



ERASMUS MUNDUS



EUROPHOTONICS-POESII MASTER COURSE

PROPOSAL FOR A MASTER THESIS

Dates: April 1st, 2016 – September 30th, 2016

Laboratory: Davalor Research Center – Universitat Politècnica de Catalunya

City, Country: Terrassa, Spain.

Title of the master thesis: Application of a high frequency display to a time-multiplexed fixed-viewpoint volumetric virtual reality system.

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Summary of the subject (maximum 1 page):

The capability of the human eye to focus near targets is the so-called concept of Accommodation. This concept has been comprehensively studied since the last century, however, there are still many issues related to it that are not fully clear. Additionally, since the apparition of virtual reality (VR) technologies accommodation has been given an increasing relevance since it is thought to be one of the key points for the success in VR development and implementation. In other words, an appropriate representation of focus cues (i.e., accommodation and peripheral depth cues) in a virtual reality system is still a limitation in these displays.

To this sense, there has been recently developed fixed-viewpoint volumetric systems (also known as multiplane displays) that are capable of representing nearly correct focus cues. The basic idea of these systems is to generate multiple focal planes in such a way that the observer looks at a superposition of focal images, thus, each element of the scenario can be represented at its corresponding focal distance. The multiplane generation can be done in two ways, spatially or time multiplexed. The latter one requires the synchronization of a high frequency display with an active element that acts as a fast switchable lens.

This master thesis aims to develop a software for controlling the luminance of each frame of a display, develop an experiment to easily test the software, discuss the limitations of the outcomes for virtual reality applications related to visual health testing, and finally work on the coupling of this system with a fast-switchable lens. The interested reader may find more information in Hu X, Hua H. Design and Assessment of a Depth-Fused Multi-Focal-Plane Display Prototype. *J. Disp. Technol.* 2014;10(4):308-316.

Keywords: digital micromirror device, time-multiplexed, volumetric displays, focus cues, depth perception, virtual reality.

Additional information:

* Required skills: MATLAB is essential. Self-motivated, objective-driven and capable of autonomous working within a multidisciplinary team is also important. Additionally, basic concepts in Visual Optics, Statistics, SPSS, R 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 visual optics, optometry, optical design, metrology and color science. Possibility of joining the centre for a PhD/Research career in case of common interest. Early incorporation is welcome.