

# Urban HCI: Spatial Aspects in the Design of Shared Encounters for Media Façades

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## ABSTRACT

Designing interactive applications for Media Façades is a challenging task. Architectural sized large-scale screens can result in unbalanced installations, and meaningful interaction is easily overshadowed by the drastic size of the display. In this paper we reflect on urban technology interventions by analyzing their spatial configuration in relation to the structuring of interaction. We outline basic categories and offer a new terminology to describe these interactive situations designed for the built environment.

## Author Keywords

Media Façade; Urban Screens; Media Intervention; Shared Encounter; Architecture; Social Technology; Urban HCI.

## ACM Classification Keywords

H.5. Information Interfaces and Presentation

## General Terms

Human Factors, Design

## INTRODUCTION

In the book “Production of Space”, Henri Lefebvre argues that urban space is a complex social product and that space is produced by spatial practices [21]. So how can novel technologies integrate gracefully into this context? We employ the term *Urban HCI* to emphasize the situation that is composed of the built environment, the interface and any associated computer system, and the social context. Urban HCI focuses on situations outside the lab and inside the city where context is activity and not just a location point. Even though its focus is not on screen-based interaction, a prominent medium has found increased use over the past few years. Media Façades and Urban Screens have become experimental platforms for artists and creative coders exploring new forms of communication and adding cultural value to architecture. Real-time systems transform these displays from a passive medium into an interactive visual medium. Nevertheless, most of these screens are installed solely for (passive) advertising purposes. While advertisers focus mainly on visibility and pedestrian flow to create as much exposure as possible, we focus on aspects beyond recall ef-

ficiency. We build on the concept of *Shared Encounters* which bridges existing research in architecture, urbanism, social sciences, anthropology and computer science. Adapted from Goffman’s “Behaviour in Public Places” [14], a Shared Encounter is defined as “an ephemeral form of communication and interaction augmented by technology” [29] and “[...] the interaction between two people or within a group where a sense of performative co-presence is experienced by mutual recognition of spatial or social proximity” [39]. We consider them as short intermezzos in our habitually predetermined everyday urbane life, or as *dérive* creating works that are integrated in the built environment, without demands of permanence in time. They are a symbolic intervention, with the ambition to understand urban space, not as data source but as experience itself.

The emerging interest in Media Façades within HCI research can be recognized in a slowly increasing number of published case studies [2, 5, 36] and design processes [6, 13]. The slow pace of progress results from the difficulties of the medium itself that often demands compromises. Usually, various stakeholders are involved in the (production) process and only rarely is extended airtime (longer than 8 minutes, see e.g. [1]) provided for interactive pieces. This poses a problem for the development of appropriate evaluation methods. Moreover, there is the lack of language for describing spatial phenomena and relations. With this paper we want to further the discourse about the role of spatial aspects in Urban HCI and propose a terminology for spatial relations and phenomena in technological media interventions in urban space.

In the following, we first introduce the domain of Media Façades and briefly outline existing models from the HCI literature on public screen interaction, discussing to what degree these are applicable to Media Façades. We then describe two interventions we have created for this medium. By comparing the setup and interaction patterns at different exhibition venues, as well as those of other Media Façade installations at the same venue, we illustrate important aspects of spatial design. Our contribution in this paper is to demonstrate that Shared Encounters should focus on the interaction design *in front of the screen* and think about the overall space, rather than just the interaction *on* the screen. We propose a terminology for describing the structure of this space. We believe that this may inform the design process and the integration of installations into new locations by providing a better conceptual understanding of the interrelation of an installation with the space.

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## BACKGROUND

Harrison and Dourish [18], and others [16, 28, 33] have pointed out that locations are not just containers of geometric spaces (settings), but become a place when space becomes meaningful; place is created through cultural interactions and context. Media Façades allow content producers to change the meaning of a location for a short time, changing the situation, and ideally provide the public with the opportunity to engage creatively and communicatively with the urban environment.

### Media Façades

The sorts of Media Façades we focus on are projections or LED-based displays of much larger scale than public displays [25] or urban screens. The façade sizes we have experience with range from 40m<sup>2</sup> to 273m<sup>2</sup> with a resolution of 0.34 – 3.63pixel per inch (ppi). This is at the lower end of the scale, since bigger façades may cover an entire building of up to 900m<sup>2</sup> (e.g. Kunsthaus, Graz), with only 0.03ppi, where content mostly has aesthetic and ornamental function. At this upper end of the scale a Media Façade enters the domain of architectural sized elements, and adopts sculptural functionalities. It is obvious that the potential forms of interaction at this scale go beyond touch screens. This has the positive effect that potentially more people can engage with the installation simultaneously, creating social engagement and co-presence in front of the façade.

Making large displays interactive is a challenge, because people do not usually assume them to be interactive. Most host passive advertising or news channels; some are reactive, for example [4, 9], or visualize sensor data as ambient or generative information [8]. A few allow pedestrians to interact, enrich or participate (with the community) by adding content [26]. The latter is a concern for the façade owner. User-generated content needs monitoring for content considered inappropriate. But this prevents rich real-time interaction. However, with our own installations we observed that this is less of a problem if the spatial setup imposes social norms (e.g. if authorship is visible) and makes people refrain from posting inappropriate content. We therefore believe that the design of urban installations can exploit such effects to produce *social space*.

