Research Proposal:

HDR imaging techniques to understand facade view interactions

Laboratory: LIPID (Laboratory of Integrated Performance in Design)

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Summary of the research project that you will be working on (description, goals and why you are interested in working on it) :

The aim of the research project is to develop a high dynamic range (HDR) image dataset for use in daylight and views research. HDR images are used to measure the lighting environment through sequential imaging. These images will be used to identify and quantify the visual perception and comfort of facade openings. The particularity of these images is that they will be taken from a facade to the outside. This is in order to focus on the view offered from any facade. In this way, we can provide an assessment of visual characteristics from a window or other viewpoint. According to research, content such as natural landscapes, panoramic views, points of interest, horizontal stratification and movement enhance visual comfort and are therefore key elements for the health and well-being of building occupants (Ko et al,2021)

The understanding of these images is transdisciplinary, addressing issues ranging from the optimisation of facade equipment to the health of occupants, as well as the use of light as a design tool for buildings. It is this capacity for modularity and flexibility, enabling bridges to be built between physics, architecture and health that fascinate me about this project.

Description of the work that you will be specifically undertaken in the project (description and intended outcomes of your work)

In order to build the database, the project will consist of the following steps:

1. To understand the basics of HDR photography and their implications.
2. To locate the capture sites across the city of Lausanne by recording: positions, orientations and exposures.
3. To index capture locations and recorded data.
4. To sort, group and plan capture sites according to their location and orientation.
5. To collect image sequences from the capture sites. Each location is photographed with direct and indirect exposure of sunlight.
6. To import the data in order to represent it geospatially with QGIS.
7. To develop the image sequences into HDR images.

8. To analyse the images obtained to understand certain aspects of perception and visual comfort.

The outcomes of this database will be used to develop future research into perception and visual comfort. It will be used, for example, to study the visual effect of certain aspects of the building envelope on human performance and perception, focusing on visual clarity. A typical application of this is the visual performance of fabric shading systems and electrochromic windows. But also the way in which these images are taken and sourced can potentially improve the methodology of future work.

Expected planned research impact **(why does your research matter? how this research will positively impact society?)**

A better understanding of visual comfort and the interaction of daylight between indoors and outdoors could have a significant impact at work, in hospitals, and in high-density housing. This understanding could be translated into architecture as a key player and tools to truly respond to human mechanisms such as the circadian rhythm regulating our physiological and neuroendocrine responses on a daily basis. By capturing a wide range of incident light and views their uses are not single but diverse. Above all this diversity highlights the major role that light can play as a bridge between different disciplines, for example between health, medicine, physics and architecture.

References

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