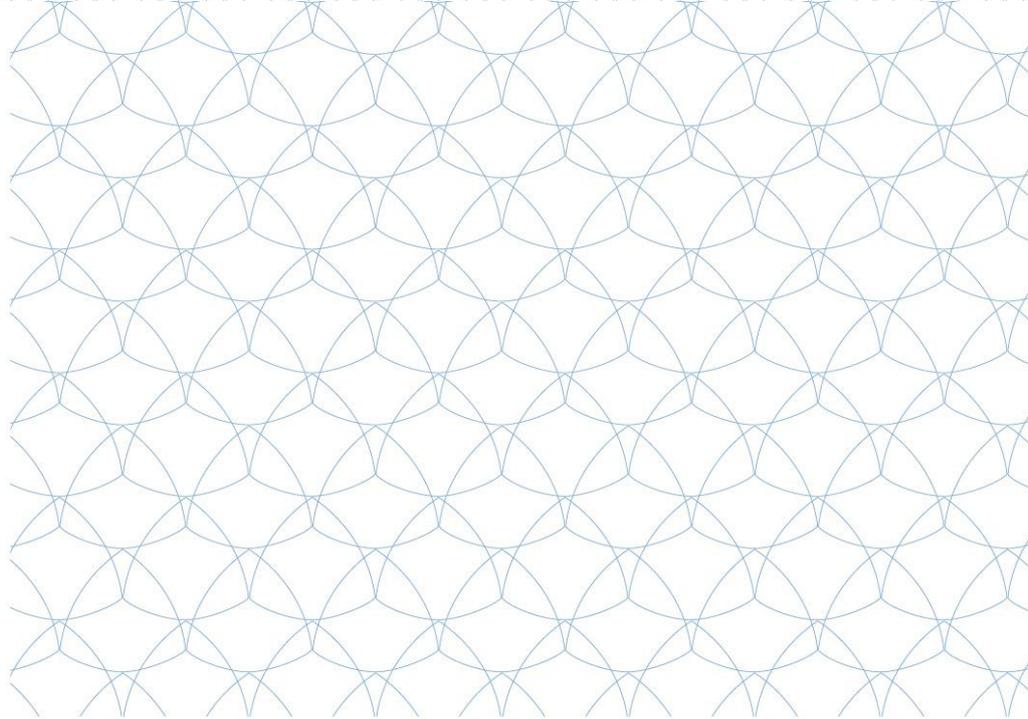




**EXCELLABUST**  
EXCELLING LABUST IN MARINE ROBOTICS

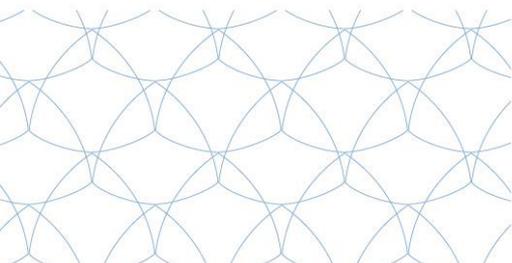


# Staff exchange 4

## *Report*

May – Jun 2017

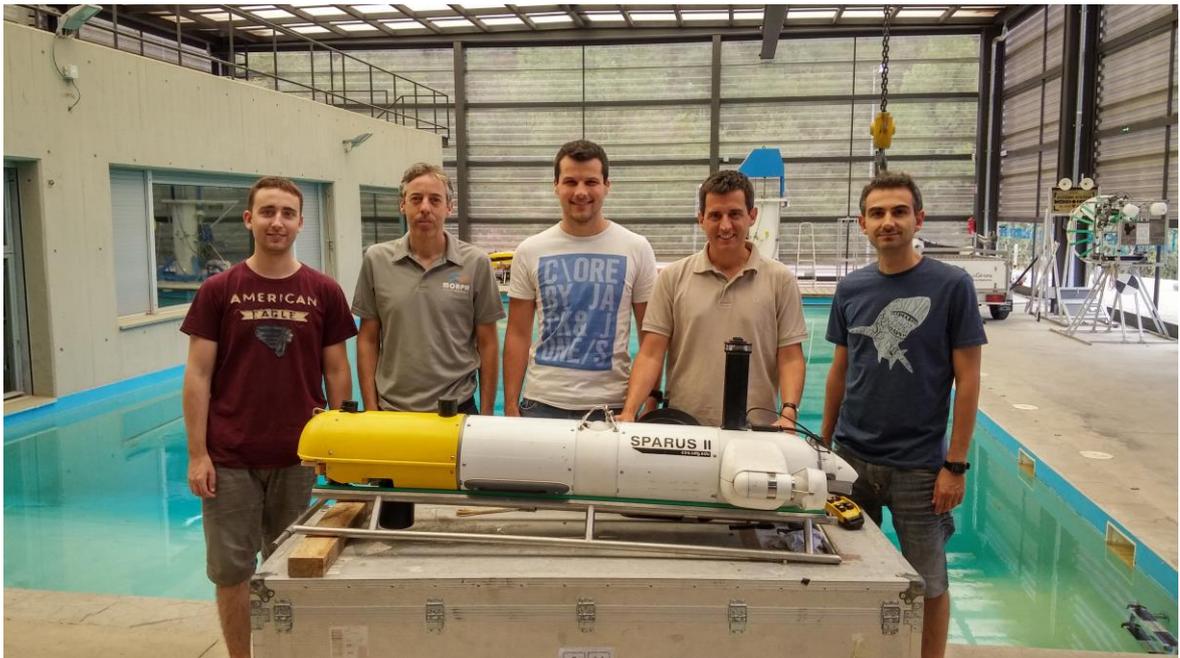
Ivan Lončar @University of Girona



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Ivan Lončar was a guest researcher during May and June 2017 in the Underwater Vision and Robotics Research Centre (CIRS) at the University of Girona (UdG). Facility is located in Scientific and Technological Park of the UdG, which currently consists of around 24 employees. Their team is composed of: pre-doctoral researchers, engineers, technicians, postdoctoral fellows and permanent staff. They are one of the leading teams in the research and development of Autonomous Underwater Vehicles for accurate seafloor mapping and light intervention. With more than 20 years of experience, they offer research, engineering and field operations experience to companies and institutions. Also, the team is part of the Institute of Computer Vision and Robotics (ViCOROB) and member of TECNIO network of Excellence in Catalonia region.



*Figure 1. UdG CIRS team*

During his stay, Ivan Lončar has been involved in research in the field of underwater localization. His research goal was collecting data necessary for testing localization algorithms based on multilateration approach, which were studied prior this staff exchange. His work was supervised by Dr. Marc Carreras. In addition, Lluís Magí and Carles Candela were very helpful with hardware integration necessary for conducting the experiments. Eduard Vidal introduced him with software architecture used in working with AUV (Autonomous Underwater Vehicle) Sparus which was developed in the Underwater Robotics Laboratory of the University of Girona.

