Staging Urban Interactions with Media Façades

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Abstract. Using media façades as a subcategory of urban computing, this paper contributes to the understanding of spatial interaction, sense-making, and social mediation as part of identifying key characteristics of interaction with media façades. Our research addresses in particular the open-ended but framed nature of interaction, which in conjunction with varying interpretations enables individual sense-making. Moreover, we contribute to the understanding of flexible social interaction by addressing urban interaction in relation to distributed attention, shared focus, dialogue and collective action. Finally we address challenges for interaction designers encountered in a complex spatial setting calling for a need to take into account multiple viewing and action positions. Our research-through-design approach has included a real-life design intervention in terms of the design, implementation, and reflective evaluation of a 180 m^2 (1937 square feet) interactive media façade in operation 24/7 for more than 50 days.

Keywords: Media facades, urban screens, multi-user, public space.

1 Introduction

Research in human computer interaction has during the recent years progressed from predominantly focusing on the workplace setting [1], to other spheres of activity reflecting that only a fraction of the microprocessors produced today go into desktop computers whereas the majority become an integrated part of our physical environment [2]. Enabled in particular by ubiquitous computing technologies [3], HCI researchers have turned their attention to the expanding use of digital technologies as part of other aspects of human life including the home, entertainment, the school, museums etc. Urban life, with its social and cultural practices, differs from other aspects of human life, and has different kinds of spatial and material circumstances which pose new challenges for interaction designers. McCullough [4] has in his account of the intersection between architecture and interaction design drawn to attention the importance of addressing the situatedness of urban computing and has as part of that purpose compiled a tentative list of thirty situational types (e.g. watching, idling, cruising, attending, gazing) indicating the complexity and particularity of the urban setting. Greenfield & Shepard [5] have also explored the terrain of urban com-

puting with a particular concern for the local and context sensitive aspects of what they call ambient informatics in contrast to urban computing.

In this paper, we focus on one particular kind of urban computing, media façades, which is the general term for incorporating displays as an integrated part of a building's façade [6]. Within the domain of media façades, a number of genres may be identified of which *advertising* together with *news* is by far the most common. The buildings surrounding Times Square in New York and Hachiko Square in Tokyo are some of the archetype examples of commercial advertising used as a media façade. *Architecture* has throughout history been constantly on the lookout for ways of renewing itself with new expressions and use of new materials. Use of mechanical devices are among the ways of dynamically altering the facade expression as seen on Institut du Monde Arabe in Paris [7], where iris-like shutters automatically open or close to adjust to the lighting conditions. *Art* is the genre where artists are the driving forces behind the creation of the media façade, like in the case of "Body Movies", an installation by artist Rafael Lozano-Hemmer [8]. *Games* are often used along with other genres such as art or community media. Blinkenlights [9] is a classical example of such an installation where artists placed lamps behind each window in a building in Berlin and used the pixel matrix as a screen for playing pong and displaying low resolution animations. *Community media* and *news* is the media façade version of community media and live events as explored as part of BBC Big Screens all over the UK leading up to the 2012 London Olympics. *Public Service* is driven by the need to provide information to citizens in urban areas, for instance in terms of bus schedules, weather forecasts or traffic info.

Using media façades as a subcategory of urban computing, our research focus revolves around coming to grip with sense-making and social mediation as part of identifying key characteristics of interaction with media façades in an urban setting. Our approach strongly relies on design research-through-design [10, 11] by conducting real-life design interventions where we have taken advantage of our engagement in specific design practices in order to explore aspects of urban computing. The specific case that provides the fuel for our discussion is *Aarhus by Light*.

