Series of ARAS Public Webinars

Swarm Robotics in Oil Spill Monitoring and Cleanup

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Abstract

Oil spills are serious threats to the marine environment in the era of increasing environmental concern. Effective efforts have been made to tackle this problem, amongst them, the concept of using swarm robotics for **Oil Spill Monitoring and Cleanup** is a promising solution. Thanks to the recent progress in robotics, there are opportunities to use autonomous aerial drones for labor-intensive environment monitoring purposes. Engaging multiple drones instead of one, not only increases the robustness and scalability of the system in time-sensitive and hazardous events such as oil spills, but also in spatiotemporal oil spill cases increases the accuracy of measurements by multi-sampling the environment concurrently. Marine environmental monitoring tasks can strongly benefit from these advantages, as the monitoring areas are typically large, and communication with a central control unit might not always be available. Among these obvious advantages, more work needs to be done to understand the capabilities and limitations of autonomous systems and the resources required in the marine environment and ensure their acceptable use to the regulatory agencies. In this presentation, we first review a number of **aerial drones** developed in **ARAS**, which are very promising in such applications. Then a review **on swarm robotics** concepts and potential research gaps are given. Finally, The application of oil spill monitoring and cleanup in the Persian Gulf is given professional notice. Since the monitoring of the oil spill expansion on the water surface is a spatiotemporal problem, we also address the oil spill modeling by a Gaussian mixture model, which is based on NOAA's advanced oil spill model (**GNOME**). Furthermore, a cooperative control framework developed for a group of Unmanned Aerial vehicles (UAVs) will be introduced as a novel strategy in oil spill monitoring in **the Persian Gulf**.

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