Beyond Information and Utility:
Transforming Public Spaces with Media Facades

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SMSlingshot is a media facade system at the confluence of art, architecture, and technology design in the context of urban human-computer interaction. It represents a participative approach to public displays that enlivens public spaces and fosters civic and social dialogue as an alternative to advertising and service-oriented information.

Unlike public media displays that appear as standalone structures and are typically of smaller scale, media facades[1] are integrated into architectural structures such as buildings or street furniture.[2] They might be realized through dedicated screens built into a facade or through a temporary projection that overlays the surface and is therefore visible only in darkness.[3] Media facades aren't necessarily interactive. Many just display advertisements; others, like the popular art form of facade mapping, transform the appearance of a building via projections in a preprogrammed spectacle that doesn't allow for audience interaction.

Our research focuses on user interaction with big displays in public spaces, as exemplified in the SMSlingshot system (see Figure 1).

We introduced SMSlingshot in an earlier paper, where we also presented a model of how media facades and architectural features produce different types of spaces in a media installation.[4] Here we extend that discussion to emphasize that the environment and context should be seen as a resource to generate value. Media facade *interventions* (a term we prefer to the more permanent connotations of *installations*) are one form of computing that integrates these resources on an architectural level. Our insights are based on three years' experience exhibiting and analyzing SMSlingshot interventions worldwide.

Fusing Information Technology and Architecture

Media facades are one of the rare original fusions between information technology and architecture. Because most of them have had a commercial purpose, application development has been left to the advertising industry and property developers. However, the arts have established venues to explore the relationship between architecture and human-computer interaction (HCI). Art and technology festivals—for example, FILE (Electronic Language International Festival), Today's Art, Urbanize, Incubate, Future Everything, and the Media Facade Festival—are vehicles for developing and deploying novel installations. In such situations,

festival curators act as the broker between artists and city councils or the media facade's owner.

Our interest is in the convergence of HCI, ubiquitous computing, and architecture in participatory media facade interventions.[2,5] The audience can interact with them to create their own content and, in doing so, create a shared encounter among members of the public.[6] The current dominance of advertisement and commerce in this research area makes it difficult to imagine using public screen displays in a different way. We saw this when teaching a short interaction-design module that challenged first-year students to choose an unused urban space and sketch how they could revitalize it using digital technologies. It was striking how information, efficiency, and access to services prevailed in terms of proposed functionality, and most groups suggested standalone screens. This shouldn't be surprising. If we look around our cities, most identifiable computer technology takes the form of screens that present information or advertising to passersby, and our students were clearly influenced by what they already knew.

New-media art and, more recently, HCI have investigated interactive approaches to enliven urban public spaces.[7] Often these are merely playful, such as the BBC BigScreen Red Nose game.[8] Others aim at purposes such as cultivating social values and sparking political discourse.

City policy makers have been largely silent on the topic of urban public displays. This leaves space for others, including the cultural sector, to innovate. We believe that architecture can play a major role for urban HCI systems design. As a discipline, it has developed a sophisticated understanding of space and spatial structure. Furthermore, architectural thinking helps focus on the value that public displays could create for a city beyond information and utility.

Ubiquitous computing tends to strip the relevance of space away from systems design, aiming instead for universality and independence of time and space. Furthermore, cities have integrated media technology in their spatial dynamics along two dominant axes: spectacle and surveillance. Both assign a passive role to the citizen and user of public spaces. Architecture has a tradition of promoting social and cultural values—whether aesthetic, sociological, environmental, economic, or scientific—that address issues such as inclusion, identification, participation, or social change.

Just as architecture and urban planning have adapted over time to accommodate cars, they now increasingly accommodate computing technology. The insights and views of urban design can help

Figure 1. The SMSlingshot system in Madrid. The user (in the bottom-right corner) is employing a slingshot interface to shoot his message at the building facade. Media facades can create shared encounters and enliven public spaces.

enliven public space and activate city dwellers as the technology becomes pervasive in our cities.

SMSlingshot

We developed SMSlingshot as a participative intervention for media facades. The system consists of a portable input device in the form of a slingshot (see Figure 2a) and a rendering PC connected to either a powerful projector (>14,000 ANSI lumen) or a media facade. Users type text messages on a phone-sized keypad integrated into the slingshot's wooden case (Figure 2b). Then, they aim at the facade and shoot the message, which subsequently appears in a colored splat at the targeted point (see Figure 1).

