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Development of an algorithm for the fluid-structure interaction of bioinspired problems with multi-body systems[1] GONZALO ARRANZ, OSCAR FLORES, MANUEL GARCIA-VILLALBA, Universidad Carlos III de Madrid — A non-monolithic algorithm for the fluid-structure interaction with multi-body systems is presented. The motivation behind is the analysis of biological motion, such as insect flight or fish swimming. For the modelling, the multi-body systems are composed by a collection of rigid bodies which are connected among them by kinematic joints which restrain certain degrees of freedom. The flow is assumed to be Newtonian, incompressible and is solved by means of direct numerical simulations, where the presence of the bodies in the flow is modelled using and Immersed boundary method. A recursive dynamic algorithm in reduced coordinates is employed to compute the dynamic equations of the multi-body systems, allowing for the computation of a large variety of different system with no code modification. The algorithm is validated against existing literature, showing very good agreement. Additionally, simulations of a flexible, self-propelled wing are presented, as an illustration of the capabilities of the algorithm. In particular, the kinematics and performance of a 2D self-propelled flexible wing are compared to those of a 3D flexible wing of aspect ratio, $AR = 0.5$.

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