

Abstract Submitted
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Modeling Self-Induced Effects is Important for Flow-Relative Control AMY GAO, MICHAEL TRIANTAFYLLOU, Massachusetts Inst of Tech-MIT — For aquatic animals, self-generated stimulation has the potential to mask signals from external sources. Fish, which sense their near field using their lateral lines, have developed passive and active means of subtracting the flow signals generated by their self motions, which not only mask biologically relevant stimuli, but also render control deficient. While prior work in this field estimates the orientation of a vehicle as a linear function of the difference in pressure between opposite sides, we demonstrate that a high performance controller cannot operate using simply this linear relationship, because in a hydrodynamic environment, the external flow and the self-induced flow combine in a nonlinear way. A misinterpretation of the hydrodynamic interactions due to simplistic signal manipulation can be catastrophic, leading to instability or collision. Overall, we demonstrate the importance of model-based control in the underwater environment, and propose a robust controller which uses flow-relative feedback from a sensor inspired by the lateral line of fish.

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