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PERIPHERAL APPEARANCES: THE EXPERIENCE OF COLORED LIGHT IN THE URBAN OUTDOORS

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Resumen

Una revisión de las publicaciones de arquitectura contemporánea revela que el uso del color en el diseño arquitectónico y el entorno urbano se ha incrementado en las últimas dos décadas. Con la llegada de diodos emisores de luz (LEDs), los métodos para la incorporación de color en el entorno está experimentando actualmente una amplia transición. Debido a la facilidad de aplicación y programación, la iluminación que cambia de color se utiliza con frecuencia en la iluminación de fachadas de edificios y espacios urbanos.

Hemos llevado a cabo un pequeño estudio de campo durante un festival de arte público, urbano y de luz para obtener conocimientos en el uso de luz coloreada en los entornos urbanos. Las experiencias de cuatro visitantes de los mismos espacios urbanos durante el festival y después del festival se documentaron usando grabaciones vídeo y sonido Después se realizaron entrevistas para conocer las experiencias subjetivas de cada participante y se tomaron mediciones de luz y color para el experimento.

Los resultados documentan el impacto del color y la luz coloreada para transformar el espacio urbano y la experiencia del entorno que implica muchos niveles sensoriales. También dieron una visión de cómo se podría mejorar el uso del color-luz y utilizarse en futuros diseños urbanos y en instalaciones temporales y permanentes.

Palabras clave: LUZ COLOREADA, ILUMINACIÓN URBANA EXTERIOR, VISIÓN PERIFÉRICA, PERCEPCIÓN DEL COLOR, ARTE LUZ Y DISEÑO

Abstract

A review of contemporary architectural publications reveals that the use of color in architectural design and the urban environment has increased over the past two decades. With the advent of light-emitting diodes (LEDs), the methods for incorporating color into the built environment are currently undergoing a vast transition. Due to the ease of application and programming, colored and color-changing lighting is frequently used in the illumination of building facades and urban spaces.

We conducted a small pilot field observation during a public urban light art festival to gain insights in the use of colored light in urban environments. The experiences of four visitors within the same urban spaces during the festival and after the festival were documented using video and sound recordings. After the walks, interviews were conducted to learn about the subjective experiences of each participants. Light and color measurements were taken by the experimenter along the way.

The results documented the impact of color and colored light to transform urban space and the experience of the surrounding environment on several sensory levels. They also gave insight how use of color and colored light could be improved and be used in future urban designs, both in temporary and permanent installations.

Keywords: COLORED LIGHT, URBAN OUTDOOR LIGHTING, PERIPHERAL VISION, COLOR PERCEPTION, LIGHT ART AND DESIGN

1. INTRODUCTION

Cities are increasingly using colored lighting to market and brand their city and attract tourists with light festivals and illuminated landmarks. Colored light is implemented into building facades. Historical roots are in entertainment as well as advertisement when particular areas were dedicated to such "frivolous luxuries". While areas like Times Square, cities like Las Vegas and events like the Olympics, e.g. in Beijing, are still at the forefront of colorful urban illumination, with the availability and affordability of colored light technology, concepts and installations can be found more widespread (Arup 2015; Bahamon and Alvarez 2001; Laganier and van der Pol 2011; Seitinger et al. 2009; Schulte-Römer 2011). Art installations during festivals have been described as playful places for experimentation and test beds for technical innovations (Schulte-Römer 2013).

At the same time bottom up approaches of community groups and artists can be observed to use color and light to playfully transform the urban living and working environment (Kobayashi and Murakawa 2013; Guerilla lighting 2015; Arup 2015). The use of artful lighting and colored light is looked at as a playful way to claim and revitalize an outdoor area, make it feel safer and more interesting, attract pedestrian users and therefore support social interaction.

Our research was concerned with learning about the different media available to implement light and color into the urban environment, and how viewers experience the resulting change in the environment.

We chose one light art festival, the one week long Glow festival in Eindhoven (Glow 2015) to conduct a small exploratory study to inform a future larger experiment. Of interest was how many of the art works used colored light, what lighting technology was used to create the experience, and how the visitors responded to the works.

The objective was to get participants' comments via the interviews after the walks, and their verbal expressions during the walks, to get some comments in regards to:

- the differences in spatial perception comparing the environment with and without the installation
- if participants could envision elements from the installations in an every-day outdoor lighting scheme
- how the participants evaluated the use of color in the installations

2. Study

2.1. PROCEDURE

The Glow festival had suggested walking paths to view all 38 artworks throughout the city. The experimenter walked the exhibition with 3 participants at different days during and after the art festival. The participants and the experimenter wore small cameras to record audio and video during the walks. GPS data, light level and light color readings were also recorded throughout the walks. The participants were interviewed afterwards as to their experience.

Fig. 1. Glow 2014, Google map with three art work areas described in this paper

For this paper, data for one small segment of the art walk was chosen which included three light installations in a neighborhood located just outside the city center between an area with bars and restaurants, and a residential area. The neighborhood itself used to be high end residential, however most of the 2-3 story mansions, surrounded by garden and park areas that are separated from the public walk ways by water streams, are now used for various businesses and foundations, as well as an assisted living facility. The adjacent residential area is occupied by densely built 2-story one-family houses.