We usually give the crowd three or four slingshots, enabling simultaneous message creation and shooting. To create a smooth, magical user experience, most of the SMSlingshot technology recedes into the background. Moreover, the projection integrates into the built environment by using a building's natural borders.

Figure 2. The SMSlingshot. (a) A phone-sized keypad is integrated into a wooden case. (b) The user types a message to shoot onto a media facade. The system also includes a rendering PC connected to either a powerful projector or the media facade.

We designed the slingshot interface for portability and flexibility so that it can be easily handed around. Compared to fixed installations, in which people tend to end up waiting in a queue, an untethered device supports more social interaction with bystanders, making it less inhibiting to try out. Moreover, this interaction design renders the entire space in front of a media facade interactive.[4]

In addition, users who aren't technology savvy can easily comprehend the slingshot form and infer how to interact. Shooting a message provides a useful analogy, conveying the notion of transferring content over a distance. Moreover, the slingshot evokes memories and feelings of childhood unruliness. This playful rebellion gives the slingshot a guerrilla-like quality, which fits with our overall vision of "reclaiming the screens." The classic story of David slaying Goliath with a sling also fits our vision.

As an input device, the slingshot requires and allows for expressive embodied action, which is easy for others in the same space to see.[4] In this, our project differs from other media facade installations that use smartphones for input.[3] Even though smartphones allow for sophisticated on-screen interaction, they don't support much ex-

pressive action, which we've identified as part of the fun of using the slingshot. Users perceive pulling and releasing the elastic band as highly satisfying, and many of them exaggerate the action.

Media facade projects have often used smartphones partly because the researchers believed that people are already familiar with them and that they provide privacy and reduce social embarrassment.[9] It's frequently assumed that getting people to write public messages is difficult unless they can do so anonymously, without standing out from the crowd. SMSlingshot users do stand out from the crowd, but we observed little inhibition. This might be partially because the activity only becomes performative (highly visible) at the last stage of shooting the message.

SMSlingshot allows for performativity and authorship. The nontechnical metaphor and simple interface lower the entry threshold for interaction. Moreover, while composing a message, users are observed only by direct bystanders, and they can shield the display from view. We've noticed that users sometimes discuss messages with bystanders and revise the messages before shooting them. In this way, the bystanders have already approved the messages. This gives users confidence and builds

Figure 3. SMSlingshot in a walkway during Mexico City's CROMAfest. Users casually interact with bystanders and friends.

up anticipation of wanting to shoot the message and see it displayed.

The visibility of shooting also seems to create a sense of authorship and accountability. A main concern of media facade owners is about inappropriate user-generated content. Given our purpose of letting the public "reclaim the screens," we didn't censor anything. Yet, in more than 20 exhibitions in varying contexts, we rarely saw inappropriate or offensive messages, although political statements were common and encouraged. Nor were there any noticeable attempts to steal the device. Occasionally, we lost track of our slingshots. However, they were easy to find because the shooting gesture reveals their location, and people often returned them when finished.

Exhibition History and Research Approach

Over the past three years, we've set up SMSlingshot interventions in 24 locations in 18 cities, usually at the invitation of festival organizers who let us choose a facade and urban space in agreement with them. We seldom had full control over the site settings and had to accept compromises in the spatial setup, but we could observe and study how the system was used and how the situation was influenced in a variety of settings.

Ten interventions took place in plazas, six were in walkways or pedestrian zones, and the others were in hybrid settings or indoors. Setting types varied from everyday situations (see Figure 3) to more scripted events that people went to for entertainment (see Figure 4). A typical intervention ran for three hours at dusk or night.

The number of people who just observed the intervention or interacted with it varied according to the urban space's size and the festival type. In the

Figure 4. Setting up for Cleveland's Solstice Festival. The large scale and crowds in this situation are similar to more scripted events.

smaller venues, about 12 to 20 people on average were in the area simultaneously; larger venues held up to 600 people.

Three Example Situations

The following three settings illustrate the diverse situations and give a sense of the type and amount of data related to the slingshot's use.

At the Marsatac music festival in Marseilles, 23,000 festivalgoers streamed through a 649-m^2 plaza over two days. This plaza (one of six at the festival) could hold approximately 400 people. A 40,000 ANSI lumen projector hidden 27 m from the facade created a projection 7.5 m wide and 12 m high. Altogether, approximately 473 people used three slingshots over two days, for a total of 6.5 hours. During this time, they shot 903 messages.