### Models of Public Screen Interaction

The emergence of large screens and embedded UbiComp displays has turned ‘space’ into a relevant category for HCI. Various models for understanding public screen interaction have been proposed. [32, 35] describe the interaction process with public displays and present an onion-layer model of how people approach the display (from seeing a display from afar, observing it, to interacting peripherally and directly). But these models are often system-centric and primarily describe the information available to the system. Other models (e.g. [3, 12, 27, 31]) focus on performative interaction in public space, distinguishing different roles. They describe the relations between performers and spectators, and transitions between roles, distinguishing between active performers (Actors), participants who co-engage with

the performer, passive observers and bystanders. Sheridan [31] and Reeves [27] in particular, provide useful terminology and basic interaction models for the design and evaluation process. However, large distances, architectural influences, and relations between displays of architectural scale and human scale are rarely discussed. Most models for interaction with public displays presume displays that rely on direct manipulation interaction (touch) or react to proximity. They describe the interaction with displays that are relatively small in comparison to the Media Façades we focus on. Issues of scale and spatial organisation, of context and environment are rarely considered in these frameworks.

So how can Urban HCI describe people’s interaction with digital systems in relation to the structure of public space? The work of anthropologist Adam Kendon [20] offers a spatial analysis of human interaction which has been used successfully in HCI by Marshall et al [23]. Furthermore, the typology of Edward T. Hall, who coined the term proxemics [17], or urbanists’ views on the city such as William H. Whyte [37] might help to understand urban space.

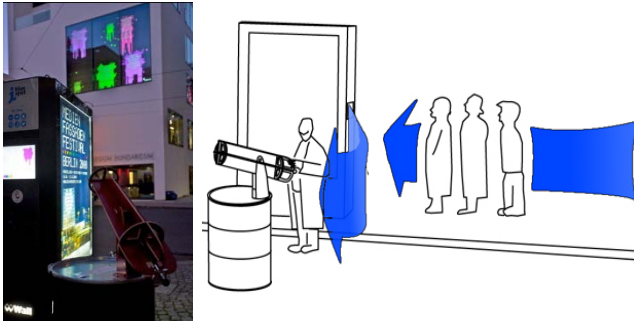
More quantitative approaches come from mobility research, particularly for estimating the value of advertising billboards. With parameters such as viewing angle, distance to street, competing nearby visual stimuli, numbers of passers-by, a so-called G-Value is calculated that estimates how many people per hour will remember an advertisement. While these parameters might be useful, the G-value does not tell us much about the actual experience or people’s behaviour. Related to these parametric approaches that measure and describe the built environment, is Space Syntax [19]. Concepts such as integration / segregation, visual stability, mazelikeness, drift and isovists provide mathematical measures that can be used in scientific modelling and simulation. These approaches have already been used for the analysis of public interventions by Fatah gen. Schieck [30]. These research attempts also attract neuroscientists like Wiener who aim to correlate affective effects, experience and behaviour in the built environment using Space Syntax [38]. Even if we are not aiming for a parametric approach; the terminology of Space Syntax might be useful to describe advanced spatial concepts and properties.

## OUR URBAN INTERVENTIONS

We now describe two successive versions of our installation, the Spread.gun and the SMSlingshot. Our analysis will focus largely on the SMSlingshot that we have exhibited in a variety of places, but we will also refer to the first instantiation Spread.gun. We prefer to call these exhibitions ‘interventions’ since they intervene in public spaces, changing their nature and use ephemerally. These are not permanent as the term installation might suggest.

### Motivation and Design of Spread.gun and SMSlingshot

The Spread.gun was the result of a call for participation in the Media Façade Festival 2008. Our initial idea was to create an ancient Greek agora like situation, where the communication channel employed by advertisers is opened up



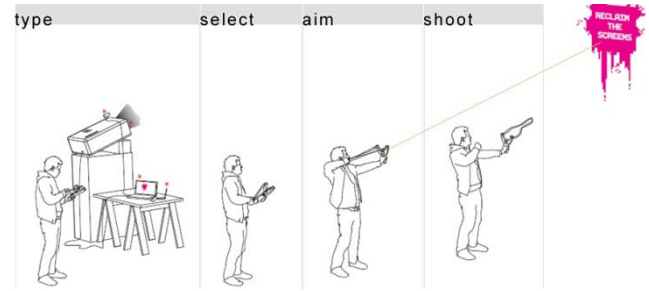
**Figure 1. The Spread.gun setup and its process of spatial use** to the public, creating a digital speaker's corner. At that time we had no experience of what it means to design for Media Façades and experienced similar challenges as identified later by Daalsgard [5].

For example, our initial concept did not fit with the given physical properties of the Media Façade (Daalsgard's challenge No. 2: Integration into physical structures and surroundings). Furthermore, we were required to use digital street furniture owned by the sponsors (Daalsgard's challenge No. 5: Aligning stakeholders and balancing interests). Further challenges are described in [13]. However, our main vision survived. The Spread.gun resembled an ancient cannon that could be loaded with digital messages from a city terminal's touch screen (Figure 1). After the cannon was loaded, the message could be shot onto the façade using a pinball trigger. The intervention ran on 3 different days during the festival. A limitation of the Spread.gun apart from lack of robustness (Daalsgard's challenge No. 3) and high system complexity was how it dealt with the social space in front of the interfaces. The emerging situation was rather similar to that at a supermarket or ATM. People lined up in front of the touch screen, with their back to other people's faces, and would then move on to the cannon. There was little discussion and sociality. Even though we recognized the problem, our spatial design thinking was not as elaborate as today. The main impetus that drove the design of the subsequent SMSlingshot was to enhance embodied interaction. An expressive gesture should clearly define the performer. Our design principle was to draw the action into the space in front of the screen. People should be able to pose and use the space like actors use a stage.

