

Poster

Non-linear Adaptive Lighting Model as a More Holistic Approach to Urban Lighting Design

E. Gonçalves¹, A. M. Ferreira¹, & H. Christiaans²

¹ UNIDCOM/IADE, Lisbon, Portugal

² TU Delft School of Industrial Design Engineering, Netherlands

Introduction

The way we currently use the nighttime space is changing rapidly (Tillett, 2011). As current lighting systems, generally, do not respond to these social changes, there is a need to devise new concepts and approaches (Ritter, 2006). From this framework the research question arises: Is it possible to develop new theoretical models, that considers adaptive light, as a way to ensure a more effective control and response to user-centred needs, maintaining or enhancing the sense of security and well-being in urban space?

Hence, the main goal is the development of an analysis tool (model), that can support the creation of more tailored and flexible lighting solutions, than current ones, in relation to the location. This approach, should provide a broad empirical basis for the conceptual interpretation of the designer.

Proposed Model

Perception of space and time is as vital to our biorhythm (Burnett, 2011) as it is to the understanding of our surrounding. This is linked to the natural movement of shadow and light variation along the daytime and over the seasons (Narboni, 2004). According to Madsen's (2006) concept of *Light Zones*, it is more appropriated to refer to light as being all the different levels of shadow in between light and darkness.

The model will promote the correlation of light modulation - through the use of four main lighting variables: brightness, colour temperature, direction and distribution (Madsen, 2006) - with analysis methods for user and space

perception (Pont, 2012; Van Bilsen, 2008; Tillett, 2011). Structured into two groups of layers that interact at different levels: one *analytical* and one *responsive*.

Validation method

We will resort to mix methodological approach. In a first moment, supported on bibliographic and case study review, and on a second, validation through a quasi-experiment in laboratory (Pont, 2012), (Flynn, 1979) and in a full-scale outdoor experiment (Lindh, 2011). The objective is to measure the subjective impressions of light in the users in an outdoor pedestrian spaces.

References

- Burnett, D. (2011). Circadian Adaptive Lighting. *Professional Lighting Design*, (78), Gütersloh: Verlag für Innovationen in der Architektur, pp. 48-54.
- Flynn, J.E., et al. (1979) A guide to methodology procedures for measuring subjective impressions in lighting.
- Lyndh, U. (2011). Lighting Design Research in Public Space: A Holistic Approach to a Complex Reality. *CIE 27th Session- Proceedings*. CIE, p.767
- Madsen, M. (2006). Light-zones: As concept and tool - An architectural approach to the assessment of spatial and form-giving characteristics of daylight. *Proceedings International Conference on Architectural Research ARCC/EAAE*
- Narboni, R. (2000). *Lighting the Landscape*. Birkhäuser Architecture.
- Pont, S. (2012). Spatial and Form-Giving Qualities of Light. *The Wiley-Backwell Handbook of Experimental Phenomenology*, Liliana Albertazzi (ed.)
- Tillett, L. (2011). Grounding practice: speculations on affect and environment. *Convention Programme - PLDC 3rd*. in VIA-Verlag, Joachim Ritter e.K. (ed.), Gütersloh, pp. 77-78.

Van Bilsen, A. (2008). *Mathematical Explorations of Urban and Regional Design*. TU Delft, PhD thesis.

Ritter, J. (2006). Editorial article. *Professional Lighting Design*, (52), Gütersloh: Verlag für Innovationen in der Architektur, p. 8.