School of Naval Architecture and Ocean Engineering

HUAZHONG UNIVERSITY OF SCIENCE & TECHNOLOGY

SEMINAR

Advanced Control of Biomimetic Underwater Vehicles

U-CAT Case Study

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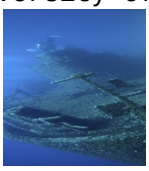
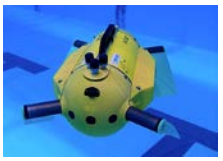


Abstract of the talk

Diving into a shipwreck can be a dangerous task for humans, furthermore it is costly and time consuming. One better solution for such a task can be the use of an underwater robot. However, so far, there are no underwater robots available complying with the requirements of such a task, since the most developments in underwater robotics have been, for a long time, driven by needs from oil and gas industry. To fulfill the needs of shipwreck inspection for archeological applications, U-CAT has been developed with the following five design requirements; (i) The main interest is the video footage from the interior of the shipwreck to identify objects of interest, (ii) The robot has to penetrate in confined spaces, so it must be small and maneuverable, (iii) The vehicle must be capable of silent motion in order to not disturb the bottom sediments that would make visual observations impossible, (iv) The vehicle has to be untethered as the cable would significantly constrain vehicle's motion inside the wreck, (v) The cost of the vehicle has to be affordable for archaeologists with a limited budget. U-CAT has been specifically designed to meet these end-user requirements of underwater archaeologists. Consequently, a 4-flipper design was emerged to control the 6 DOFs. As opposed to the propellers, flippers have a large actuation area and therefore the propelled mass around the robot disturbs less bottom sediments. This makes close video inspection of a ship interior more feasible. To control the robot different schemes have be proposed and implemented on the robot. The heart of this talk is to tackle the control problem of U-CAT as well as the proposed solutions in three cases (i) Control of one DOF (depth), (ii) control of two DOFs (depth and yaw), (iii) control of three DOFs (depth, yaw and surge). All the proposed control schemes will be illustrated through real-time experiments either in a controlled environment or in real operating conditions.

Short Biography: Ahmed CHEMORI received his M.Sc. and Ph.D. degrees, respectively in 2001 and 2005, both in automatic control from the Grenoble Institute of Technology in France. He has been a post-doctoral fellow with the automatic control laboratory of Grenoble in 2006. He is currently a tenured research scientist in Automatic control and Robotics at the Montpellier Laboratory of Computer Science, Robotics, and Microelectronics (LIRMM). His research interests include nonlinear, adaptive and predictive control and their applications in underwater vehicles, humanoid robots, exoskeletons, parallel robots, under-actuated mechanical systems and aerospace.

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