College of Engineering

Department of Mechanical & Industrial Engineering

Intelligent Underwater Robotics Adapting to Dynamic Environments

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Underwater robots have gained research attention in the past years as they can expand our knowledge of the oceans and perform dangerous tasks in extreme environments. However, these robotic systems are expensive, require large infrastructures for deployment, and the commercially available system are either teleoperated or have pre-programmed missions that are not adaptable to changes in the environment or the system. Achieving full autonomy and executing long-term deployments for marine robots requires addressing limitations in system modeling and predictive behaviors, scene understanding, control, planning, and energy management. This talk will focus on the steps taken to create intelligent marine robots capable of adapting to environmental changes and hardware limitations, by looking at predictive models and model-based control architectures for underwater vehicles and manipulators. A brief overview of the different types of underwater robots will be given, and advancements in modeling techniques such as data-driven and physics-informed approaches will be discussed. The talk will also demonstrate how these models can be used to ensure that marine vehicles complete autonomous survey missions and that underwater manipulators optimally interact with the environment.

*Corina Barbalata is an Assistant Professor in the Department of Mechanical and Industrial Engineering, at Louisiana State University (LSU), United States. She is the co-director of the iCORE Laboratory and a fellow in the Costal Studies Institute at LSU. She is also the co-director of the High-School Student Research Program in the College of Engineering at LSU. She got her BS in Automation Systems from Transilvania University, Brasov, Romania, she has a double MS degree in Computer Vision and Robotics from University of Burgundy (France) and Heriot-Watt University (UK) and her PhD from Heriot-Watt University (UK). Before joining LSU, she was a postdoctoral associate in the Naval Architecture and Marine Engineering department at University of Michigan, Ann Arbor. Dr. Barbalata and her group are working on proposing solutions for real-world robotics applications with social and environmental merits, through the combination of theoretical, computational, and experimental methods for the design new reactive capabilities for autonomous robotic systems working in complex and dynamic environments. Her research interests are in physics- and data-driven modeling of vehicle-manipulator systems, development of model-based control structures for autonomous robotic systems, and scene understanding and interpretation for robotic navigation. Her application domains are marine robotics and industrial automation. She received the NSF Career Award in 2024.