

ME 600 Seminar

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Title:

Cyber-physical Robot Systems for Ocean Explorations

Abstract:

Exploring, monitoring, and using oceans in a smart and sustainable way is an extreme challenge to current marine robotic systems. Bio-inspired engineering is a popular way to endow autonomous underwater robots with the potential to achieve high-performance underwater locomotion, which requires three areas of expertise: flow physics, robot design, and control. However, the difficulties of transferring knowledge between the three classic research areas limit the performance of major existing bio-inspired underwater robots.

In this talk, we will present our recent efforts that merge flow physics, robot design, and control to develop high-performance bio-inspired underwater robots. First, we develop a unique cyber-physical experiment system that closes the gap between physics and robotics. Towards swimming at high efficiency in various conditions, just like fishes, we developed the first high-speed tuna-inspired robot with a tunable stiffness tail that demonstrates the effectiveness of real-time stiffness control, which could double the swimming efficiency compared to traditional design. In addition, we also explored the underlying physics of multi-fin, and robot-boundary wake interactions, which boost the robot design and control algorithm development for complex swimming missions.

This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.

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