Dynamic Lighting as a Design Tool to Achieve Amenity in Open Space

Aimilia Karamouzi[1], Dimitris Papalexopoulos[2], and Tasos Varoudis[3]

Abstract. This paper presents our research objectives about dynamic lighting as a tool to achieve amenity in open space. We are currently reviewing theory and technology and we outline our main research methodology. We aim to study how dynamic lighting patterns can impact on amenity and people's engagement in public space, oriented towards a sustainable development, and then to create a parametric tool that demonstrates these dynamic lighting patterns as visual salient objects in public space.

Keywords: Architecture, urban lighting design, dynamic, engagement, sustainability, parametric tool.

1 Introduction

There is a positive aspect of implementing dynamic lighting in open space. Dynamic lighting is present in urban relighting projects that have reported a generally psychologically more inviting environment, in essence providing sustainability.

Our motivation is that currently, more than ever, dynamic lighting has been perceived to promote this engagement. Criticism has already become powerful that warns against sensory overload and an overflow of information that expend themselves ever more quickly and demand ever stronger stimuli to wrest attention. In the meantime very precise decisions are made between the temporary and the permanent light installations. The problem however is that the struggle for attention demands rules. And what temporarily surprises, gives pleasure and stimulates the senses could quickly become annoying as everyday life [1]. One area of considerable debate with regard to exterior lighting design is the use of colour and more recently the dynamic aspects of colour change [2].

2 The Methodology

This research aims to overcome the lack of a formalized way to analyse architecture, dynamic lighting technology and digital technology. By reviewing bibliography, a new set of rules and ideas will form the base for developing the second part of this research. In addition to the literature review a preliminary study of reviewing technology about digital recording equipment and software implementation will be carried out.

R. Wichert, K. Van Laerhoven, J. Gelissen (Eds.): AmI 2011 Workshops, CCIS 277, pp. 41–44, 2012.
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Then we will try to find key design parameters of light and space that transform the patterns of light into dynamic salient objects in the city. Important issues are the tools and the case studies selection. There will be a coupling between theories about architecture, space, morphology and the most interesting technological tools that are likely to be used in order to document and analyse the case studies.

At last we aim to design a parametric tool that demonstrates dynamic lighting patterns as visual salient objects and produces amenity and sustainability in public space, with increased interest in open areas in the city. The result will be demonstrated on an open area in the city of Athens. This open area will probably be the Kotzia Square as far as the selection of each case study is also subject to the later analysis and any additional forthcoming criteria. This methodology aims to create a theory and a tool as the final products of this study.

3 A New Set of Rules and Ideas about Dynamic Lighting and the City

This section refers to the background theory of urban lighting as dynamic components in the city and the lighting and digital technology that is currently used to create dynamic lighting effects. We aim to introduce a formalized methodology about the dynamisation and the digitisation of light.

There is a broad literature concerning architecture, light and information that should be combined to create a basis for a concrete theory about dynamic lighting and architecture. Theories about dynamic and public lighting, parametric and hybrid architecture, time and space will be combined to the underlying lighting and digital technology and their potential to create amenity lighting and engagement in public space.

This research sets out to the theme of the dynamisation of light and the digitisation of light sources and poses the question of how the architectural space is defined when units of light are digitally addressed, constituting a luminous dynamic spatial grid of pixels. It is an architectural-philosophical approach, noting the origins and effects of today's urban light technology as applied to architectural surfaces.

The dynamisation of light has been an underlying trend in recent years. Dynamic lighting is lighting that changes that is not always static. It is a thing of the past that light could only be turned on or off [1].

Our notion is that light is enriched by information; light becomes informed. Materiality is increasingly being enriched with digital characteristics, which substantially affects architecture's physicality [3]. Artificial lighting works as a structural and a building material under the scope of the visual perception and the interaction with the architectural surface.

The underling idea is that of digital controlling the lighting characteristics of architectural spaces. Further study needs to be carried out in order to find key design parameters in the context of light and information that define the luminous surface of architecture.

4 Lighting Parameters and Space

This study aims to review theories about the spatial and formal configuration in relation to lighting properties and a scientific approach observing regularities or unordered space time phenomena through the analysis of the case studies which integrate dynamic lighting. A hypothesis of the main characteristics of dynamic light patterns, that influence the way public space is used, can be tested by observing the outcome of the case studies.

The case studies have been selected according to their spatial characteristics and the effect of dynamic lighting in the environment and will be analysed according to the patterns of light in space and time, that they create, as well as their potential to attract attention. The case studies will represent basic types of dynamic lighting installation, which has an effect on public space and they work as a different, additional level of public lighting.

A detailed documentation will be carried out in order of being able to recover the state of the effects and make further analysis of the phenomena. According to the preliminary study of technology about digital recording equipment and software implementation, mobile equipment will be needed to carry out the onsite documentation. We speculate that the main light parameters are the luminance and the colour contrast and the main space parameters is the viewing distance and the geometry of the luminance pattern in relationship to how people move and engage the space.

Parameters of light that transform the patterns of light into dynamic salient objects in the city should be examined under the scope of existing theories concerning the human factors (safe movement, visual orientation, visual comfort, facial recognition, a general feeling of safety). Visual perception is a complex phenomenon and many studies have been carried out to examine different aspects of perception. This research will be mainly survey theories about selective attention as salience maps, color constancy, engagement, image based lighting and theory.

Concerning space, Bill Hillier in his book “Space is the machine”, refers to the social logic of space. A key outcome is the concept of “spatial configuration” meaning relations which take account of other relations in a complex. He says that architecture begins when the configurational aspects of form and space, through which buildings become cultural and social objects, are treated not as unconscious rules to be followed, but are raised to level of conscious, comparative thought, and in this way made part of the object or creative attention [4].

5 Parametric Analysis and Demonstration

This part will focus on the development of a stand-alone software implementation that will demonstrate a set of dynamic lighting patterns as visual salient objects. Before the main development phase, there will be a lengthy procedure of translating the theoretical and analytical findings of the previous working packages to better reflect the software development approach.

The result will be demonstrated on site at an open area in the city of Athens. The public space and the social attitude, engagement and aesthetics, amenity and city iconography are some of the underlying theories that will be combined to a human factor analysis in order to create a realistic tool.

Key points in the software tool will include: a) Selection of the best reviewed technologies for each field from the previous working packages and b) Translation of the lighting parameters and architectural understanding towards an easy to use interface.

A key point of the demonstration is to create dynamic effects related to the recreational requirements of different social and lifestyle groups wanting access to the square. This includes design that adds new user contexts and publicly accessible activities that manage to be socially inclusive and promote social encounters and cultural exchange.

6 Conclusion

The objective of this paper is to highlight the key issues and provide some form of framework for detailed discussions of the various topics involved. We aim to design a tool for dynamic lighting design that shall respect and interact with the diversity of existing building typologies and with the distinctive spatial aspects of the public space. This may include allowing to incorporate new lighting installation and to promote an aesthetic reinterpretation in the context of the city. An artistic and eventful dimension will interact with the existing identity of the open space. The tool demonstration should result in new urban spaces. A human scale will promote opportunities to spend time and engage in activities in the square's public areas.

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