The Cleveland Museum of Art's Solstice festival was our largest venue to date and marked the limit of technical feasibility. The environment contained two facades, creating a 500-m^2 projection area in front of an 1,800-m^2 plaza (see Figure 4). The projectors were hidden 48 m from the facade. On average, approximately 600 visitors were in the plaza during the three hours of the show. More than 160 users posted 439 messages.

One Mexico City venue was a natural walkway in a pedestrian zone (see Figure 3). We positioned the projector and equipment opposite the facade, 10 m away and visible to all. The projection area was 20 m^2, with an area of 300 m^2 in front of it. In this small venue, an average of between 20 and 27 people congregated, mostly near the equipment. During the intervention's first half, we displayed two trigger questions continuously in the middle of the projection; one was, "Que te hace feliz de mexico?" (What makes you happy in Mexico?). Approximately 62 users shot 382 messages for over close to two hours.

Observation and Data Collection during the Events

Team members were present during SMSlingshot setup and throughout the intervention. They explained the slingshot and its artistic and activist statement to interested visitors, monitored its use, and observed user interaction. We recorded most of our interventions. The collected data included field notes, videos and photographs taken at ground level, aerial photos and videos, and system logs. We also conducted informal interviews during and after an intervention to find out how people experienced it.

We conducted a systematic iterative data analysis, focusing on spatial aspects that compared the unpopulated spatial layout of the settings (acquired from maps and pictures) with the observed social situation and behaviors.[4] We wanted to better understand how to integrate different types of spaces into an urban-interaction design and how to develop a model for using space in media interventions. The granularity of interest for this analysis was generally below 50 m and over 1 m.

Our research takes an open-ended, inductive, research-through-design approach that employs SMSlingshot as a vehicle to explore properties relevant to creating a broader theory of urban HCI.

Insights from Exhibiting

Exhibiting in various contexts and immersion in the situations has let us compare diverse experiences, noting similarities and differences and, over time, identifying their causes. Here we focus on insights regarding context and environment, the two outer layers of Jennifer Sheridan and her colleagues' performance triad model.[10]

Content and Context

Most messages were personal ("adam, marry me"), contained personal advertising ("rooftop party waterstreet 1" or "amparhomestyle.com.mx"), or just said hi ("hello cleveland"). Some were political ("make love not war"), religious ("god will save you"), funny ("i am bill clinton"), or insider jokes ("purple monkey dishwasher"). Some were used to communicate within a group ("lets meet at the bar"). Sometimes messages referred to previous messages, creating a conversation:

- 23:46:30, "will you marry me?"
- 23:47:36, "its too soon."
- 23:50:23, "anyone else available?"

Another sort of sequence usually started with one person self-advertising, which another person picked up by doing the same, and so on.

People also extended the potential interaction space to another medium—mobile phones. This occurred especially in bigger venues, such as Cleveland and Marseille, where friends were in the same compound but not necessarily near each other—for example (with altered phone numbers):

- 23:03:43, "joan call me,"
- 23:04:30, "440 5643 5788," or
- 0:51:23, "text 716858123849."

The phone numbers didn't necessarily belong to the person posting the message. In Marseille, people made jokes out of this, posting other people's (presumably, friends') numbers. In one case, the friend, standing next to the posting person, said, "This won't work, anyway," when the message was shot. Five new incoming texts to her phone proved her wrong.

The venue context also resonated in the message content. For example, people at the Cleveland Art Museum's festival posted more philosophical texts than usual. At a similar but smaller art museum in Palma, people also posted more philosophical message content as well as much longer messages than elsewhere.

The posted content became even more directed and homogeneous when we used trigger sentences, questions, or images. Images were the weakest form of direction; questions tended to elicit short, two-word answers. A branded space venue by Amnesty International made people especially conscious

about their words. Teenagers (aged 14 to 16) even tended to ask for help to spell sentences correctly.

The cultural context also influenced the situation. For example, the number of political messages in Cleveland was much higher than in Mexico. This went so far that the curator at some point asked us to prevent further political messages, such as "no more obama," but we insisted on SMSlingshot being uncensored.

SMSlingshot is a public medium that doesn't strip away space the way mobile phones do. It offers enough privacy to give users confidence about adding or removing personal identification from the message formulation and spatial situation. For example, declarations of love constituted approximately 9 percent of all messages. An instance of the message "i love you, hans" probably won't offend a religious conservative if the location and context don't reveal that the person posting the message is gay. The context would be apparent only in the social space around the posting person, through the interaction of the couple. This example illustrates the connections of context, content, and space and how they affect interaction.

