Media Façades: Turning buildings into large-scale interactive surfaces

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Abstract

The rapidly increasing number of so-called media façades is one prominent example of how new digital technologies are augmenting urban environments. The majority of media façades covers most of the outer shell of a building, which gives them a 3D form factor. Due to their size and visibility, as well as the dynamic public urban environment they are usually situated in, they offer great potential for interaction. Unfortunately, this potential is mostly neglected so far. In this position paper, we described our previous and ongoing efforts to exploit the full potential of media façades in order turn them into fully-fledged, interactive displays in urban environments.

Author Keywords

Media façades, interaction technique, interaction design, mobile device.

ACM Classification Keywords

H.5.2. Information interfaces and presentation: User Interfaces – Input devices and strategies, Interaction styles, Graphical user interfaces.

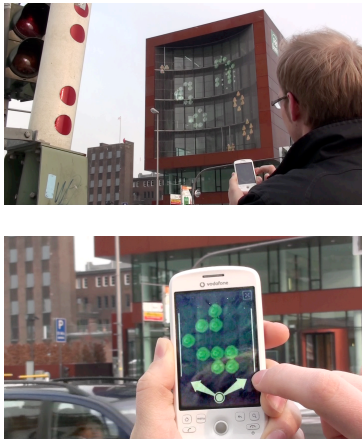## General Terms

Design, Human Factors

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

Introduction

More and more urban landscapes are equipped with so called *media façades.* With the term media façade, we determine gigantic digital screens in manifold occurrences, which are created by extending architectural structures – such as the outer shell of a building - with interactive, light emitting elements [5, 6]. Their technical capabilities, size, visibility and the naturally large audience offer great potential for interactivity. Due to their size and the therefore required viewing distance, interacting with them directly (e.g., by touch input) is not possible. However, recent advances in mobile computing allow users to interact with such façades in several ways at-a-distance. The goal of our work is to exploit the potential of such gigantic public screens and to turn media façades into fully-fledged interactive display surfaces. We believe that our work will enrich the urban landscape and open up new perspectives for the field of urban computing.

In this position paper, we report on our experiences in designing interactive systems for media façades and developing new interaction techniques, dedicated to the properties and capabilities of them. We further outline how we envision interactive media façades to become an essential part of the urban environments of the future. We believe that we can enrich the workshop by providing inspirational thoughts that will lead to fruitful discussions throughout the workshop.

Related Work

Urban public spaces are emerging as prime locations for digital systems, embedded into the landscape of the city [6, 7]. Haeusler describes the term "media façade" as the idea of designing or modifying the architecture of buildings, using their surface as giant public screens

[5]. He further provides a categorization of media façades, based on their technical specifications. Researchers recently explored the potential of providing interactivity with media façades [8]. Since media façades are situated in a highly dynamic and public environment, the design of interactive installations needs to address the requirements introduced therewith. Dalsgaard and Halskov described eight key challenges when designing such novel interactive systems and – most importantly – when offering new interfaces [3].

Engaging Interaction

When providing interactive media façades, people need to get engaged to use such systems and to interact with them. In [1], we implemented several prototypes to create playful engagement with the media façade of the PSD Bank building[1] in Münster, Germany. As depicted in Figure 1, we implemented several ubiquitous games, such as Tetris or the Game of Life, where passersby where able to play those games on the façade using a smartphone – a ubiquitous input device the majority of people carries in their pocket – as input devices. This work delivered valuable insights on how people can get engaged to interact with media façades in general and how they perceive and approach this novel type of interface.

Interaction Techniques

Due to their properties, making media façades interactive usually implies interaction at-a-distance. Therefore, suitable interaction techniques are required. Since touch input is a common and natural interaction technique for situated public displays, a straightforward
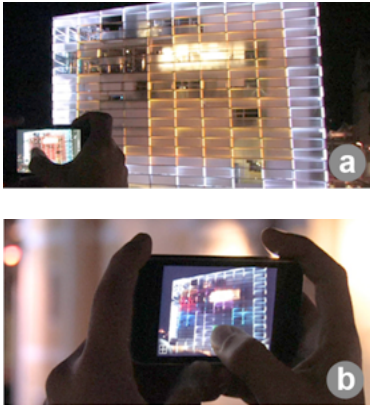
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[1] http://www.psd-medienfassade.de/

