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## PHOTONICS - EUROPHOTONICS MASTER COURSE

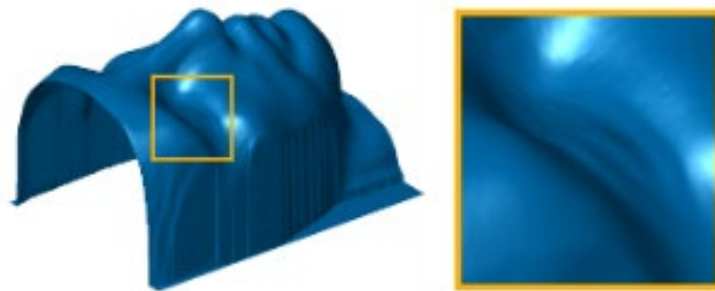
### PROPOSAL FOR A MASTER THESIS

Dates: February 1<sup>st</sup>, 2021 – September 31<sup>st</sup>, 2021

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

Title of the master thesis:

### Recovering 3D from polarization images



[https://web.media.mit.edu/~achoo/polar3D/Kadambi\\_polar3D.pdf](https://web.media.mit.edu/~achoo/polar3D/Kadambi_polar3D.pdf)

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## **Summary of the subject:**

**Aim:** To implement reconstruction techniques of surface normals from polarimetric images.

**Description.** Different types of sensors are currently being implemented to further exploit the particularities offered by polarimetric imaging. One exciting application of this techniques is the possibility to retrieve 3D information of an object based on its normals, recovered from a number of polarimetric images. Such a feature appears as highly desirable since the obtained algorithms are relatively simple and can work with very dense images, allowing in principle good quality reconstructions. The technique, however, has a number of trade-offs which need be explored to improve processing and provide reliable results.

At CD6 we have developed a number of polarimetric imagers using different approaches which may be used for this 3D reconstruction applications. Within the project the student will perform measurements with some of them in order to continue a works already started where a preliminary implementation of 3D from polarization has already been tested. The goal is to optimize algorithms and processing in order to deliver the best possible results for such reconstructions, and to investigate the factors which affect it.

**Project:** This is an applied project with experimental and computational component. Full time dedication expected. Along the first weeks of the project you will be introduced to the theoretical basis of the project, present current status of the technique in the Centre, to then implement your own algorithms, propose imaging approaches, and provide results. You will have direct support of CD6 staff in all moments.

**Keywords:** lidar imaging, point cloud processing, image processing, optical instrumentation, optical engineering

## **Additional information:**

\* Monthly allowance possible depending on value of candidate

\* Recommended skills:

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

Basic concepts in optical engineering and image processing

Programming (C++, MatLab, Python)

Search of resources, both scientific and technical.

Self-motivated, objective-driven, autonomous worker 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.