Aarhus by Light was a two-month social experiment with an interactive media façade at the Concert Hall Aarhus in Denmark. In the façade lived small creatures of light. When you approached the concert hall, you entered their world, which was also a part of the city. They were social beings always (or mostly) happy to see you. On the central path leading visitors towards the concert hall were three illuminated zones, each covered with carpets in bright colors (pink, blue, and yellow). In these zones, camera tracking translated the visitors' presence and movements into digital silhouettes on the façade, and through the silhouettes, visitors could caress, push, lift and move the small creatures. The creatures would wave back, fight, sleep, climb, jump, kiss, and occasionally leave and come back, thereby creating a relation to the visitor which was not only physical and embodied but also emotional and narrative.

Our research proceeds along the path pursued by Peltonen and colleagues [12], who have drawn to attention the fact that interactions with large screens in urban settings is a new and fairly unexplored area of research. Their research is in many ways related to ours by focusing on the social organization of interaction but with notable differences in scale, location and duration: Peltonen et al. introduced a shop-window-sized display on a shopping street during an eight days period, whereas Aar-

hus by Light was an 180 m^2 (1937 square feet) interactive media façade in a central public park which ran 24/7 for more than 50 days. Another closely related study is that of Paay & Kjeldskov [13] who present a detailed examination of social interaction in urban space with a concern for the situated aspects of interaction which they use as the platform for the evaluation of a mobile prototyping system.

The structure of this paper unfolds as follows. First, we introduce our practice-based research methods followed by a presentation of our design intervention, Aarhus By Light. Following this, we account for our data collection consisting of observations, interviews and log data which provide the platform for our analysis of the emerging spatial interaction, sense-making and social mediation.

2 Method

Our research method has been a practice-based explorative approach known as research-through-design [10, 11] carried out as a reflective design practice, not only focusing on the design artifacts themselves but rather using design artifacts as a means to get insights into the kinds of interactions emerging in an urban context.

We have addressed our research question from a multidisciplinary perspective enabled by a series of collaborative workshops and other kinds of design activities, including field studies, experiments [14] and design workshops [15] that produced a series of materialized artifacts [16].

While navigating the research-through-design process, we selected various design methods and tools trying to overview, structure and foresee the consequences of the intervention. E.g., we conducted field studies to get insight into the complexity of the urban domain and existing use patterns, continuously refining design values for the design artifacts and using structured workshops to develop concepts for interventions; all in dialog with the materialization of sketches, 3D models, and prototypes.

We have studied and analyzed the interventions and their influence on the lived life in a specific urban context primarily using qualitative methods including observations and interviews [17]. In addition to video-logging of use during the entire period, the media façade software logged activation and other important events in terms of quantitative data which was used in the analysis of patterns of engagement and use.

In the subsequent analysis, we finally linked and summed up on all the material throughout our work to distil the findings in relation to our research question. Progressing from the research question toward the presented findings has not been an entirely linear process, neither a fully pre-designed research process in the narrow sense, but rather a continuously navigation through the design aspects uncovered. To a certain extent, the research activities have been iteratively interweaved through versions of design artifacts and workshops informing and shaping each other.

3 Design Intervention: Aarhus By Light

As mentioned briefly in the introduction, Aarhus by Light (AbL) was an interactive media façade, engaging local citizens in new kinds of public behavior in order to

explore new possibilities of digital media in urban life. The large glass facade on the building was fitted with 180 square meters of semi-transparent LED screen that was distributed in a non-rectangular pattern behind the surface of the Concert Hall Aarhus towards to the adjacent public park. Visitors in the park were met with the spectacular view of animated creatures crawling around the structure of the glass facade along with a constantly moving outline of the skyline of Aarhus. When visitors walked through the park, they passed through three interaction zones marked with colored carpets. Once on the carpet, a sensor picked up the outlines of your body hereby creating a silhouette on the screen. This silhouette encouraged a curious and playful investigation of the expression among the users, while enabling them to interact with the creatures by pushing, lifting and dropping them.

The motivation behind AbL was driven by research interests and curiosity, but was also supported by the concert hall's interest in challenging its own rather conservative image. They did not, however, in any way want to influence the actual design.