The interface itself has the shape of a wooden slingshot (see figure 2). It embeds a 2.1 inch display and 12 wooden keys arranged like a mobile phone keypad. A high frequency modem transmits typed text to the rendering PC when a message is 'shot'. A use sequence during an intervention is to hand the SMSlingshot to an observer, who then starts to key a statement into the device (thereby turning into a performer). The performer can then choose a colour



**Figure 2. SMSlingshot**



**Figure 3. Interaction with the SMSlingshot**

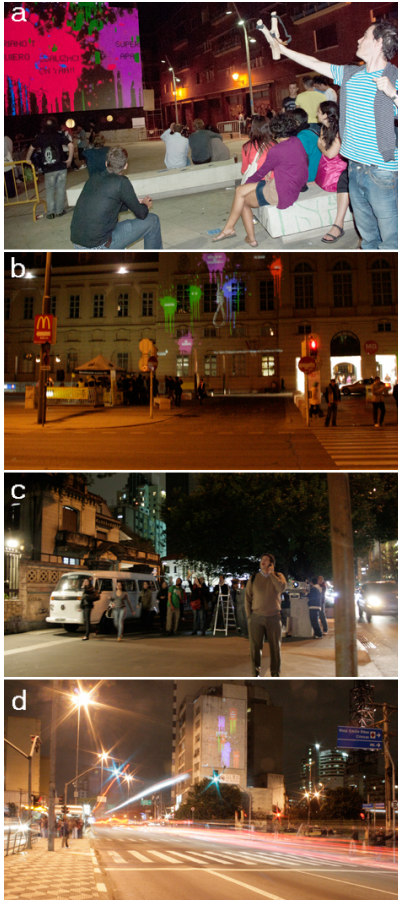
for the text background. Next, they aim at a spot on the Media Façade by holding up the device while pulling the rubber band. A laser beam lights up if the rubber band is pulled to show the aim. Once the band is let loose, the virtual message "is shot" on the façade, rendered as a coloured splat carrying the message. Then, the SMSlingshot is often handed to another person who wants to have a go.

In the course of our exhibitions it became apparent that SMSlingshot transports and creates many values (cf. values of third wave HCI [11]) we were not initially aware of. In particular, the ability to cover a very large potential interaction space in front of the Media Façade helped to not only generate interaction between user and system, but also to create a social interaction space.

#### ANALYSING SITUATIONS BY SPACE AND DISPLAY TYPES

Exhibiting in a variety of places helped us to realize the role of spatial setup and differences in scale, and their effects on the success of an intervention. Our systems have been exhibited at several venues over the past three years, each constituting a different architectural setting and context. The SMSlingshot was shown outdoors at an art festival (White Night, Riga 2009), in an indoor exhibition (Technical Museum, Berlin 2010), a conference and demo context (TEI, Boston 2010), Contemporary Museum of Art, Mallorca 2010), during a theatre award ceremony (São Paulo, FILE 2010), at a pedestrian walkway (São Paulo 2010, Eindhoven 2010), on a plaza (Media Façade Festival, Madrid, Liverpool and Berlin 2010), and within a branded space Museumsquartier Vienna 2010 for Amnesty International). Not only did the context of venues change, but the spatial setting was unique to each place, often requiring adaptation of the technical setup. All interventions began after dusk, as projections are not visible in daylight, with the positive side effect that passersby are not in a rush.

William H. Whyte [37] conducted pioneering field studies on informal, spontaneous interaction in the streets of Manhattan through observation of common spatial patterns; e.g. he found that street conversations occur typically on corners and in front of entrances and stairways. In a similar manner, we analyzed the use of our interventions with regard to performer, participant and observer roles. To investigate the role of spatial relation and interaction, we analyzed the various situations we exhibited in, distinguishing between



**Figure 4. Top to bottom: Plaza, hybrid, walkway, and open plan setting**

different types of spaces and displays. Most of our interventions were recorded to identify interaction patterns and spatial effects. Collected data includes photos and videos recorded ‘on the ground’, as well as maps, aerial photos and videos from an elevated position, as well as field notes and interviews with users. Analysis and comparison of this material informed the development of our model (Fig. 5). This was derived via a systematic iterative analysis of the data, focusing on the implications of spatial configurations, from which the categories in our model successively emerged.

In the following we characterise types of spaces and displays to describe the different venues and compare configurations of urban installations. Comparing these with other systems installed at the same location, we highlight core differences in configuration and propose a terminology that offers a framework for describing spatial setups for Shared Encounters.

### Basic Categories

Our main distinction of situations in the built environment is between a plaza and walkway. Most of our outdoor settings can be categorized by one main type, even if some have a hybrid character. The hybrid feel becomes prevalent if streets rather than buildings border a plaza. The setting then becomes open plan instead of feeling intimate and enclosed. This also changes the ratio between **Display Space** and **Interaction Space**, which will be discussed later-on.

