On the motion of a rigid body in a perfect compressible fluid

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Abstract

We consider a rigid body moving in an inviscid compressible fluid within a bounded domain. The fluid is thereby described by the compressible Euler equations, while the rigid body obeys the conservation of linear and angular momentum. This gives us a coupled system comprising an ODE and the initial boundary value problem (IBVP) of a hyperbolic system with characteristic boundary, where the fluid velocity matches the solid velocity along the normal direction of the solid boundary. We establish the existence of a unique classical solution to this coupled system. Our approach involves constructing an approximate system with a non-characteristic boundary, which enables the decoupling of the fluid and solid equations. We then derive the uniform estimate and finally we obtain the solution by compactness principle. This is a joint work with F. Rousset (Orsay).

Keywords: Fluid-Structure interaction, Hyperbolic system, Compressible Euler equations.

References

[1] F. Rousset, P. Su, *Local well-posedness of the motion of a rigid body immersed in a compressible inviscid fluid*, preprint, 2025.