NJ IEEE Aerospace Chapter Invited lecturer

Topic: Advanced Motion Control Strategies for Biomimetic Autonomous Underwater Vehicles

Talk Abstract:

Biomimetic autonomous underwater vehicles (AUVs) provide an alternative to conventional propeller-driven systems, particularly for tasks requiring high maneuverability and precise low-speed operation. Median and paired fin (MPF) locomotion, inspired by aquatic animals, enables effective hovering and agile motion, making it well-suited for inspection tasks. Among MPF-based designs, sea turtle-inspired four-fin propulsion has gained increasing attention. Platforms such as Turtle 2005, Madeleine, Finnegan, and AQUA have demonstrated the potential of this approach. In this context, U-CAT, developed within the ARROWS European project, is a biomimetic AUV specifically designed for close-range inspection of shipwrecks and delicate underwater structures, with its design driven by end-user and environmental constraints. Motion control of such systems remains challenging due to nonlinear dynamics, strong coupling, and underactuation. This talk presents some control strategies for biomimetic AUVs, focusing on U-CAT case study, including priority-based, acoustic-, vision-, and data-fusion-based control methods. Their performance is demonstrated through real-time experiments in both controlled and open-water environments.

Invited Speaker Bio:

Ahmed CHEMORI received his M.Sc. and Ph.D. degrees in Automatic Control from the Polytechnic Institute of Grenoble, France, in 2001 and 2005, respectively. From 2004 to 2005, he served as a Research and Teaching Assistant at the Laboratoire de Signaux et Systèmes (LSS, CentraleSupélec) and Université Paris-Sud (Paris 11). He subsequently joined GIPSA-Lab (formerly LAG) as a CNRS postdoctoral researcher. He is currently a Senior Researcher at the French National Centre for Scientific Research (CNRS), affiliated with LIRMM Laboratory. His research focuses on nonlinear control, particularly adaptive, robust, and predictive approaches, and their real-time applications in robotics, including parallel, marine, and wearable systems. Dr. Chemori has authored or co-authored near 200 scientific publications, including journal articles, patents, books, book chapters, and conference papers. He has co-supervised 27 Ph.D. theses (21 successfully defended) and over 40 M.Sc. theses. He currently leads the Marine Robotics Team and chairs the LIRMM Valorization Committee. He serves as Technical Editor for *IEEE/ASME Transactions on Mechatronics* and has been Guest Editor for several special issues. He is IEEE Senior Member and an active member of the International Federation of Automatic Control, contributing to multiple technical committees (TC1.2, TC4.2, TC4.3, and TC7.2). He has also served extensively as a TPC/IPC member and Associate Editor for leading international conferences, including IEEE IROS, IEEE RO-MAN, IFAC ALCOS, IFAC CAMS, and the IFAC World Congress, and has organized numerous scientific events.

Date: **May 5, 2026**
Time: **12:00 PM EST (New York City time)**