

PHOTONICS - EUROPHOTONICS MASTER COURSE

MASTER THESIS PROPOSAL

Course 2014 –2015

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

Title of the master thesis: Dynamic measurements of the eye's pupil under controlled conditions of luminance and accommodative vergences in two optical devices.

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Summary of the subject (maximum 1 page):

The optical system of the eye is composed by a couple of lenses, a diaphragm and a sensor. Although seems simple, it has its own particularities as decentred optical elements, non-homogeneous media, and non-linear dynamic behaviours. The aperture stop of this optical system is the eye's pupil, defined by the iris' constriction or dilation. It is well-known that the main goal of the eye's pupil is to adjust the amount of light reaching the retina, thus under low luminance conditions the pupil dilates while at high luminances constricts. Moreover, due to the nerve innervation, the pupil size is related to accommodation and vergence, as in the near triad: the accommodation to near objects leads to convergence and pupil miosis. Besides, neural processes, as emotions, can also affect the pupil size.

The pupil size changes dynamically affected by all the factors previously cited and its study is a matter of interest as it can provide usefull information about the near triad, neurological process of vision or diseases, for a better understanding of the human visual system. Thus, it is essential to measure the pupil diameter with accuracy under different conditions of luminance and accommodation.

In this Master Thesis the comparison of two instruments for dynamic measurements of the eye's pupil, under different conditions of luminance of the eye's stimulus and under different accommodative vergences (eye's focus at near distances) will be carried out. The pupillometric results obtained with two optical devices with different temporal and spatial resolutions and pupil-detection algorithms will be analysed and clinically compared.

Keywords: pupillometry, luminance, eye's accommodation.

Additional information:

* Amount of the monthly allowance (if it is the case):

* Required skills: Self-motivated, objective-driven, capable of autonomous working within a multidisciplinary team. Basic concepts in Visual Optics, Signal Processing or MATLAB will be very helpful, although are not essential.

* Miscellaneous: This thesis contents will be considered confidential due to its closeness to market. Multidisciplinary environment with optics and optometry workshops comprising specialists and technicians in metrology, color science, optical design, visual optics and optometry. Possibility of joining the Centre for a PhD/Research career in case of common interest. Early incorporation is welcome.