Artwork 1 (Atsara, 2014) was an installation that projected video of white shapes onto shrubbery as well as wires tensioned between treetops above a body of water. Artwork 2 (Avrabou and Xenakis, 2014) was an installation (utilizing fiber optics) of illuminated colorful watering cans. Artwork 3a (*Les Orpailleurs de Lumière*, 2014) was the illumination of a tree lined parkway using tree mounted color changing moving lights. Using these lights the trees were up-lit in different colors, while the regular cool white metal halide street lights were covered with red filters to soften their light. Sometimes the ground was illuminated by patterned light. Artwork 3b (*Les Orpailleurs de Lumière*, 2014) consisted of video projections with sound that were mapped on the front facades of two mansions on opposite sides of the street. Apart from using the red color filter on the street lights, and adding temporary light art, the existing landscape remained unchanged.

Fig. 2. Area 3b before/ after (left) and during (right) the festival

2.2. RESULTS AND DISCUSSION

During a normal evening, pedestrian, car and bike traffic was sporadic on the walkways and 2-lane streets; residents passed through from and to downtown, or to one of the businesses located in the neighborhood. During the art festival, however, the streets and walkways were filled with pedestrians, despite the temperatures being around 3°C and rainy.

While during the festivals additional lights provided visual information and color in comparison to a normal evening, the average horizontal light levels and vertical light levels at eye level were lower for areas that featured a colored light installation (see Figure 2, locations 2, 4, 5 and 6). Despite the lower light levels the areas were generally evaluated as comfortable to be in. Areas adjacent, where white light was added to the existing illumination, were slightly brighter during the festival (see Figure 2, locations 1, 3 and 7).

Most installations incorporated illumination of vertical objects, not just the ground, and therefore supported peripheral vision. Video recordings show that all participants' gaze was drawn upwards when the light installations were in place. During default every-day illumination the gaze was predominantly on the ground. The time it took the participants to walk the area was more than twice as long with the installations compared to default every-day illumination (18 min versus 8 minutes), excluding the projected video films in artwork 3b, which added another 6 minutes to the walk.

Fig. 3. Light Levels during and after the light art festival.

Differences in spatial perception comparing the environment with and without the installation were clearly described by all participants. In general the art works added illumination in the vertical plane, thus the space looked larger. Walking by the area of artwork 1 after the exhibit was over, one participant for example said: "This looks tiny too. And it smells different."

Generally the added textured light in the vertical plane that revealed tree tops and surroundings was rated as a good idea for regular lighting. While dynamic lighting and projection were welcome as temporary art installation components, the participants felt that for every-day use it would be too distracting at the intensity, saturation, dimension and speed that was used for the art works. However the subtle addition of colors into the everyday after-dark was evaluated as generally positive.

'Glow' enabled their visitors via web and phone app to vote and rank the art works. The data is publically available (Glow 2015). Out of all 38 projects, 68% used color, 71% had dynamically changing light elements, 42% used projection, and 42% LED technologies of various sizes. Looking at the 10 highest ranked artworks in terms of popularity (in relation to the number of visitors), all of them used dynamically changing light, 70% used color, 60% used and transformed the urban environment given, half used video projection and half LED lighting. (Two of the three artworks included in the research above were among the top ten (rank 2 and rank 10)).

3. CONCLUSION

Colored light is a major component in artistic light installations and it has entered every day after-dark outdoor illumination. While, depending on color and light spectrum, dimmer light levels can look equally bright (Besenecker and Bullough, 2014) and feel comfortable, color adds a sense of wonder. Through illumination of vertical surfaces of buildings, objects and plants, the sense of space can be extended, which was evaluated as positive. This suggests an opportunity to generally improve an after-dark pedestrian experience. Well-placed vertical illumination enables pedestrians to see and experience the 'spatial volume' of their night time surroundings (and not just the ground plane of walk-ways and streets). This can improve a sense of orientation. In addition color can be used to shape and set the mood of the particular area.

In this study the color aesthetics of the projected artworks were rated by the participants as superior to the colorful LED installations. Studies into the spectral compositions of the colors produced (as done in the fields of theatre lighting) (Gerlach 2003) might help pinpoint what the difference in quality is and how LED produced color could be improved. Color mixing, which functions differently in LED technology than in filtered broadband lighting, is being researched, both in the area of performance and entertainment lighting, to improve LED color quality.

The study described here was an exploratory pilot investigation during a light art festival. Many aspects other than light and color can affect peoples' behavior and perception

in a festival such as Glow. Therefore any attempt for generalization is difficult, and any possible findings should be investigated further in a more rigorous study.

Such follow-up case study is planned this fall, where an existing outdoor permanent art installation, created using colored metal halide light sources with dichroic glass filters, will be retrofit using color changing LED technology.

Participants will evaluate the urban space illuminated by this artwork. The evaluations will occur before and after the retrofit, to gain knowledge of the differences in perceived color quality produced by different color/light technologies.

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