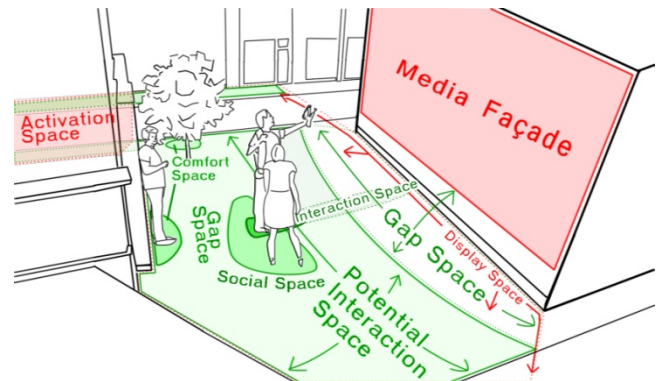
Another relevant distinction concerns the vertical position of the display, which is either on ground level or in an elevated position. While advertising tends to prefer elevated positions to maximize display space and visibility, ground level displays promote more interactivity, being in reach-of-grasp. For example, we observed people running towards ground level projections in order to ‘perform’ in collabora-

tion with the primary performer holding the SMSlingshot. Their idea was to have their silhouette stencilled out on the wall by the coloured splash being shot. Other possible façade positions and orientations are explored by creative installations like Bus-Tops [7] or Canopy [34] which use displays in horizontal positions above ground and dramatically change the relation between pedestrian and display. The resulting display and interaction space for these setups is rather different to what we are examining here. Because of their orientation these displays probably defy the definition of a façade.

Figure 4 shows the spectrum from enclosed plaza to open plan situations, where streets cut through the setting and situation and environmental complexity increase. Streets usually reduce the interaction space. They often create an imbalance with the space from where the façade can be seen from (Display Space), making it difficult to understand the interaction unless explicit cues are given. For example, the graphics of the SMSlingshot application emulate the flight and squash of a paint bomb, illustrating that someone ‘threw’ a message from somewhere in front of the façade.

### An Overview of Types of Spaces and Displays

Figure 5 summarizes and illustrates the different types of spaces we have identified, using a plaza situation as example. In the following, we present and discuss these and their interrelations. Depending on installation type, context, and environment, these spaces can differ in size and position. They can also change in size throughout the intervention time and often overlap (discussed under ‘dynamics’).



**Figure 5. Types of spaces**

Identified relevant spaces are:

- **Display Spaces** are the areas from which a display can be seen.
- **Interaction Space** is the space used to carry out a form of communication with the installation. It belongs to a single person, but can overlap with other person’s interaction space.
- **Potential Interaction Spaces (PIS)** are spaces where the interaction between system and performer can potentially occur.
- **Gap Spaces** are spaces that create distance, either between human and system or among humans.



- **Social Interaction Spaces (SIS)** are those areas where people congregate, being attracted by the system, and have a Shared Encounter.
- **Comfort Spaces** provide a sense of physical and psychological ease. Protective features like walls, pillars, trees, etc. draw people subconsciously towards them.
- **Activation Spaces** are spaces where some displays can be seen from, often triggering curiosity, but interaction is not possible.

### Display Space

Display Spaces are areas from which a display can be seen. This refers to the Media Façade, but also to other elements considered as ‘displays’ forming part of the installation. We will discuss this under ‘people as displays’.

### Interaction Space

The Potential Interaction Space (PIS) encompasses all areas where interaction could occur, whereas the (actual) Interaction Space is the space used at a specific moment in time. Several things can constrain this space. For example, a performer usually cannot stay long enough on a street to finish their action without risk to life. Of course this may cease to apply when there are few cars (e.g. at night) or the road is closed. Other restrictions might be an obstructed view of the façade, and any restrictions via system design. The PIS is an intermediate space that creates flexibility in the formation of observers, participants and performers. It allows diversity of action, and eases movement between the roles of observer, participant and performer. A setup such as that provided by the SMSlingshot does not convey that actions need to be carried out at a specific location - the PIS is theoretically everywhere.

### Maximizing the Interaction Space

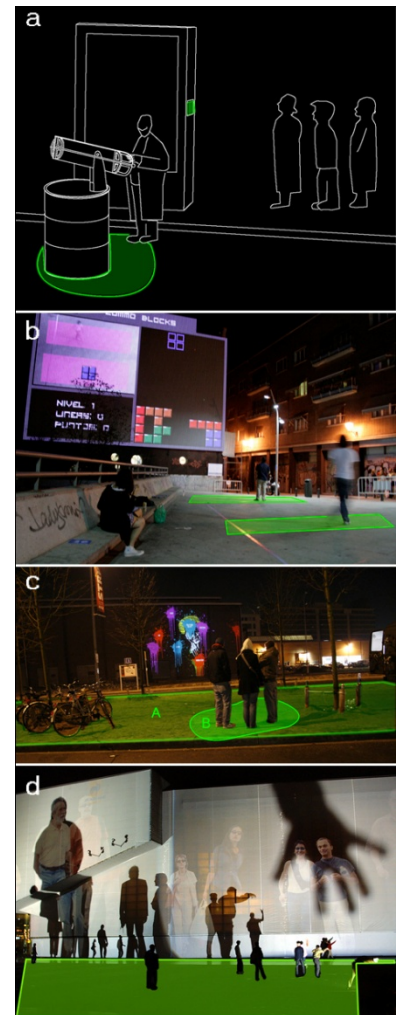
Urban interventions can create different sizes of Interaction Spaces. There is a continuum that the designer can choose the right degree from, even if it is hard to get it right. At this point we want to illustrate various sizes of Interaction Spaces by reviewing two more installations; Lummoblocks [15] and Rafael Lozano-Hemmers Body Movies [22].