Figure 2. The façade from the building (a) is directly manipulated through the video image on a mobile device (b) [2].
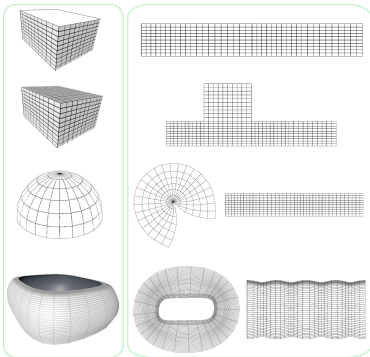

Figure 3. Map projections (right) for different common form factors (left) [4].

approach is to transfer the capabilities of direct touch input to media façades. Since due to their size, manually touching the façade is not possible, we introduced an alternative, vision based approach to allow for direct touch input on the media façade, utilizing a smartphone as input device [2]. As depicted in Figure 2, the boundaries of the media façade are tracked in the live video on the mobile device. Users can touch the building in the video feed on the mobile devices. The touches are mapped on the building and send to the media façade, giving the impression of actually touching the media façade itself. Since this approach requires a direct line of sight between user and the façade, it is suitable to interact with media façades that come with a 2D form factor or excerpts of more complex façades. Hence, interaction is restricted to the currently visible part of the façade.

Since media façades usually cover more than one side of a building, they often come with a 3D form factor, offering a potentially interactive area that goes beyond the parts of the façade that are visible from the current position of the user. In [4], we applied the concepts from the field of cartography to media façades. We analyzed the form factors of existing media façades and collected dominant shapes. For the obtained shapes, we applied the concepts of cartographic map projections – mathematical algorithms to map 3D surfaces into a 2D space - to create 2D map representations of a media façade, based on its dominant form factor (see Figure 3). The created maps can be used to allow for direct touch interaction without requiring a direct line of sight. Users can touch any point of the façades displayed on the 2D map running on a smartphone and the touches are mapped onto the actual façade. Hence, independent from current point of view, a user can

continuously interact with all parts – also the occluded ones – of a media façade with arbitrary form factors.

Designing Interaction

Media façades represent a novel kind of ubiquitous interface, situated in a highly dynamic urban environment. When designing interactive applications for media façades, there is a need for a structured design process, which addresses the aforementioned challenges introduced by this domain. In [9], we reported on our experiences designing interaction with media façades. We approached the development in a user-centered design approach while addressing the design process at two points with additional means: (1) We utilized purpose-built prototyping toolkits for prototyping and testing content and hardware before deploying the system. Since situated in a highly public environment, everything deployed to a media façade is already live. This raises the need for novel prototyping and testing tools for the different development stages. (2) As we experienced with different installations, when interacting with a media façade in a public urban environment, people tend to prefer enjoyment over ease-of-use, we adapted existing *user experience* (UX) evaluation methods and made experimental use of them to investigate the users' actions and emotions more holistically. We iteratively derived a combined and adapted evaluation approach, which allows both improving the usability as well as revealing insights on users' experiences interacting with this new form of interface.

Understanding the design process and adapting it to meet the requirements of interacting with architectural sized displays in an urban environment is a very important aspect in order to design a successful system and to create a usable and enjoyable outcome.

Discussion & Conclusion

Media façades have great potential for interactivity and to become new ubiquitous interfaces to urban landscape. However, to achieve the ultimate goal of turning them into fully-fledged, interactive public displays, it is still a long way down the road on which several challenges have to be addressed. (1) At first, media façade come with a huge variety of sizes, form factors, resolutions and technical capabilities in general. So far, existing interactive systems are highly tailored to the particular media façade they were designed for. Hence, existing applications are hardly transferable from one media façade to another. There is a need for a generalized design process and development tools that support modeling different hardware interfaces, as well as the adaption of existing application the various form factors and resolutions of different façades. (2) As described by Dalsgaard and Halskov [3], due to its highly public exposure, the displayed content is also an important challenge. It has to suit the medium both in terms of appropriateness and also concerning the available screen size and resolution.

(3) In recent works with media façades, interactivity was mostly realized in playful or artistic installations, without efforts to develop universal interaction techniques. With [2, 4], we presented first approaches to provide such universal interaction techniques that are applicable for all media façades, independent of their size, resolution and form factor. Without applicable and easy-to-use interaction techniques, there is no reasonable chance for providing generalized interaction.

We believe that the presented ideas can enrich the workshop by providing inspirational thoughts that will lead to fruitful discussions about turning arbitrary building façades into interactive architectural sized display surfaces.

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