
Digital Light Installations – Connecting people through interactive buildings.

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Abstract

The rapidly increasing number of digital lighting systems embedded into architectural structures offers great possibilities for interaction. One prominent example are media façades, which are created by equipping the outer shell of a building with light emitting elements of various kinds. As a first step towards exploiting their full potential, in terms of providing interactive experiences, and connecting people, we share our experiences on working with different media façades in urban areas. In this position paper, we share the experiences and insights we gained during the development and deployment of various interactive systems for media façades. We provide inspirational cases for our current and future research for the development of interactivity in urban areas.

Author Keywords

Media façade, interactive lighting design, interface, social interaction

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Experimentation, Human Factors, Design.

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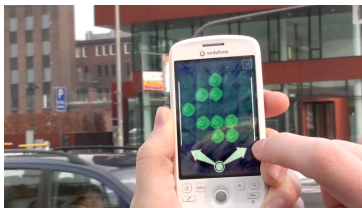


Figure 1. A passersby playing the game of life on a media façade with a smartphone as input device [1].

Introduction

The amount of digital technologies that are deployed into the urban landscapes steadily increases [7]. One prominent example are digital lighting systems embedded into architectural structures and façades, turning the buildings outer shell into giant screens. These so called media façades [6] represent a rapidly emerging field of research. As described by Seitinger et al, [7], they can provide also interactivity, as they offer new ubiquitous interaction possibilities in a highly public environment. Due to their architectural scaled size and the therewith connected high visibility, media façades can address large audiences and hence also provide various opportunities for interacting simultaneously with several users. When designing interactive systems for digital lighting installations like media façades, several challenges have to be considered. Dalsgaard and Halskov described eight key challenges when designing interactive media façades [4]. In summary, they state that: (1) There is a need to find suitable interaction techniques and modalities. (2) Researchers and designers have to deal with different technical capabilities of media façades and most importantly with tremendously different resolutions, ranging from very low to nearly full high-definition (HD). Hence, the displayed interactive content needs to suit these properties. (3) On the one hand, the highly public exposure of the media façade, and thus its content being widely visible, there is a great potential for multiple users interacting simultaneously. On the contrary, this matter also raises the need for appropriate content and for suitable strategies to support multiple users accessing such shared encounters in parallel without leading to frustrating experiences.

In this position paper, we share the experiences that we gained while working with different digital lighting installations in various settings. We believe that these lessons learned can lead to fruitful discussions on the topic.

Interacting with Media Façades

Engaging People

When trying to engage people to interact with each other mediated by digital lighting installations like media façades, passersby need to get engaged to interact with the media façade itself as a necessary first step. In [1], we implemented several prototypes to create playful interaction with a medium resolution media façade of the PSD Bank building¹ in Münster, Germany. As depicted in Figure 1, we implemented several ubiquitous games, such as Tetris or the Game of Life, where passersby were able to play those games on the façade using smartphones as input devices. This work delivered valuable insights on how people can get engaged to interact with media façades in general.

Simultaneous Interaction

To investigate how multiple users can simultaneously interact with a media façade, we installed an experimental setup at the ARS Electronica building² in Linz, Austria. The deployed application was meant to ease ubiquitous interactions with media façades at-a-distance, supporting multiple users interacting simultaneously [3, 8]. The media façade in this setup consisted of about 40000 LEDs that are located inside the building's 1087 windows. The size of the building

¹ <http://www.psd-medienfassade.de/>

² <http://www.aec.at>

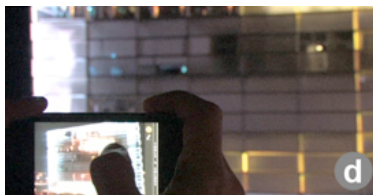
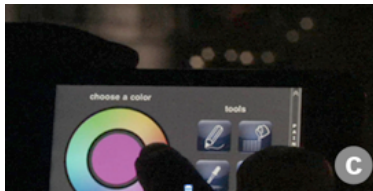


Figure 2. The façade from the building (a) is directly manipulated through the video image on a mobile device (b). A tool palette (c) empowers users to paint the building in different colors over a distance (d) [8].

allows a viewing distance of up to 300 meters, with an optimal interaction distance being around 50 meters. The area in front of the façade allowed the users to spread over the whole area. This led to the effect that users could not necessarily see each other. To allow interaction and manipulation of the displayed content, we adopted the concept of *Touch Projector* [2], a system introduced by Boring et al. and applied the concept of interacting through live video at-a-distance. The system runs on an interactive see-through panel (see Figure 2a-d). By utilizing this approach, we also ensured all users are in front of the building, since a direct line of sight is required for the interaction. We prototypically implemented a *painting application* allowing user to *paint* freely on the façade by touch input. We ensured that at least two users were simultaneously interacting at all times. Out of 50 users in total, we recruited 15 for detailed feedback after interacting with the building.

Collaborative versus competitive use

Regarding *painting* on the façade, we experienced two main scenarios. When users knew each other beforehand, there was the tendency to collaborate in a cooperative way. When not knowing each other, the users mostly interacted in a competitive manner. In general, we found that users liked both collaborative and competitive interaction. One user made a controversial statement about this: "Well, it was good and bad, because it is good in a way to interact in a parallel way if you know the person, you are co-working together. But if you don't know the person, you are kind of fighting over the pixels and over the space to draw and it's kind of annoying".

Connecting People

With the described prototype, we allowed multiple users to simultaneously interact with a media façade. Our observations showed that by making digital city lighting installations embedded in media façades interactive, people can get engaged to interact with these façades and hence, with the urban environment. Regarding the interaction itself, the observation of the users and the feedback we gathered in informal interviews indicated the different interaction patterns, *collaborative* versus *competitive* interaction, depending on if the users knew each other beforehand. But one important finding we observed was that independent of the familiarity, the users were willing to interact with each other, both online through interaction with the façade and also offline, person to person, triggered by the interaction experience with the media façade. Initiating social interactions with other users was hindered in some cases by the circumstance that users often were not aware of each other. This is owned due to the matter, that the space in front of a media façade is fairly large such that there is not always a line of sight between the users. While interacting, users already tried to spot other users by watching out surrounding people in similar postures. In some cases after the interaction, they approached the spotted users to confirm and strike up a conversation on their experiences while interacting. Hence, we argue that knowing who the other users are and having the possibility of spotting them in the space in front of the media façade are important aspects that need to be addressed and understood when designing interactive applications for media façades in order to connect people in urban environments with each other.

Conclusion and Future Work

The reported experiences indicate that media façades as a representative of digital city lighting installations have great potential to provide interactivity and to connect people with urban landscapes and with each other. To exploit this potential, users need to be provided with suitable interfaces and interaction techniques that create engagement, as well as with interactive applications on the façade that foster interaction of multiple users in parallel.

Currently we are investigating suitable turn taking algorithms to allow *temporary ownership* over a façade in order to enhance the users' experiences. On the other hand we want to know which mechanisms are the most promising ones to gain more awareness on each other when interacting simultaneously with urban architecture.

We want to enrich the workshop with our gained experiences and observations in order to engage fruitful discussions on how interactive digital city lighting systems can be utilized to engage people to interact

with the urban space and to trigger social interaction between them.

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