# The Mighty Un-touchables – Creating Playful Engagement on Media Façades

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*MobileHCI 2011*, Aug 30–Sept 2, 2011, Stockholm, Sweden.
ACM 978-1-4503-0541-9/11/08-09.

## Abstract
In this paper we investigate interaction with a media façade that is out of reach for touch-based interaction. We describe four different applications that utilize mobile devices to enable passers-by to interact with the façade. Each application has been designed constrained by limitations given by formal regulations of an editorial board (e.g. to prevent traffic distractions) and with the aim to catch the attention of passers-by to achieve interaction and keep the users engaged. Besides the description of the design and implementation of the different application, we report on initial feedback of users after a first preliminary user test that informs further development and design.

## Keywords
Media façades, engagement, mobile interaction.

## ACM Classification Keywords
H5.2. User Interfaces: Input devices and strategies.

## General Terms
Design.

## Introduction
Digital public displays are becoming ubiquitous. This development can especially be seen in urban areas,

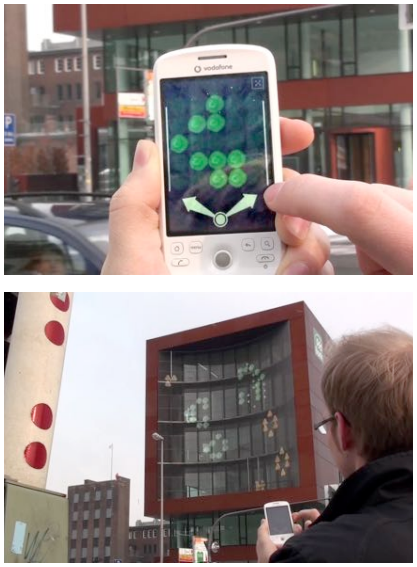

**Figure 1**. The mobile application for choosing the game role and creating a formation of spaceships (top) and the visualization of the planet (bottom).

e.g. in form of digital signage and digital displays in shop windows. Besides these public displays, media façades are getting more and more popular. Thus, displays that are out of reach from touching and often too huge so that users cannot make use of this kind of interaction modality. In this paper, we present four applications designed for interaction with such media façades that empower people to influence the display's content by using their mobile devices. The applications rely on distant interaction and partially incorporate physical movement into interaction. Our design goal was to create a playful experience and an on-going engagement with the façade. We present design considerations and first feedback from people who are familiar with the façade as a solely emissive medium.

## Situation, Environment and Constraints

The media façade employed for the applications in this paper covers 178m$^2$ of the main building of a bank in Münster, Germany. Due to the low resolution of 219 pixels vertically by 192 pixels horizontally and with respect to the large dimension of the façade, the optimal viewing-distance is about 20m to get the whole picture at one glance. This is common for most large media façades. The owner, the local city council and an editorial board responsible for the content stated some constraints for new applications. Most importantly, the huge screen must not distract car drivers and other traffic participants. Hence, rapid visual changes drawing people's attention off the road have to be avoided. Additionally, plain text and narrative content is abandoned as well as explicit product promotion. Up to now, passers-by have not been able to interact with the media façade and it was just a broadcasting display. Therefore we focused on the question: How do we allow passers-by to easily apprehend the idea and the underlying interaction model of the presented applications? The four applications themselves do not clash with the constraints imposed by the facilities mentioned above. They do not show explicit product promotion, but still draw people's attention to the building and – if they do interact – create a bonding experience.

## Related Work

The term "media façade" is described by Haeusler as the idea of designing or modifying the architecture of buildings using their surfaces as giant public screens [5]. Furthermore, the number of media façades that are embedded in the landscape of cities increases more and more [7]. The social potential of such media façades is recently explored by researchers as the media facads can be seen or even designed by multiple persons simultaneously [1,6]. Boring et al. describe a puzzle that can be solved by multiple users simultaneously on a media façade through live-video on a mobile device [3]. Dalsgaard et al. described eight key challenges when designing such novel interactive systems and when offering users new, distributed interfaces [4].

