — We present a new immersed interface methodology for embedded complex geometries in Cartesian fluid solvers. The object boundaries are represented using a standard level set. The flow fields are then extended smoothly inside the fictitious domain, using an improved version of the approach pioneered by Osher and co workers, and the boundary conditions are enforced by a technique inspired by analytic continuation. In the compressible version of the method, each fluid field is extended independently with the only constraints being the boundary conditions associated with that field. In the incompressible version of this method, the divergence-free condition of the velocity field is enforced throughout the fictitious domain in addition to the no-slip boundary condition. Applications to shock reflections, shock-ramp interactions and both supersonic and zero-Mach number flows over several simple, e.g., a sphere, and complex three-dimensional objects will be demonstrated.

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