Apart from the message content, we didn't observe many cultural differences in people's use of SMSlingshot or the crowd's use of the overall space. One of the few exceptions was that people in Mexico were more likely to sit on the ground than they were elsewhere.

Space and Spatial Structure

A public space's scale and structure affect the social situation. For example, they change the degree of intimacy and how people move and behave in the space. This in turn influences the kind of installations and interactive activities that work well.

The spatial environment's role. We've noticed that people in plazas tend to look for some form of development or narrative. They can usually see the display over a longer distance and thus for a longer time while traversing the space (see Figures 1 and 4). Plazas usually provide opportunities to stop, observe, and spend time.

In contrast, pedestrians in walkways or in streets are less likely to linger. The display's visibility as well as that of the slingshot shooting action is lower in these situations. Thus, a longer narrative might not be suitable or necessary, and passersby might have less opportunity to observe others. In these situations, how to interact must be made instantly clear, and short episodes must be meaningful and interesting for observers, who might not get to see a longer development.
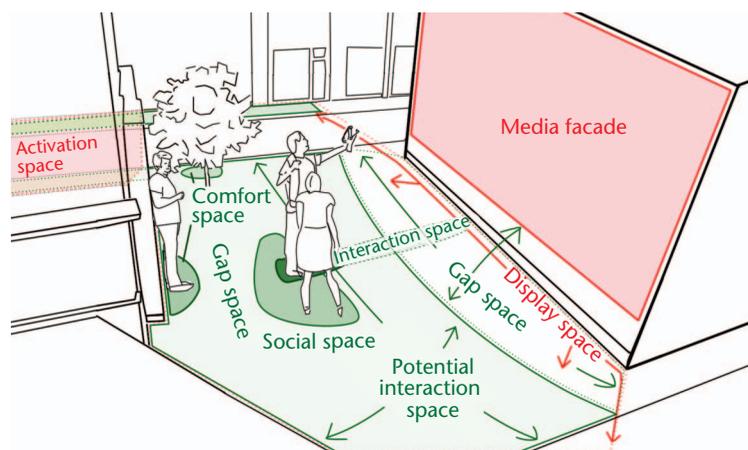

Figure 5. A space type model for urban HCI. The model defines seven subspaces to describe and analyze the space in front of a media facade.[4]

We believe that developing interactive technology for large spaces requires an architectural understanding of space. Implementations of pervasive technologies in architectural spaces often seem focused on screens in relative isolation from their surroundings. The environment then is analyzed only in terms of where to attach a screen and how the surroundings influence usability requirements or location-based information needs.

Although it's standard for HCI to stress designing for context, it's not so usual to think about it on an architectural level, where the environment also produces the context. Urban HCI can benefit from research on the interaction patterns in spatial structures in related areas such as environmental psychology, urbanism, sociology, and space syntax.[11]

From system-centric HCI models to spatial models. Researchers have proposed various models for understanding public-display interaction. Some present an onion-layer model of how people approach the display (from seeing a display from afar to interacting with it directly); others focus on the relationships among performers, participants, and spectators and the transitions between roles.[12,13] However, large distances, architectural influences, and reactions between displays of architectural scale versus human scale are rarely discussed. Most models for interaction with public displays assume that the displays rely on direct manipulation (touch) or proximity reactions, and the displays are relatively small in comparison to media facades. Issues of scale, spatial organization, context, and environment are rarely considered in these frameworks.

Figure 5 shows a model of spaces based on our exhibition work in media facade environments (for details, see our earlier work[4]). The model addresses the different types of spaces and displays in these settings, with respect to scale and relation. It can

Figure 6. SMSlingshot projecting onto a high-rise along a busy street in São Paulo. The potential interaction space is on a street corner opposite the high-rise building approximately on the other side of the road from the sitting person, who is in the activation space.

help designers make better decisions in developing interactive public pieces by

- clarifying how the numerous subspaces interact and contribute to (or interfere with) the installation or intervention and
- inspiring them to consciously use these spaces.

SMSlingshot lets the *performer* (user) move around in a *potential interaction space* in front of the facade, so the *interaction space* between the performer and facade moves. Often, a *social space* forms around the performer while he or she types a message. Architectural configuration and context affect the social space's size, position, duration, overlap, transition, and fragmentation. It's important to note that the performer isn't isolated but in a group.

Isolation and exposure also affect the observers. They tend to gravitate to *comfort spaces*—protective features such as walls, pillars, or trees that provide a sense of physical and psychological ease. In one case, people even gravitated around a ladder that we were using for our technical setup.