Figure 6 shows an overlay of interaction spaces (green) on photos of the situations. For the Spread.gun (a) there were two rather small spaces for interacting with the Media Façade, one at the touch screen terminal, where people could type in messages and load the Spread.gun, and one behind the cannon to aim and shoot. This split of the interaction space meant that people often approached the cannon first, making it difficult for them to understand how the system works. Also, social interaction was minimal due to the small size of this space, and it was rarely occupied by multiple people (apart from parents with children). Even couples did not approach the interaction space together, but one would wait and observe instead of participating.

Lummoblocks (b) also has two Interaction Spaces, but of larger size. It was shown at the same venue as the SMSlingshot. The installation is a two player public game based on

Tetris [15]. One player moves a falling block right and left, the other rotates it. Both players have an individual areal in which to move in order to move or rotate the block. Both see a birds-eye view of themselves on the screen, so they can determine where they are within the interactive space. The interaction space for each performer is approximately 6m wide. Observers usually position themselves behind this space and this configuration generates an arena situation. Observers quickly start to judge performer’s competence to play and shout what to do.

The SMSlingshot (c) intervention enlarges the interaction space by creating several interaction spaces around the device. First, there is the keypad and the embedded LCD that allows asynchronous interaction from the façade. Since people in urban spaces often walk in groups of two or more, the interface is also seen by nearby people, who peek at the screen, interfere by pressing buttons or suggest messages. This creates a **Social Interaction Space** (Figure 6 c/B) around the device, where messages are reviewed or other topics around the intervention are discussed. This is related to the ‘honey-pot effect’ described by Brignull [3] and to F-formations [20, 23], but we here distinguish between participants in the situation and pure observers. In addition, the Potential Interaction Space allows the performer to interact with other things while handling the slingshot. Adding more slingshots creates multiple Interaction Spaces, transforming the Potential Interaction Space (PIS, Figure 6 c/A) into actual Interaction Space. However, despite of the large size of the SMSlingshot’s PIS nobody ever tested how far it extends. The biggest installation in terms of the size of interaction space determined by system design we know to date is Rafael Lozano-Hemmers installation Body Movies (6d).



**Figure 6. Different sizes of Interaction Spaces. (figure 6.d from [22] licensed under Creative Commons)**

His installations explore relational architecture at the intersection between new technologies, public space and performance art. They comprise façades of 400m<sup>2</sup> to 1800m<sup>2</sup> and up to double this space in front of the façade. Lozano-Hemmer uses façades at ground level. This is crucial for this installation, creating a strong connection between façade and interaction space. Strong floodlights are positioned at the opposite side of the plaza directed towards the façade [23]. These allow people to cast shadows of 2 to 30 meters in size. On the same façade, multiple projectors display people in various positions that can be revealed and mimicked with one's shadow silhouette. If all positions have been mimicked the projection changes. This technique creates an interaction field where passers-by automatically become part of the installation as they enter the plaza, willing or not.

We have illustrated several techniques of urban interaction that create different sizes of interaction space and will now outline further spaces to think about in façade designs.

### Gap Space

Gap spaces create distance to the system or between humans. They may have multiple causes, some induced by the



**Figure 7. Gap Spaces**

built environment, from social or cultural conventions (cf.[17]) or by system design. Street entertainers are very aware of this and often arrange the audience in the beginning of their show, asking them to come closer, sit in the first row or to leave a gap to avoid congestion. Explicit arrangements are rarely the case in media installations since there is usually no facilitator. Gaps between people occur naturally and 'closing' them can be difficult. However, from studying interaction principles in plaza or walkway situations, we can estimate gap spaces for future designs. With Media Façades the most common Gap Space is generated through the screen position. With the Spread.gun, for example, interface affordances and associations affected spatial arrangements. Observers did not position themselves in front of the cannon. A triangular space between cannon and Media Façade remained empty and was occasionally perceived as 'dangerous'. It was interpreted as belonging to the interface, extending the Interaction Space of the person operating the cannon. People crossing it tended to apologize for doing so, just as people do when they cross into the line of view when people take photos. Here, the interface metaphor (ballistic device) generates an extended Interaction Space that can bridge Gap Spaces.

Figure 7 shows two different types of Gap Spaces. One is in

front of the façade and the second between a Comfort Space and a Social Interaction Space. The gap in front of the façade is created through the elevation of the Media Façade. As stated earlier, interaction is more encouraged if a projection is at ground level as in the Body Movies installation. The second Gap Space is located between the spaces used by different roles. People in the Comfort Space position themselves as observers, away from participants and performers. This gap has been observed in a plaza situation. Performers and participants mix in a crowd, forming the Social Interaction Space. Observers keep apart from it via this gap, remaining at Hall's public distance [17].

