

PHD TITLE	Improvement of AUV-Diver Interaction Modalities
Laboratory	Laboratoire COSMER, Université de TOULON
Industrial Partnership	Company NOTILO PLUS
Supervision	Vincent HUGEL (supervisor), Eric WATELAIN, Claire DUNE, Jérémy NICOLA
Contact	<a href="mailto:claire.dune@univ-tln.fr">claire.dune@univ-tln.fr</a> , <a href="mailto:jeremy@ibubble.camera">jeremy@ibubble.camera</a>
Documents to apply	a CV, a cover letter, the grades associated with the last degree (+ letter of recommendation for this thesis)
Candidature deadline	March, the 30th, 2020

Following their aerial counterparts, underwater UAVs are now available to the general public at affordable costs. Among them, the autonomous robot IBubble from the company NOTILO PLUS has made a technological breakthrough by developing a new mode of underwater teleoperation: the diver is equipped with a remote control that allows the drone to locate him and to change its operating mode during the dive. This novel mode of interaction has set the stage for cooperation between the UAV and the diver it is tracking.



However, the interaction remains limited to a master-slave relationship reduced to selecting a behaviour from a pre-recorded list. The objective of this thesis is to develop more intuitive drone-diver interaction modalities. The European FP7 CADDY<sup>1</sup> project, the work of the Minnesota Interactive Robotics and Vision Laboratory group, then the ADRIATIC<sup>2</sup> project explored different communication modalities between an underwater robot and a diver: the use of tags, immersible tablets, the understanding of the diver's gestures with marked or instrumented gloves, ...

**Recent methods of artificial intelligence will be used to develop intuitive communication modes based on the diver's gestures without adding equipment.**

The thesis is based on the SEASAM industrial version of the robot IBubble. It will be co-supervised by the COSMER laboratory of the University of Toulon and the company NOTILO PLUS. It is part of a transdisciplinary project, called DP11, which involves researchers in robotics, control theory, human and social sciences, and the sciences and techniques of physical and sports activities.

#### Candidate profile

- Master 2 degree or equivalent in artificial intelligence, robotics or a related field;
- Strong skills in mathematics, programming (python, c/c++, shell, matlab, ros);
- Advanced skills in AI (pytorch, tensorflow) and image processing will be appreciated;
- A very good level of English will be a definite asset for this recruitment;
- Experience in scuba diving will be appreciated.

<sup>1</sup> <http://www.caddy-fp7.eu/>

<sup>2</sup> [https://www.fer.unizg.hr/zari/labust/research/projects/ongoing\\_projects/adriatic?](https://www.fer.unizg.hr/zari/labust/research/projects/ongoing_projects/adriatic?)