Gap spaces create distance, either between humans and systems or among humans. They sometimes occur between different social spaces and sometimes result from the interactive setup. For example, an elevated display tends to create a gap space in front of the facade.

Finally, there is the *activation space*, from which people can see the facade and have their curiosity aroused but can't interact with it. Furthermore, they might see only parts of the installation—often without being able to observe how the interaction occurs.

Designers should consider all these spaces in concert when adapting an urban media facade installation for a new setting or creating a new installation. Setup choices might allow for creating comfort spaces in suitable locations (and avoiding unsuitable ones), tightening gap spaces, and enlarging the potential interaction space.

This model helps envision the emerging situation before deployment. For example, having too many comfort spaces tends to be counterproductive if you want people to roam. Not only observers but also slingshot users will gravitate to comfort spaces, and we found it impossible to lure them away without altering the spatial setup.

Marseille and Cleveland illustrate the effect of comfort spaces. Both were plazas saturated with people and their sizes were similar, so you might expect that people would have behaved similarly in both situations. This wasn't the case.

In Marseille, users were distributed throughout the plaza, even moving toward the edge of the gap space in front of the facade. The lack of comfort spaces might have caused this dispersion; the plaza had no places to sit. Only the edges were potential comfort spaces, but ticket stalls occupied them, making them unattractive places to linger.

In contrast, Cleveland had platforms (1.5 × 1.5 × 0.5 m) at the rear of the plaza that attracted people to sit on them. Users were less likely to move from those areas, so queues to use the slingshot emerged in their vicinity. Users were also less likely to move away from this area, taking the slingshot with them, as was the case in Marseille.

We regularly observed people gravitating toward comfort spaces, influencing the overall use of space (with less movement around the entire plaza).

Scale and Size

Media facades operate on a scale that affects the user's experience. Shooting a message over a large distance onto a facade that's bigger than a human seems to create a strong user experience. This contributes to a feeling of empowerment, compared to shooting at a small, nearby display. The slingshot bridges the gap between the media facade's architectural scale and the activity's human scale, bringing the facade into virtual reach. This is similar to casting a large shadow that momentarily transforms its owner into a giant.

In large-scale media facades, such as those in Figures 4 and 6, the slingshot extends the user's physical abilities (and skills) and might even defy gravity by shooting to a height and distance impossible in true life. We've experienced this when comparing audience reactions in indoor venues, where the projection is usually comparatively small and the space in front even smaller, with their reactions in outdoor situations that support large projections or display surfaces.

The illustration in Figure 7 shows interaction locations from different distances (from P1 and P2) to a middle-sized screen at the STRP Festival Eindhoven. In this situation, a street divided the area in front of the facade into distinct interaction areas. Most people chose to shoot from the other side of the street (P1), farther from the facade (in front of a building entrance E).

We still don't know the reason for this. The two positions P1 and P2 trade off distance against the size of the media facade. However, reducing this phenomenon to an ergonomic problem with the parameters of facade size and distance doesn't seem promising, especially as we observed contradictory positioning in several architectural configurations.

HCI hasn't yet studied scale issues well. This research topic requires interdisciplinary collaboration among architects, psychologists, and HCI and other technologists. Inspiration is available in modern art and architecture, which often experiment with the perceptual and psychological effects of scaling (enlarging as well as miniaturizing) objects and environments.

Some of the emergent questions ask whether the psychological effects of shooting a message depend on the perceived distance and size or just the display's size on the retina. Does an optimal relationship exist between size and distance? Can the display be too far away? Does it depend on the type of content, such as images and symbols versus text?[11] If we have media facades that are large enough to transform public spaces, what kinds of

Figure 7. A street space at STRP Festival Eindhoven. The street in front of the middle-sized facade (bottom left) is not busy, but participants (P1 and P2) preferred to shoot from farther away (in front of a building entrance (E).

content are appropriate for these? And what types of content work on which scale?

Applying architectural thinking to our field experience helped clarify how human behavior in urban HCI is affected by not only the display and its size but also the different areas in front of it, such as the comfort, activation, and gap spaces. In the case of our interventions, the slingshot mediates between the human scale and the facade's architectural scale, while adding a subversive element that supports our artistic intention. How to create this mediation is one design challenge for urban HCI; mastering the different types of spaces is another. Although we had a specific mission for our interventions, we believe some of the lessons learned apply to most public-display situations and will be useful for designers and developers of this new medium in urban spaces.

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