For the Lummoblocks installation, three gap spaces were common: One is created (by system design) between the two players' Interaction Spaces. The second results from the elevated Media Façade. The third emerged between the players, and the observer and participant crowd. Like the space between street entertainers and their viewers, this gap emerges automatically but unlike an entertainer, a system cannot minimize the gap by asking viewers to come closer.

For Body Movies, gap spaces are evenly distributed between little groups of 2-3 people. The installation does not attempt to remove Gap Spaces in the physical world, but does so through the shadows cast in the 'virtual' world. Partial anonymisation closes a social gap on the screen. People can act in real-time on the façade, detached from their normal role in public space. They start to play with other people's shadows and do things they would not do in real life. Touching people's shadow without breaking personal space makes the piece so playful among unacquainted people.

'Detaching' performers from the physical world can bring them together in the 'virtual' world. In Lummoblocks the players are brought together in the virtual world, but at the same time a gap between the player and the audience is created. The players are positioned in front of the façade, and their visual field is completely occupied by it. Gap Spaces are harder to close the greater the space is. In plaza situations there are usually few, especially if the projection goes to the ground. In walkway situations the space is usually open plan and streets, signs, street furniture, trees, etc. create more and greater gaps.

### Social Interaction Spaces

Social Interaction Spaces (SIS) are spaces that emerge as soon as more than two people come together and the chance of a social encounter is given. The Social Interaction Spaces we are especially interested in emerge through the situation that an interactive installation or intervention creates. For Shared Encounters it is essential to create SIS areas.

Spread.gun is a good example of how the setup of an installation can prevent a Social Interaction Space from emerging around the interface. The configuration of people is not social in any way. People face others' backs when waiting for their turn. This changed for the SMSlinslot intervention. People gathered around the interface, and easily started to

talk or discuss e.g. the political implications of the work. Lozano-Hemmer's work establishes no Social Interaction Space on the plaza itself in front of the façade, but primarily creates a sense of co-awareness on the screen.

Social Interaction Spaces can also host different roles. Whereas with the SMSlingshot, the performer and participants could mingle, with Lummoblocks observers and participants mingled, while the performers were left outside of the SIS. Dynamic aspects can also contribute to the emergence of SIS. For example, the process of typing a message (this takes about 45-60 sec.) on the SMSlingshot creates an opportunity for social interaction within a group. This can result in longer interactions, because the message is discussed while typing or after passing the slingshot around. Often social activities integrate along the interaction with the slingshot. Observed activities range from suggesting new messages, reviewing messages, holding items initially carried by the performer so that s/he can use both hands to shoot, snatching the device from each other, and so on.

The most extreme reach of SIS was when people from nearby office buildings approached the artists/researchers. They had a deeper relationship with the space 'occupied' by the projection, and pointed out where they work, talked about their job, and were very interested in the project. Not only did they tend to stay very long, but they also pulled acquainted people into the place due to their presence. They proudly explained to them what was going on and explained the interaction. This shows a really extreme case of how an intervention becomes a Shared Encounter.

### Comfort Spaces

Comfort spaces are spaces near architectural elements that provide physical or psychological comfort. They are created by the built environment. The setup of the Media Façade influences which comfort spaces are suitable for observing, providing line of sight and giving observers the feeling of being 'out of the way'. Protecting one's back is an instinctive behaviour. In the diagram (Figure 5) this is illustrated by a man leaning with his back to the wall. It also shows a comfort space at the edge of the plaza beneath a tree. Here, not only the tree provides protection, but also an extended view into the streets seems to please human needs and thus attract observers. These spaces are not always positive for a Shared Encounter and may interfere with designers' intentions of achieving a certain situation in a given setting.

### Activation / Noise Space

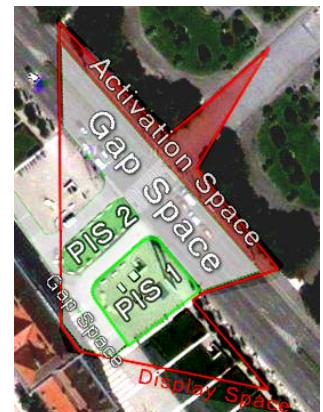
Activation Spaces are regions near the fringe of the Display Space where ongoing interaction with a Media Façade is not necessarily seen from. Here, a full understanding of the situation cannot be established, unless the work is already known, and misunderstandings are likely. From an artist's perspective this could also be seen as space that does not pay tribute to the interactive artwork or even compromises its aesthetic expression. It is an area of heavy noise which is uncontrolled, especially when façades are elevated high above ground casting a large Display Space.

Again, if we look at the Body Movies installation we find that these difficult zones are handled quite well. The unity of the piece is not compromised by distance and is well bordered. People in the Activation Spaces can still understand the situation because the interaction technique of casting a shadow is well known. With SMSlingshot we had a different experience. Especially in open plan settings where scene complexity is high, people did not always understand that the projection is interactive. Some observers reported that they realized that the projections might be interactive because of the metaphor of throwing a colour bag on a façade. While this interaction technique is common in street art culture and natural for the urban environment, it is less well understood than the one in Body Movies and thus seems to perform less well within Activation Spaces.

### EXAMPLE ANALYSIS

In this section we illustrate how spatial design thinking could have been useful for an intervention at the Museumsquartier in Vienna for Amnesty International if we had been aware of the described spaces at this point. Figure 8 (see also 4b) illustrates the hybrid plaza walkway situation and different spaces. The context provided restricted choice of which façade to project onto, and where to place temporary structures like a pavilion/tent, a podium, desk and the projector.

