PHOTONICS - EUROPHOTONICS MASTER COURSE

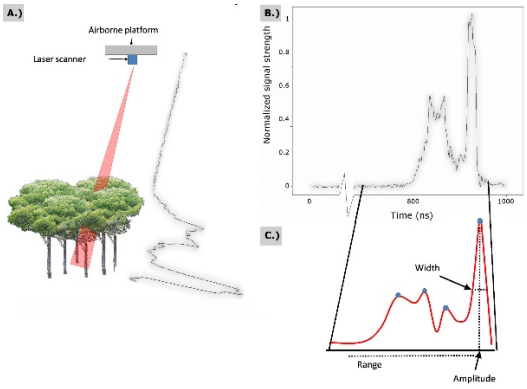
PROPOSAL FOR A MASTER THESIS

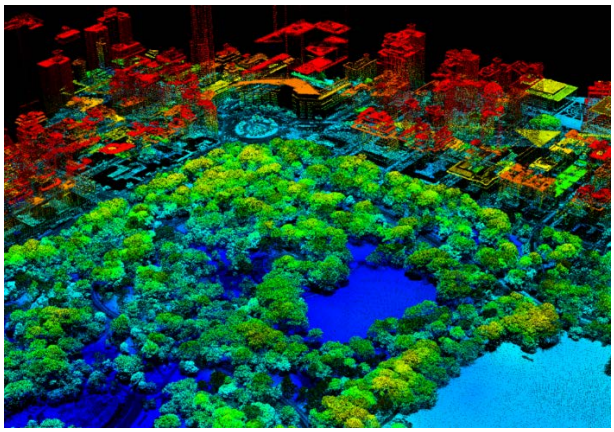
Dates : April 1st, 2016 – September 31th, 2016

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

Title of the master thesis :

A/D conversion in long range lidar imaging





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Summary of the subject (maximum 1 page):

Lidar imaging is a powerful measurement technique where a laser pulse is shone onto an object and the beam reflected back is recovered at some solid-state detector. The time elapsed is counted so an automated measurement of the distance to the target is obtained, without any further calculation. The concept is also referred to as ladar or time of-flight imaging. Different scanning mechanisms have been proposed to recover complete 3D images out of this pointwise approach.

In several applications, though, the performance of lidar units becomes limited by the presence of obstacles which partially block the laser beam. Applications involving fog or smoke, or the detection of objects after leaves or obscurants require the detection of very fast events and the reconstruction of either first or last returns to compose the lidar image and remove the clutter in the optical path.

One of the key parts of the lidar sensor is the electronic circuit used for digitizing the received laser pulses. The goal of the project is to design an electronic system based on a high frequency DAC for digitalization of analog signals generated by a long range lidar system. The optical pulses are detected by an APD (avalanche photodiode) sensor and the resulting signal is introduced to a high frequency DAC. By applying digital signal processing techniques, the distance values are calculated and dense 3D images are obtained. Such images are used to detect moving objects at distances up to hundreds of meters.

Keywords : flash ladar cameras**,** time-of-flight, 3D imaging, optical metrology, aerospace, transport

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++, MatLab) and use of scientific software packages (Zemax, 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.