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Optimal Sensor Layouts in Underwater Locomotory Systems

BRENDAN COLVERT, EVA KANSO, Univ of Southern California — Retrieving and understanding global flow characteristics from local sensory measurements is a challenging but extremely relevant problem in fields such as defense, robotics, and biomimetics. It is an inverse problem in that the goal is to translate local information into global flow properties. In this talk we present techniques for optimization of sensory layouts within the context of an idealized underwater locomotory system. Using techniques from fluid mechanics and control theory, we show that, under certain conditions, local measurements can inform the submerged body about its orientation relative to the ambient flow, and allow it to recognize local properties of shear flows. We conclude by commenting on the relevance of these findings to underwater navigation in engineered systems and live organisms.

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