Master in Photonics – "PHOTONICS BCN"
Master ERASMUS Mundus "EuroPhotonics"

MASTER THESIS PROPOSAL

Dates: April 2023 – July or September 2023

Laboratory: Polarized light applications laboratory
Institution: Universitat de Barcelona
City, Country: Barcelona, Spain

Title of the master thesis: Polarimetric imaging for visibility and detection enhancement utilizing active polarized illumination

Name of the master thesis supervisor and co-supervisor: Oriol Arteaga
(for external proposals a co-supervisor from the Master program and a collaboration agreement is needed)
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Keywords: polarimetry, polarized light

Summary of the subject (maximum 1 page):

Polarimetric imaging is an effective way for clear vision and detection in turbid media and it has applications in biomedical research, for underwater vision, target detection in foggy environments, etc. In such conditions, polarimetric imaging is challenging because images are degraded by the particles in turbid media because of backscatter generation and signal light attenuation. In this work, we will study methods for visibility and contrast enhancement of turbid media (most significatively biological tissues and turbid water) based on polarimetric imaging utilizing active polarized illumination. The main technique used will be imaging polarimetry based on complete Mueller matrix measurement. Compared with traditional polarimetric imaging using linearly polarized polarimetric imaging scheme more reliable and robust.

Objectives:

-Optimization of the Mueller matrix imaging polarimeters available in our laboratory for turbid media analysis

- Optimization of the Labview/Python polarimetry scripts for imaging analysis and contrast enhancement
- Polarimetric imaging contrast of nerves in biological (animal) tissues.
- Underwater vision in lab environment.

Additional information (if needed):
* Required skills: Good programming and experimental skills are required.
* Miscellaneous: Ideally, after completing the Master Thesis, the candidate should be interested in developing a PhD thesis in the field of polarized light / polarimetry. Funding opportunities are possible depending on the interest and commitment of the candidate.