Cooperative Navigation and Control: Marine Vehicles and Humans in the Loop

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ABSTRACT

This talk addresses the general topic of cooperative navigation and motion control of marine vehicles, both from a theoretical and a practical standpoint. The presentation is rooted in practical developments and experiments. Examples of scientific mission scenarios with autonomous surface vehicles (ASVs) and autonomous underwater vehicles (AUVs), acting alone or in cooperation, set the stage for the main contents of the presentation. From a theoretical standpoint, special attention is given to a number of challenging problems that include: i) cooperative motion control of fleets of autonomous vehicles and ii) cooperative vehicle navigation using geophysical and single-beacon measurements. The efficacy of some of the systems developed has been shown during real tests at sea. Recent results on cooperative motion control with applications to the development of devices for robot-assisted diving operations are also described. The results are illustrated with videos from actual field tests with multiple marine robots and a human diver in the loop. The core material presented in the talk was obtained in the scope of the EC GREX and CO^{3}AUVs projects (http://www.grex-project.eu) and (http://www.co3-auvs.org)

Short Bio:

António Pascoal – PhD in Control Science from the University of Minnesota, Minneapolis, MN, USA. Associate Professor of IST and Vice-President, Scientific Affairs of ISR. Expertise in Dynamical Systems Theory, Robotics, Navigation, Guidance, and Control of Autonomous Vehicles, and Networked Control and Estimation. Associate Editor of IEEE Journal of Oceanic Engineering and International Journal of Systems, Control and Communications. Elected, Chair IFAC Technical Committee Marine Systems, 2008. Vice-President EuorOcean, the European Center for Information on Marine Science and Technology. He was the responsible scientist for eight EU funded collaborative research projects and several national research projects, all in the area of dynamical systems and ocean robotics. He is the author of more than 150 papers and communications on the subject, published in international journal and proceedings of conferences.

A. Pedro Aguiar - PhD in Electrical Engineering from the Instituto Superior Técnico, Lisbon, Portugal. Formerly a research scientist with the University of California Santa Barbara (UCSB), California, USA. Currently a senior researcher with ISR/IST and Invited Assistant Professor of IST. Expertise in Dynamical Systems Theory, Trajectory Tracking and Path Following Techniques, Nonlinear Control, and Networked Control and Estimation. Associate Editor of IFAC Automatica. Currently he is the coordinator of three large national projects on the subjects of Navigation and Cooperative Motion Control. He has published relevant theoretical work in highly prestigious journals of control.