LightBox - Exploring Interaction Modalities with Colored Light

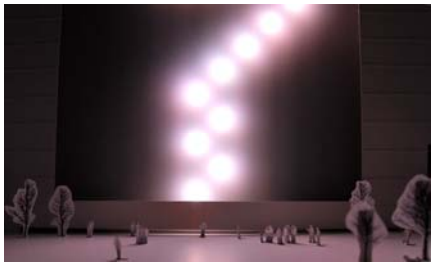

Figure 1. An animated lighting sequence visualized on the hi-power LEDs of *LightBox*

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Abstract
In this paper we describe a prototype for the simple and playful exploration of various interaction modalities with colored light.

Keywords
Interactive Lighting Design, Prototyping.

ACM Classification Keywords
H5.2. Information interfaces and presentation (e.g., HCI): Prototyping.

General Terms
Design.

TEI'11, January 22–26, 2011, Funchal, Portugal.
ACM 978-1-4503-0478-8/11/01.

Introduction
In lighting design, more than in many other design disciplines, it is mandatory to approach a new concept by iterative trying and testing. As light is an intangible and very transient medium, which is influenced by a wide variety of factors, new design concepts need to be applied and tried on an experimental basis in order to arrive at an aesthetically appealing result. Thus applying good lighting design concepts is a challenging task which demands careful consideration. Things are even more complex when adding a layer of interactivity to the project. To investigate this type of setups, we have crated *LightBox,* a tool for exploring interaction with colored light and for testing concepts for responsive environments [1]. The ultra-bright multi-colored light-emitting diodes (LEDs) of our system can generate any visible lighting color. They can be addressed and controlled individually, thus simulating effects ranging from a solid beam of light to very subtle animations, transitions and dimmed lighting effects.

Implementation
LightBox is housed in an aluminum suitcase measuring 48x38x25cm. The lid of the suitcase contains a panel of 12x12 LEDs, assembled from 12 hi-power single, 24 volt/10 watt *Colormix* red, green and blue (RGB) LED strips. These LED strips respond to digital multiplex (DMX) signals, a common data standard in industry for

controlling lights. The suitcase contains a PC running a custom software, as well as a 24- and a 9-volt supply to power and control the LED panel and additional experimental setups, e.g., for gathering input via sensors. In addition, we built in four simple circuits (consisting of one sensor element each) using suitable resistors and a micro-controller that reads out sensor values and transmits them to the computer. There, the data is interpreted and processed. Each sensor can be plugged into the aluminum suitcase from the outside, using 3.5mm stereo jacks and sockets. In addition to the sensorial equipment, we have developed a custom software application that lets users interact with *LightBox* using a graphical user interface (GUI).

Interaction Modalities

LightBox can display predefined content and turn it into a visual color experience. With a custom-built *Screen Capturing software*, the user can capture any area of the computer screen, for example a video from *YouTube*® or similar content. The software translates the captured area into DMX signals that in turn control the RGB LEDs in the prototype. By using this software, even novice users unfamiliar with DMX signals can easily define their own lighting animations. As an example, we displayed an animated, rotating globe. The texture of the globe contained lighter and darker regions, which created an intensive and rapid interplay of a colors when transferred to the (relatively low resolution) LED panel. In another modality, users can interact with the sensorial equipment. We built four types of sensor circuits: heat, motion, light and sound sensors that influence different animations in terms of size or luminance, depending on environmental changes. For example, an animated red circle would grow in size while changing in intensity and color from white to red when the heat sensor measured an increased temperature. This equipment is meant to inspire the designers' imagination for opportunistic interaction possibilities. In a playful interaction approach, they can use the sensorial equipment as a possible starting point for brainstorming and reflecting about reactive input and output methods in interactive lighting design.

Conclusion

In this paper we presented *LightBox*, a miniature lighting lab that allows designers to explore interaction modalities for interactive lighting design. Considering the fact that permanent interactive lighting installations are highly work- and cost-intensive, we believe in an approach, in which early concepts can be tried and explored on a small scale beforehand. The benefit of our system is that new concepts can be tried and tested before implementing them in the real world. Explorative prototypes such as *LightBox* might spark the inspiration of artists and designers in the design process while making a complex intangible relationship between interactivity and lighting design more graspable.

Acknowledgements

We would like to thank the company Feno for their generous support along the project.

References

[1] Bullivant, L.: 4dspace: Interactive Architecture. John Wiley & Sons (Publisher) 2005.