As the platform for a systematic introduction to AbL, we apply a *design space explorer* [18] for media façades, a light-weight framework for addressing key aspects of media façades in an urban setting. The design space explorer consists of two parts: aspects listed in the top row and a number of design choices for each aspect in the columns below. As discussed in [18], the set of aspects may be adapted for each specific design case. In the case of AbL, the aspects are: Materials, Form, Location, Situation, Content, Interaction, and Values (Table 1).

Table 1. Design Space Explorer for Aarhus by Light.

Materials	**Form**	**Location**	**Situation**	**Content**	**Interaction**	**Values**
Semi-transparent & low-res LED panels	Irregular	Façades	Visitors arriving	Creatures	Camera-tracking of movement and gestures	Playful
	Elongated	Public park		Skyline		Integration
	Spatial	Lobby	Passing by	Silhouette		Eye-catching
Carpets		Adjoining cultural institutions				Social

Material: AbL was based on 180 m^2 low-resolution LED panels. Each panel consisted of 25x50 pixels (4 cm dot pitch) that were assembled to a display counting 1250x150 pixels. The panels themselves were semi-transparent and were hardly visible from a distance. However, when the LEDs were lit, they constantly created awareness by emitting visuals in bright colors. In addition to the façade, a pink, a yellow, and a blue carpet were used in the park area to stage and call attention to the interaction zones.

Form: The rectangular LED panels in AbL matched the glass façade modules of the Concert Hall and were configured as a 50x6 meters irregular and elongated shape mainly placed alongside the main façade towards the park. The shape of the LED panels was deliberately designed to break away from a rectangular TV screen look, and a smaller part was wrapped around the facade corner in a spatial configuration.

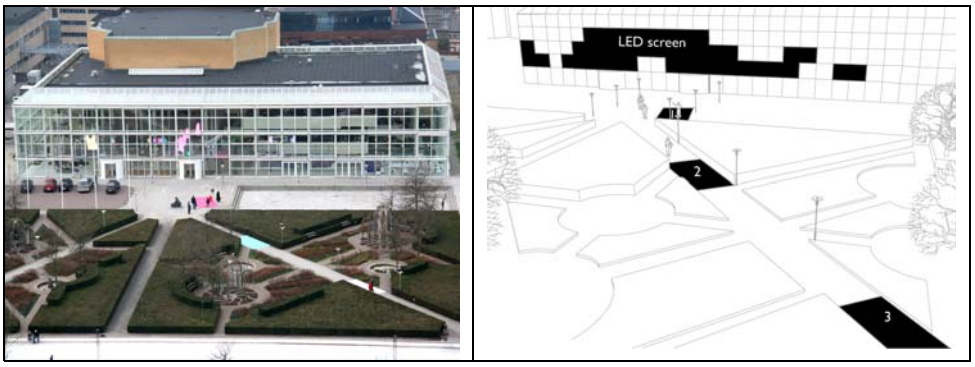

Fig. 1. Concert Hall Aarhus with the media facade installation and the three interaction zones.

Location: Location is closely related to situation but refers to the spatial arrangement rather than the practices taking place within it. The LED panels that dominated the AbL installation were integrated in the 700 m2 glass façade of the Concert Hall, which is situated in the centre of Aarhus, the second largest city in Denmark. The public park in front of the Concert Hall is defined by a series of adjoining cultural buildings – among them an art museum, and the town hall. The panels were hung from the inside of the façade and the visual content was mainly visible from the park during daytime. But during night time, the light from the LED panels was mirrored in the glass façade visible from the foyer of the Concert Hall. The mirrored light hereby created a complex visual and spatial relation between the interplay of the panels and the glass façade together with the park and the foyer (Figs. 1 and 2).

Situation: Since AbL ran 24/7 for more than 50 days, it was designed to take multiple situations and use scenarios into account. Among them were people passing by versus dedicated visitors of the Concert Hall in relation to scheduled concerts and activities, all together with possible distances, perspectives, and visual obstacles in the public park and the lobby area.

