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PHOTONICS - EUROPHOTONICS MASTER COURSE

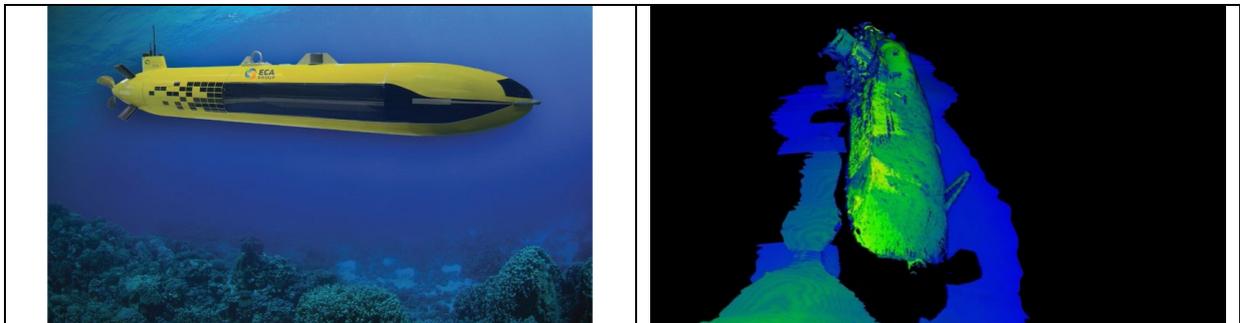
PROPOSAL FOR A MASTER THESIS

Dates: February 1st, 2022 – September 30th, 2022

Laboratory: Centre for Sensors, Instrumentation and systems Development (UPC-CD6)
City, Country: Terrassa, Spain

Title of the master thesis:

CONCEPTUAL DESIGN OF AN UNDERWATER LIDAR SYSTEM



Name of the tutor of the master thesis: **Santiago Royo**

Email address: santiago.royo@upc.edu

Phone number: 34 93 7398904

Mail address: Rambla Sant Nebridi 10 E08222 Terrassa

Summary of the subject (maximum 1 page):

Which is the problem?

Our research group has in the past developed a large number of lidar prototype systems and technologies for different types of autonomous vehicles, including applications on ground, railway, boats and space vehicles. Thus, a large amount of the technological background required for the development of an underwater lidar is lying within the group. However, the development of a solution for an underwater lidar poses several differences. One of the most relevant is the selection of the waveband to be used, which must fit to the transmission properties of seawater, but also has to allow a good enough combination of sources and detectors.

The project, thus, is oriented to the design and desirably partial implementation of an underwater lidar. A benchmark on available units will be followed by an accurate selection of the source, its optical components, its associate optical design, and the adequate detector which matches all the following. Implementation of a detailed power budget model including all potential factors, and construction of some subsystems (e.g. the detection or the scanning unit) are expected to be included in the Thesis if early incorporation is possible.

What will you do?

You will join our research group, where you'll have support on the use scanning lidars, power budget models, optical design and modelling. This project aims to explore the feasibility and limitations of using a new set of components (laser, scanner, detector) in a lidar system which performs properly underwater, desirably finishing with the physical implementation of one or more subsystems.

The interested student will work in a combination of experimental design and modelling tasks, from a very much engineering-oriented point of view, with the goals of

- 1) Achieving a complete design for a decision on feasibility of the construction of an underwater lidar system based on commercial components.
- 2) Benchmarking other available solutions present in science and technology environments, and its main applications
- 3) Analyzing commercially available components, and using their specifications to build a complete detection model for the lidar unit. This in particular involves decisions on the type of laser and the type of detectors to be used, once the ideal waveband has been fixed.
- 4) Setting up one or more subsystems of the lidar (e.g scanning, detector, imaging) characterizing them and verifying the results are fine when compared to

This is a combined experimental/modelling Thesis with strong engineering flavours. Basic programming skills (fluent Matlab or Python) and basic knowledge of electronics and optical system design are desirable, but not strictly required.

Keywords: fringe processing, parallelization, image processing, interferometry, metrology

Additional information :

* Amount of the monthly allowance (if it is the case):
To be discussed depending on the value of candidate.

* Required skills:

Interest in application-driven experimental work for solving real-world problems.

Basic concepts in optical metrology and optical engineering

Programming (C++ desirable, Python or proficiency in Matlab minimum) and use of scientific software packages (Labview...)

Search of resources, both scientific and technical

Self-motivated, objective-driven, capable of autonomous working within a multidisciplinary team.

* Miscellaneous:

This thesis contents will be considered confidential due to its closeness to market.

International team with several years of experience in the topic proposed.

Multidisciplinary environment with electronics and mechanics workshops, and specialists and technicians in metrology, optics, mechatronics, and electronics.

Possibility of joining the Centre for a PhD/Project Manager career in case of common interest.

Early incorporation welcome.