The projection had to be elevated due to the façade geometry, and a natural gap space emerged. This was further intensified by an entrance for an underground parking space accessed from the main street. Options for softening this gap were limited. We covered the illumination of the parking driveway to reduce its visual salience, which interfered with the façade. Figure 8 also shows how the relation between display space and PIS



**Figure 8. Space types in Vienna's Museumsquartier**

changes in rather open plan scenarios. The display space is much bigger than the Potential Interaction Space (PIS). We eventually chose PIS 1, a rather obvious straightforward decision. But putting up temporary structures (tent, desk, etc), transformed PIS 1 from an open plan setting into a more central position. In retrospect this was a mistake. It would have been best to position the SMSlingshots in a pedestrian flow, where people walk nearby performers and participants, increasing the probability to engage with them. One of the main pedestrian ways went parallel to the building through the gap space under the projection, neither a good place for performers' action, nor convenient for reading the messages on the screen. But nevertheless a lot of passers-by stopped here and watched the performers from the front. It



is unclear if it would have been better to block this gap space and force pedestrian flow through the PIS.

A lot of pedestrians also came from the park through the Activation Space, crossed the street over a zebra crossing and proceeded to walk to an entrance through PIS 2. Even though PIS 2 was a stopping point for observers, they rarely crossed the gap space to PIS 1, our actual interaction space. It remains an open question what would have happened if we had chosen PIS 2 or used a spot in the Activation Space.

## PEOPLE AS DISPLAYS

So far, we have mainly discussed different types of spaces and less their visible components. Depending on the setting, a façade can create a display space that is multitudes bigger than the actual interaction space. Interactivity might then not be discovered by some people. However, urban space is inherently a social space we share with other people and their activities. People observe and react to other people's actions. Hence interaction spaces can be spotted by seeing other people watching people (cf. [3], [37]). Users' and observers' actions also effectively function 'as a display'. We now discuss how role-based activity can serve as display which is effectively part of the intervention.

### Observer Display

People begin to act as an observer display when they glance repeatedly in a certain direction. This makes other people eventually do the same. We do not know how big the impact of an observer display is and from how far it can be seen. Some individuals observe the situation for a long time, some first check out the situation from different angles, and then position themselves in a Comfort Space and don't move anymore for a long time.

### The Participants' Display

Participants' displays are of a more active nature. During the SMSlingshot interventions we saw participants helping the performer (Social Space) by taking stuff off their hands so they could type and shoot, suggesting messages, showing where the delete or colour button is, teaching others how to pull the rubber band, etc. Other forms of display generated consisted of photographing the performer, photographing the shot message and distributing the slingshot to various groups.

The participant's activity of helping is a friendly, social display that is beneficial for the intervention. However, in some cases we observed a negative display, which kept other interested people outside (like a wall), blocking attempts to engage. During an intervention in Liverpool a fairly large crowd formed a single Social Interaction Space around the performer, rendering most of his action and hence display of action invisible for observers. Furthermore, people crossing the plaza mainly saw the backs of people with little space between them and thus did not feel invited in (cf. [20]). When approaching the crowd from the front, one could see the performer, but doing this would be unusual without an invitation. This might also explain why

things work better on the street, where participants usually do not form such a strong 'shield'. On the street, people are more loosely organized, making it easier for others to join.

### The Performer Display

When we consider people's activity as a display, the performers' interaction with a system is the most direct form of display. This requires a revealed or amplified interaction (as defined by Reeves [27]), since with hidden manipulation (e.g. tapping on a mobile phone) there is no visible performer display. We can not only define roles through the interaction design, but also estimate the size of the performer display. Figure 9 shows different actions and their resulting display size.

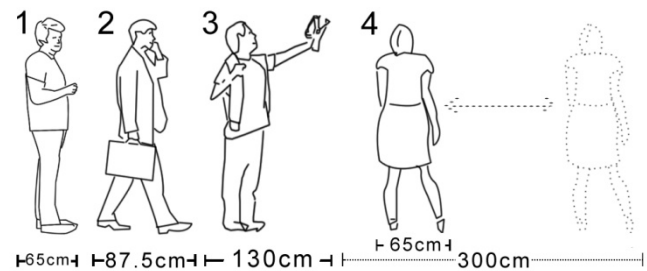


Figure 9. Different sized performer displays

One of the design intentions with SMSlingshot was to draw the interaction from the façade into the space in front of it. The idea was to provide opportunity to pose with large gestures and position oneself in space after typing the message and aiming. However, it turned out that performers do not roam around much, possibly because they are 'glued' to their group, which they don't want to leave or do not want to appear as if they might 'steal' the device.

Over time, we increased the performer display by offering multiple slingshots. While this does not change the size much, we observed an action that might do so. At an intervention in Vienna where three SMSlingshots were operating at a point, people decided to shoot simultaneously. This created a much bigger attention effect for observers. The synchronisation of performer displays (a common flash mob tactic) seems to be somehow conspicuous for viewers; indicating an increase of size of this type of display.