Fig 2. The installation in use. The LED panels themselves are almost invisible.

Content: There are three main content elements in AbL: (1) A one pixel wide lineart skyline of Aarhus landmarks which slowly emerge and disappear independently of other elements, (2) 30 luminous creatures which move around on the lattice of the facade; each creature is autonomous, though guided by specific rules which influence their behavior, and (3) silhouettes of users, which are displayed on specific parts of the facade in correlation with the users' position in the interaction zones in the park.

Interaction: In the case of AbL, users can interact by entering one of the three designated interaction zones in the park. When they do so, their silhouettes are tracked and displayed on set areas of the façade. The luminous creatures are drawn toward the silhouettes, and users can shove them around. The creatures will respond in a friendly manner – by waving at, dancing with, or crawling onto users – or hostile manner – by kicking the silhouettes. When no users are present, the creatures will go about their own routines, sleeping, kissing, fighting, crawling, and dancing. The intended duration of use ranges from <1-20 minutes. The interaction was implemented by having one big, digital canvas powered by a single PC running a custom-made C application. The canvas consisted of three layers. In the front most layer, the application processed input from the three cameras (one for each interaction zone) and produced silhouettes or rather blobs on three corresponding parts of the facade. The middle layer was populated with animated creatures, and the background layer held the changing skyline. The software ran unattended, calibrating the filter continuously for optimal silhouette-generation during shifting conditions.

Values: Values are the basic positive (or negative) considerations that have governed the design of the installation, reflecting the goals of the design and what is considered as important. AbL's final form and function is a crystallization of three main values which we have actively sought to incorporate into the installation: (1) *playfulness* as the key experiential quality which we sought to embed; this is reflected most evidently in the content-interaction fusion (use your bodily movement and gestures to play with the video game-like creatures, (2) *integration* into the existing setting, both relating to integration of the LEDs with the architecture of the Concert Hall, as well as the integration of the interaction into the existing practices and situations, and (3) an *eye-catching* expression making evident to passers-by that something new was afoot.

The design choices for each of the seven aspects have been interdependent. For instance, the choice of materials in terms of low resolution LED had implications for content in term of the line-art skyline and style of the luminous creatures. Likewise, the situational types of people passing by coincidentally or being on their way to an event at the Concert Hall Aarhus had implications for the interaction style.

4 Data Logs, Observations, and Interviews

In order to monitor the running status of the media façade and to capture events for later analysis, we set up a time-lapse camera as well as logged the activation of the interaction zone sensors. The time-lapse camera was placed in the bell tower of the nearby city hall. Throughout the duration of Aarhus by Light, it captured a still image

every six minutes as an extra source of documentation (with no personal identification possible).

The media façade software produced a log recording every activation as well as other important aspects like for instance software updates. An activation is defined as a blob identified in a camera image by the software identified producing a corresponding silhouette on the facade. Figure 3 shows the number of activations of the three cameras summed up for each hour of the day during a 21 day period.

Activation of a camera generally indicates use, but there is no simple correlation between the number of activations and the number of persons triggering the activation. First of all, the number of activations each person generated varied greatly, since some only passed by whereas others spent considerable time interacting. Furthermore, there were some causes of activation that were not due to humans. In order to assess the proportion of human activation, we validated the log data by comparing selected time periods with two other sources: (1) the time lapse camera feed, and (2) a baseline of log data during and after the installation period where we knew positively no or very few people passed through the area. The validation revealed that when it was dark and wet, reflections from the media façade would feed back into the cameras and generate non-human activation. We also found that the yellow carpet was generating more non-human activations during dark and wet conditions even though it was farthest away from the facade.