In May, work on development and integration of inexpensive acoustic modem with ROS (Robotic Operating System) architecture used on both, Sparus and testbed computer. At the start of June, acoustic modems were integrated in FPGA-based controller. For localization, developed algorithm is using TDOA (Time Difference Of Arrival) and depth measurements. Depth measurements were used to reduce number of beacons at the surface, and most underwater vehicles have pressure sensors.

Experiments at sea were conducted during end of June in Sant Feliu de Guíxols, Spain. The setup consisted of one acoustic modem mounted on the top of the AUV, and three modems mounted on left, right and back side of the boat. For implementation simplicity, AUV was sending a message containing its current depth to three modems on the boat, and FPGA board on the boat was

calculating TDOA measurements and relayed it to ROS environment on testbed laptop. Message containing depth measurements were sent directly from three modems to ROS environment.

As suspected, because of the price of acoustic modems, gathered data contains measurements with a lot of disturbances. Also, data contained many reflected signals, due to boat being tied to a pier. Further analysis on acquired measurements will be presented as a joint conference paper.

Major results accomplished during and shortly after staff exchange are:

- Hardware and software integration of acoustic modem in AUV Sparus.
- Implementation of TDOA measurement acquisition algorithm in FPGA-based controller.
- Data gathering conducted in sea experiments.
- Analyzed results will be presented as a joint conference paper.



*Figure 2. Doing experiments on the sea.*