### DYNAMICS OF SITUATIONS

The arrangement of situations becomes more complicated to design for if we switch from a static to a dynamic view of a situation, as people change their roles over the course of an intervention. Spaces are created when people walk up, they grow when the pedestrian flow brings new people in, and they shrink or vanish if people leave. Reviewing the dynamic aspects of Shared Encounters is beyond the scope of this paper, but two short observations are noted here.

In Liverpool a spatial practice emerged that defined a new role within the intervention. Some people began to distribute the slingshot to different groups within the crowd without being explicitly asked to do so. The slingshot interface



was thus able to ‘invade’ a group. This was different from ‘passing the torch’, as is usually done by handing the device over to another person after using it. This decreased effort, since groups did not have to decide to go towards the interface; the interface itself joins and leaves. However, most dynamics are difficult to handle, especially large ones. At some sites, situations ranged from emptiness to overcrowding. For the Spread.gun this was a problem, since only one person could be active. The design of SMSlingshot opened up participation to several people at once.

## DISCUSSION

Our analysis of the different settings for urban interventions has enabled us to develop a terminology and conceptual framework, which takes account of aspects not considered so far in the literature, in particular the relation of situated digital interfaces to the built environment. Our approach of Urban HCI takes a different view (compared to Ubiquitous Computing) by taking situated architectural effects (instead of the anytime, anywhere paradigm) into account (cf. [10, 24]) and focuses on how to integrate technology into urban everyday life and architectural space. The examples we have given here demonstrate that a digital system is not simply set in a given setting, but a situation is created. This situation comprises the intervention itself, its spatial setup, the given architectural and urban design structures or layouts (which influence pedestrians action), all of which interplay in how the installation will be used. We hope to contribute to a better understanding of spatial setup factors that influence the success of such an installation, and to provide a model that helps to conceptualize relevant spatial relations. We adopt a role-based view similar to Sheridan, Reeves, and Finke [3, 12, 27, 31] and extend it by describing the spaces used by performers, participants and observers. This contributes to Dalsgaard’s [5] second and sixth challenge, the integration of new installations into existing physical environments, and the diversity of situations. We propose a terminology that enables us to describe and compare Shared Encounters at Media Façades.

We believe that our model and terminology are not only useful for describing existing situations, but may also be used productively when planning ‘new situations’. On a pragmatic level, the terminology proposed here might also be helpful when explaining to stakeholders and sponsors why a certain setup is important (e.g. having to move a fixture to make space for a social congregation space). Disciplined thinking about the different spaces and display types can inform the design strategy for the creation of new installations and may provide guidance when installing an existing installation at a new location.

For example, if gap spaces are needed to provide a passageway (preventing congestion), then an elevated display might be a better choice than one at ground level. Vice-versa, if the installation is to attract people towards the façade and a sense of spatial continuity is to be created, then a ground level display is preferable. Virtual, social, role-

based or physical blocks and barriers between the different spaces should be avoided, so that the Interaction Space can attract social interaction around it. If gaps are purposely created, the designer needs to employ interface metaphors that bridge across Gap Spaces (we have found that ‘shooting’ works well) or to create a clear, visual connection.

Furthermore, it is advisable to maximize the Potential Interaction Space, increasing the potential for social interaction (observers and participants kept away from performers at Lummoblocks, and Spread.gun barely generated any social interaction). Multiple instances of a (mobile) interface can increase the PIS and may foster co-awareness between performers. We have found split-up interaction spaces to be problematic - at the Spread.gun this resulted in confusion. Factors such as good visibility of the interaction, flexibility in how and where the interface is used, and being able to hand over the device allow for the interaction spaces to move around quickly, turning participants into performers. Our observations furthermore highlighted the role of comfort zones, which allow people to observe while feeling at ease. Whenever we set up a table or projector tripod, even a ladder, people tended to gravitate towards these. Conscious use of existing comfort spaces or the creation of temporary ones can thus support an installation.

We have discussed how the form and size of interfaces along with performer, participant, and observer displays increase and extend the façade’s Display Space. However, imbalanced or oversized Display Spaces can dominate a situation. Thus, the ratio between Display and Interaction Spaces should be carefully considered. We chose the term display, because it can be applied to objects as well as subjects. This abstraction enables the designer to think about what effect to achieve, while leaving it open what kind of display to employ (human, architectural or system-generated).

We do not attempt to provide a comprehensive framework, as there may be further kinds of spaces. In further research we will continue to apply our model to different situations and to extend it, focusing on user experience issues – i.e. we have made the informal observation that shooting over a larger distance to the façade makes for a stronger user experience, being more fun and potentially creating a feeling of ‘empowerment’. We also found that the SMSlingshot had less affective impact when used indoors (with a relatively small screen) than at large outdoors façades.

## CONCLUSION

As we approach third wave HCI [11], concepts like Shared Encounters have obvious problems in how to measure success. We cannot answer the question of why one encounter is better than another, but we have proposed a terminology for describing and analysing the spatial setup of interactive Media Façade interventions, which takes account of the social use of space and of the existing structure of the built environment. This terminology highlights the interrelation of an installation with the surrounding space as well as core

aspects that can inform the design process and help designers to more explicitly reason about how to install and structure an installation within a new location. This can support intentional temporary place/making, helping the designer anticipate how the system will be used. In short, before we can properly design Shared Encounters that use digital interfaces as a link between urban environments and humans, we must first learn how to accurately describe - a future aim of Urban HCI research.

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