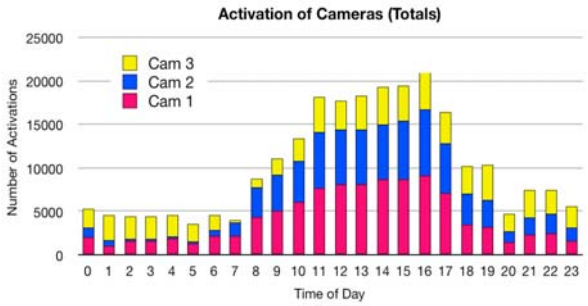

Fig. 3. Total number of activations of the three cameras over a period of 21 days.

Having subtracted the estimated 'background', non-human activation, the overall use patterns that stand out from the validated log data is the following: People engage with installation primarily during daytime, beginning around 7 a.m. and increasing without dropping until 5 p.m. Then there is a significant dip until a second smaller peak between 9 and 11 p.m. The latter peak fits with the exit times from events in the concert hall, which are more concentrated than arrival times. During evenings without events in the concert hall, significantly less people are passing by the area.

Analyzing the data supports our thesis that the installation encouraged an interlude in the movements of the public. Especially the interaction zones generated a lot of movement, but also the area next to it seems to have been a popular spot for observing others interacting.

In addition to data logging, we carried out observations in two ways: First, we did a number of in-situ observations of the installation in use. These observations were often carried out in conjunction with qualitative interviews with users. The primary

focus for these observations was on social interactions and exchanges as well as user experience, for instance if users displayed distaste or satisfaction with the installation. Second, we gathered video material of the installation in use for various purposes. The extensive amount of observations both from the interview sessions and video footage further highlights the rich variety of interaction forms and patterns spurred by the media façade. The observations show that all kinds of people interact with the façade, ranging from young boys and girls to older men and women. Observation video was shot quite openly with handheld cameras.

Last but not least, we carried out 25 structured interviews during the two months of operation. The interviews were carried out at different times of day and on different weekdays, and they were supplemented with observations before and after the interview itself in order to get a richer understanding of the interviewees' interaction with and experience of the installation.

Each interview consisted of 37 questions (not counting follow-up questions) and had a duration of 15-25 minutes. The questions were grouped into four categories: (1) occurrences prior to interaction, like the interviewees purpose for visiting the Concert Hall park, and whether they had heard of AbL before; (2) experiencing and interacting with AbL, for instance immediate impressions, accounts of what was represented on the façade and how to interact; (3) social aspects, including whether interviewees were interacting with other users, if these were strangers or familiar faces, and which types of social encounters this prompted; (4) identity and effect, like how AbL fit into the interviewees' general impression of the Concert Hall and the park, what kind of effect the installation had on the perception of a public space etc. Subsequently, the responses from the interviews were entered into spreadsheets for processing and comparison, and recurrent themes were condensed and analyzed.

5 Analysis and discussion

Our analysis revolves around four themes: interaction patterns, space and interaction forms, sense-making and social mediation.

5.1 Interaction Patterns

During our analysis of the video and observation data, we have identified a number of recurrent interaction patterns. The most prominent patterns are shown in Table 2.

Table 2. Interaction patterns.

Initiation	Interaction Style	Relation
Pass and notice	Basic exploration	Individual
Pass and interact	Visual engagement	Group
Walk-up-and-use	Embodied engagement	Family
Watch and join	Narrative and empathic engagement	Social
Watch and take over	Showing off	
Return	Hacking/unintended use	

Initiation refers to the ways in which people encountered and engaged with the installation. These span from passing and noticing the presence of Aarhus by Light through various modes of entering into interaction to returning after prior interactions.

Interaction style refers to the different modes in which people explored the installation when past the initiation phase. These encompass simple initial trials of the basic functionality and engagement in the visual expression, but also more immersive interaction through embodied interaction coupled with narrative and empathic interpretations; ultimately, a number of visitors appropriated the installation in unexpected ways, 'hacking' it and/or showing off in front of other users.

