

## A RIGID BODY LIBRARY FOR NUMERICAL SIMULATION OF FLUID-STRUCTURE INTERACTION

Mario Storti<sup>a</sup>, Facundo Inzeo<sup>a</sup>, Julián Medina<sup>a</sup>, Laura Battaglia<sup>a</sup> and Marcela Cruchaga<sup>b</sup>

<sup>a</sup>*Centro de Investigación de Métodos Computacionales CIMEC, CONICET-UNL,  
<http://www.cimec.org.ar>, [mario.storti@gmail.com](mailto:mario.storti@gmail.com)*

<sup>b</sup>*Departamento de Ingeniería Mecánica, Universidad de Santiago de Chile*

**Keywords:** Fluid structure interaction, rigid body model, computational fluid mechanics

**Abstract.** The "prtclsys" C++ library for the simulation of rigid bodies and their interaction with Computational Fluid Dynamics (CFD) software is presented. The library allows simulating relatively complex arrays of rigid bodies, links, moors, contacts of the bodies with surfaces, and other restrictions. All items in the simulation are represented as particles, including the rigid bodies which are represented as arrays of four or more particles, arranged such that they have the same mass and inertia moments as the target body. The distances between the particles in the rigid body are fixed using restrictions, and the whole dynamics of the system is solved as a system of Differential-Algebraic Equations, using the trapezoidal rule integration scheme. Fluid-structure interaction (FSI) fluid is simulated with the Finite Volume Method using the open source package Code-Saturne, and the mechanical system is solved using an explicit staggered scheme. Several examples are presented, including falling bodies and positive buoyant bodies fully or partially immersed in fluids.