

A control problem for the steady self-propelled motion of a rigid body in a Navier-Stokes liquid

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Abstract

Consider a rigid body immersed in a viscous incompressible fluid which fills the domain exterior to the body. In this talk, we are interested in self-propelled motions in the steady state regime of the system rigid body-fluid, assuming that the mechanism used by the body to reach such a motion is modeled through a boundary velocity v_* . In practice, such a velocity can be produced by propellers (submarines), deformations (fishes), cilia (micro-organisms), etc. Assuming that the velocity of the body V is given, can we find v_* that generates V ? A positive answer to this question would show that the mechanism of locomotion modeled by the boundary velocity v_* allows the rigid body to move with the desired velocity V . We show that this can be solved as a control problem in which the boundary velocity v_* is the control of the problem. Joint work with Toshiaki Hishida (Nagoya, Japan) and Takéo Takahashi (Nancy, France).