Relation denotes the social interaction patterns which we observed in the use of Aarhus by Light. Some users interacted with the installation individually, but, interestingly, the main part of users entered into social relations of some sort through interaction, either by being part of a previously formed group, possibly a family, or by entering into new social relations with strangers using the installation.

5.2 Space and Interaction Forms

An important part of understanding how people experienced AbL is to have a closer look at the interplay between the interactive media façade, the surrounding space, and the actual architecture. The integration of AbL into the Concert Hall's façade formed the basis of new use patterns in and around the Concert Hall. In this perspective, the interactive media façade, in combination with the Concert Hall and the park area, became a stage for new forms of interactions. Partly intentional interaction forms but also unforeseen and unintended use-patterns and consequences. In this section, we discuss the most important themes in relation to interactive and spatial aspects of AbL; among them, how people interacted with the media façade and how this affected the use of the park area and the very identity of the Concert Hall.

The park has gone from primarily being a place of transition with a few heated spots in connection to the entrance to a more diverse place where people still pass by, but with additional explicit hotspots in the interaction zones and the nearby areas. This indicates that the interactive zones have created new behaviors within the park, and based on the log data and the event program for the Concert Hall, we estimate that 500 persons have interacted with the installation during an average day. Furthermore, our observations as well as the log data specify that the interaction zone nearest to the concert hall has been the most used one, followed by the middle and furthest interaction zones in respective order. This is a strong indicator of the success of AbL as a new stage for urban interactions: The two latter zones were situated along what was prior to AbL the most used transitional path, whereas the interaction zone closest to the concert hall was previously almost not used at all. The new patterns thus reveal a strong interest for people to engage in interacting and experiencing the media façade.

Regarding the types of interactions, a clear pattern is that people attract more people: when there are already users interacting with the media façade, this attracts others to observe or engage in interaction. The people who interact thus become a part of the interactive installation attracting attention. Another characteristic is that a great num-

ber of people seem to return to the installation to try out new interaction forms, or to show other people how the façade works.

The interaction style patterns reveal a variety of use forms surrounding the media façade. A large group of the people who interact are primarily concerned with discovering the basic functionality, trying to identify the relation between the interaction zones and the media façade. Another dominant pattern of use is visual engagement in which the main focus of attention is the figures, the skyline, and the silhouettes on the façade, For many of the people interacting, the silhouettes they cast on the façade are more interesting than interacting with the figures; the silhouettes alone seem to make them want more, to explore how they can themselves be visualized on the screen. Another strong pattern of interaction is bodily engagement, interactions in which the focus is on the choreographic possibilities among the people who interact. People come together trying to coordinate movements on the carpet mimicking each others'silhouettes – or just to make choreographies on the carpet. It is clear that the carpet and the silhouettes legitimize physical activity in urban space that would otherwise have been seen as downright strange and inappropriate.

The above findings indicate that AbL did change the spatial relation in and around the Concert Hall, and by turning our attention towards how people came to think of the identity of the Concert Hall while the installation ran, it can help us get closer to how people experienced the space and the interaction forms. Especially the interviews indicate a new interpretation of the Concert Hall. With only a few exceptions, the interviewees found that the new interactive content augmented onto the façade, imparted a new view on the Concert Hall, ranging from more playful and inviting and in better contact with the younger visitors, to a more mystified impression balancing between the new and unknown and comparing it to other types of electronic media such as a 1980es computer game in an unexpected context.

These new interpretations of both the identity of the Concert Hall as well as the reading of the content of the media façade led to the next section where we will have a closer look at sense-making.

5.3 Making sense of large-scale urban interactions

A particularly intriguing aspect of how people experienced AbL was their efforts to make sense of this strange intervention into the urban space. In their *Technology as Experience* [19], McCarthy & Wright propose that sense-making is at the core of how we experience technologies; following this line of thought, we will discuss the most salient sense-making themes relating to AbL in order to explore and elucidate users' experience and appropriation of large-scale urban installations.

