Online Proceedings

Poster Session 3

Commons East, Easel 76

2:30 PM to 4:00 PM

Ferries for Science: Using Ferry-Based Velocity Measurements to Understand Tidal Circulation and Energy Dissipation Across Admiralty Inlet in Puget Sound

Timothy Joseph (Tim) Prusa, Senior, Civil Engineering
Mentor: Jim Thomson, CEE/APL
Mentor: Maricarmen Guerra, Civil and Environmental Engineering

This project seeks to understand tidal circulation between Puget Sound and the Pacific Ocean using data captured by sensors on board Washington State Ferries traveling across Admiralty Inlet. As the most important passage between Puget Sound and the Pacific Ocean, understanding circulation across Admiralty Inlet is critical to monitoring water quality in Puget Sound. Data from this research is being used by the Washington State Department of Ecology to manage water quality issues such as nutrient enrichment, algal blooms, dissolved oxygen concentrations, and transport of toxic chemicals across the region. In addition to managing existing data, my role has been to develop a tidal-energy dissipation map of Admiralty Inlet. While site specific energy dissipation has been calculated in areas of Admiralty Inlet, a cross-channel model has never been developed. Understanding tidal-energy dissipation at the mouth of Puget Sound will benefit future large-scale tidal-energy research by assisting tidal-energy forecasting, characterization, and assessment.

Poster Session 4

Commons East, Easel 77

4:00 PM to 6:00 PM

Tracking Coordinated Flight of Foraging Bats in a Natural Observatory

Aidan Johnson, Senior, Electrical Engineering
Mentor: Wu-Jung Lee, Applied Physics Laboratory

Insights from the study of biosonar (echolocation) in mammals such as bats have applications in developing coordinated autonomous manoeuvres in a variety of environments. However, limited research has studied bat echolocation and flight behaviour in natural habitats, which involves multiple bats competing for a shared prey resource. In a confined space, bats have been observed to emit calls with lower intensity, shorter duration, and broader bandwidth compared to when echolocating in the open. Bats foraging in the wild also experience more complex echo-acoustic scenes created by sounds of all sources in the landscape, such as calls from other bats and echoes from vegetation and obstacles in the environment. Evidence from previous field studies suggest that solo bats engage in stereotypic flight path behaviour to minimise the cost of sensory processing required for spatial orientation, making those resources available for prey localisation. Other studies have observed leader-follower behaviour in pairs of bats, where they coordinate manoeuvres by copying the others' trajectory through active echolocation. We propose to investigate flight and echolocation behaviour of an even larger number of simultaneously foraging bats over the Central Pond in the Union Bay Natural Area. This 74-acre natural area on the shore of Lake Washington is a prime location for a natural observatory right on the UW campus. We are currently developing an ultrasonic microphone array that is a non-cost-prohibitive alternative to proprietary wildlife recording devices, and we will start data collection when local bats local emerge from winter hibernation. We plan to develop fully automated algorithms for tracking bats and estimating their echolocation directional aim during foraging. These data will serve as a basis for deriving computational principles of coordinated flight and sensing across multiple agents, which can inspire new technology for autonomous vehicles in the air, on the ground, or underwater.