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Utilizing Surface Sensors to Identify Wake Regimes MENGYING WANG, MAZIAR S. HEMATI, Univ of Minnesota - Twin Cities — Marine swimmers often exploit external flow structures to reduce locomotive effort. To achieve this advantage, these swimmers utilize mechanosensory organs on the surface of their bodies to detect hydrodynamic signals from the surrounding fluid, which can then be used to inform the control task. Recently, there has been a growing interest in developing similar flow sensing systems to achieve enhanced propulsive efficiency and maneuverability in human-engineered underwater vehicles. In particular, much attention has been given to the problem of wake sensing; however, these investigations have concentrated on a restricted class of wakes—i.e., Kármán-type vortex streets—whereas more complicated wake structures can arise in practice. In this talk, we will explore the possibility of identifying wake regimes through the use of surface sensors. Potential flow theory is adopted to simulate the interactions of various wakes with a fish-like body. Wakes in different dynamical regimes impart distinct hydrodynamic signatures on the body, which permits these regimes to be distinguished from one another in an automated fashion. Our results can provide guidance for improving flow sensing capabilities in human-engineered systems and hint at how marine swimmers may sense their hydrodynamic surroundings.

Mengying Wang
Univ of Minnesota - Twin Cities

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