Most notably, interviewees presented us with a number of varying interpretations of what the installation was about and how to interact with it. Every respondent was able to distinguish between the three different types of representations – silhouettes, luminous creatures, and skyline. Judging by the responses, the luminous creatures were of most interest to them, followed by the silhouettes and the skyline. The most general impression of the installation was that it was, or was similar to, a video game; this was attributed primarily to the general low-resolution visuals of the façade as well as the representation and behavior of the luminous creatures. This interpretation is

evident in statements such as ‘It is like Pacman meets the concert hall’ and ‘It reminds me of Commodore 64’ (a popular home computer in the 1980s). This finding highlights two interesting aspects of interactive media façades. First, that the visuals of the installation, rather than the interaction form, architectural concerns, or social relations, were the most immediate point of reference in making sense of the installation. A particularly strong indicator of this tendency was that, when asked how the façade worked, interviewees answered along the lines of what it connoted – i.e. a computer game – rather than describing the technical and factual function of it. Secondly, that spectators clearly drew upon their repertoire of existing experiences with electronic media in order to understand what they were observing, and the computer game genre was deemed to have the closest resemblance to the installation. As Manovich [20] has examined, the development of new types of media lends extensively from genres and conventions from preceding media. This goes not only for media authors, developers, and designers, but also for the audience spectators and users. With regards to making sense of the interactive elements of the façade, people had fewer references to preceding media to draw upon. Since there were no explicit instructions of use, users had to adopt an experimental approach to understanding the installation, save for the instances when they could ‘lurk’ and observe already active users. As a result, many interviewees adopted an approach consisting of simultaneous trial-and-sense-making. The mirroring of users’ silhouettes in three different colors corresponding to the three physical interaction zones functioned as a very direct introduction to the mode of interaction, and both interviews, in situ observations and video observations show strong evidence that users’ understood this mapping easily.

Turning now to the relations between the three elements represented on the media façade, we observed a striking pattern of sense-making in interviewees’ responses, namely that many of them presented us with accounts that went beyond what the installation was actually programmed to do. Most interviewees constructed narratives about what the creatures were doing, how they were interacting with each other, with users’ silhouettes, and with the skyline. Some of these were in line with the programmed responses of the installation, e.g. how creatures would greet new users. Interestingly, however, many of these narratives went beyond what the installation was actually programmed to do. For instance, several interviewees presented us with narratives of social interactions among the creatures, or creature responses to visitors, which went beyond the programmed responses of the creatures. This finding is substantiated by studies in cognitive development which propose that we have a tendency to remember experiences in the form of narratives, and that we may in fact re-order components or fill out blanks in order to make the narrative conform to expectations (e.g. Nezworski et al. [21]). In the case of AbL, this tendency was in fact also evident not only in interviewees’ subsequent accounts of what they had experienced, but also in the ongoing sense-making among interacting users. For instance, there was no pre-programmed interaction between the creatures and the skyline, yet several users told us how one had influenced the other. In one instance, a girl told that she was trying to crawl up on a tower on the LED to rescue the figures. In another instance, several children told us, while playing with the installation, that the creatures were building the skyline, and that they could tear it down with their silhouettes. This ascription of intentions and motivations mirrors Heider & Simmel’s [22] seminal study of the attribution of causality, in which they demonstrated how observers of an animated clip of

simple geometric shapes attributed behavior and intention to the shapes. For the children, this attribution of causality was reinforced by the ongoing sharing of their interpretations by which consensual narratives were created and maintained.

It should be noted that we do not view these potentially inaccurate accounts as problematic. Rather, we see this tendency to construct narratives beyond the designed ones as important input into a broader discussion of sense-making in complex urban environments. In such settings, heterogeneous factors, like architectural, habitual, technological, and social aspects, will almost always co-determine the experience of technological artifacts and installations. Thus it may in many situations be very hard, or even impossible, for designers to take into account all of these factors, let alone create an installation that commands the focused attention of users.

We propose that the balance between framing and open-endedness in AbL played an important part in its success. It presented users with recognizable representations in the shape of computer game-like creatures, the city skyline, and their own silhouettes, yet provided room for appropriation with regards to the emerging interactions. This proposition is in line with Thackara's [23] discussion of designers' proposing vs. imposing experiences and Greenfield's [24] similar examination of highly designed experiences.

5.4 Social Mediation

One aspiration of staging engagement in public space is often to provide a medium or a platform that invites people to connect socially. As we have seen, there are not many cases of interactive media façades facilitating social interaction, and there is no dominant, coherent framework to address the situation facing designers of interactive media façades. One reason is that the technology is still waiting to be deployed, but another and probably more important reason for the lack of interactive media façades is that they are not very easy to embed into the socio-cultural fabric of urban space. It is simply not obvious what kinds of social mediation are desirable and acceptable.

We may address this issue in the case of AbL by extracting observations and patterns in the interviews, observations, and log data, as we have seen above. As a platform for an attempt to further generalize and characterize these patterns and observations, we build on Ludvigsen's [25] framework of social use in public spaces, especially the notion of "situational interaction flexibility*", SIF. This framework is simpler than e.g. MIRANDA and SOPHIA [26], which are based on McCullough [4], but still captures salient features in a way that are easy to communicate and discuss.

SIF is based on Goffman's [27] concepts of behavior in public space: occasion, situation, and encounters. SIF then proposes another set of related concepts – levels of social interaction (Table 3) – that help answer the following types of questions when evaluating a design for social interaction: What is the level of social interaction? What do we want it to be? How is this specific level of social interaction supported? May the user(s) take the level of social interaction to another level?

* We have rephrased the original term 'mobility' to 'flexibility' in order to reduce semantic confusion

Table 3. Levels of social interaction according to Situational Interaction Flexibility.

Level	Scope	Example
Distributed attention	Each person is in a separate 'bubble' of attention	People passing by
Shared focus	People observing the same thing, not unlike broadcast media	Watching, exploring together
Dialogue	"shared activity in which [people] are investing themselves and their opinions"	Showing off, intensive explorations
Collective action	People engage and work towards a shared goal	Choreography, mass explorations, hacking/unintended use

Looking at quantitative and qualitative data through the optics of these levels, we may argue that the AbL is demonstrating a high degree of situational interaction flexibility. This means that not only is the installation mediating social interactions, it is facilitating a very wide range of social interactions and transition between these levels of interaction.

If we connect this claim with our initial question of how interactive media façades may embrace the socio-cultural practices of the occasion, to use Goffman's term, we get at least some answers in the form of qualified examples.

The relation patterns highlight the fact that most of the interactions are part of larger social relations. Even though there are examples of individuals interacting with the media façade alone (but still in public space), most of the interactions take place in different social groupings – families, groups hanging, or other social gatherings. The sociality of the interaction both relates to the carpet, where two or more people come together to interact, and when people are affecting other people by looking at or commenting their interactions.

6 Conclusions and Future Work

Using Aarhus by Light as the principal case, we have zeroed in on some of the challenges when designing for large media façades in urban space. We have in particular addressed the open-ended but framed nature of interaction, which in conjunction with varying interpretations enables individual sense-making. Moreover, we have contributed to the understanding of situational interaction flexibility by addressing urban interaction in relation to distributed attention, shared focus, dialogue, and collective action. In addition, we have elaborated on the challenges for interaction designers encountered in a complex spatial setting calling for a need to take into account multiple viewing and action positions. Space and time have only allowed us to build our argument around a single, though complex, case at the expense of having multiple cases to compare and generalize from. The complexity of the urban interaction surely calls for additional research into the distinctive spatial, material, and situational circumstances of urban interaction with media façades.

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