Several techniques have been proposed for interaction with media façades. Ballagas et al. describe how relative and indirect pointing can be used for distant displays by turning a camera-equipped mobile device into a mouse-like device [1]. With Touch Projector, Boring et al. go one step further by allowing interaction with a distant display shown in the viewfinder of their smartphone camera using touch input in real-time withour using virtual pointers or relying on fiducial markers [2].

## Applications

We implemented four different applications with the intention to explore possible user participation on me-

**Figure 2.** The user is able to navigate through a maze (top) by using his mobile. Obstacles can be overcome by a combination of gestures performed with the mobile (bottom).

dia façades. The commonality of all applications was that they bridge the distance to the display utilizing a mobile device. The applications originate from different fields to attract a wider audience. We developed three games for competitive and collaborative interaction and one educational interactive media installation. All applications were based on a server-mobile client architecture where communication was handled using a mobile Internet connection. In the following we will describe the applications in depth and discuss the design considerations that were taken into account for these applications.

*"Recolonize" – An Adaption of Conway's Game of Life*
The first game is an adaption of Conway's Game of Life[1]. The idea is that the users can control different species of extraterrestrial life that try to conquer a planet. Therefore the users choose their spaceships on their mobile devices, which from then on serves as a launching pad for sending new forces to the planet. The user creates a formation of spaceships (as shown in Figure 1), points the device at the planet (the façade) and performs a swipe gesture to send out new spaceships. To determine the region where the spaceships touch down on the planet the pose of the device (measured through the accelerometer) and the direction of the swipe is used. E.g., when she points the device to the top of the display and swipes to the left, the spaceships appear in the upper left (accordingly with other directions).

Following Conway's Game of Life, the planet has a grid layout, and time is discretized into cycles. The original game follows simple rules to simulate an evolution of cells, e.g. they die if too little or too many neighbors are around, and they create new cells when an appropriate number of cells are gathered. To enable a multilayer game, we introduced new rules: interferences between the different species are ruled according to the rock-paper-scissors-principle, i.e. one species beats another in a triangle.

This game's incentive for passers-by to join is to dominate the planet with their own species. During the gameplay they might explore different strategies according to the rules for evolution. In our game design there was a maximum of three species, yet there could be more than one player for each species. Although there is no determined end of the game, a player will most likely loose captured land when he leaves the court.

*"ArtMaze" – A Maze Game with Quests*
This application mimics a typical maze game where the maze is shown on the façade and the tokens for the different players are controlled using the mobile application (see Figure 2). The task is to maneuver the token from its starting position to each level's finish, symbolized by a key. Obstacles can block the players on their way. Each level has a distinct set of such obstacles, distinguishable by their icon. Once "trapped" in them, the player has to solve a quest: discover a specific combination of gestures with her mobile. As soon as she found the right sequence of moves, her token is set free again. Once a player reaches the finish, she ascends to the next level. In a different game mode, the game's objective is slightly extended: before a player can ascend to the next level by reaching the level's finish, it is necessary to collect respectively "eat" all items in the maze – just as in Pac-Man. While navi-

[1] http://en.wikipedia.org/wiki/Conway's_Game_of_Life

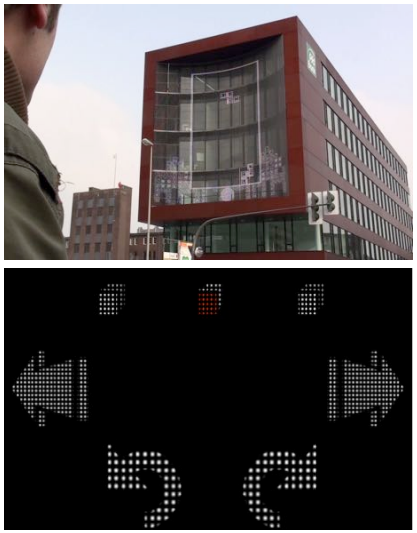

**Figure 3.** The game reacts to user input by tilting the playing field (top). The mobile devices can be used to move and rotate the falling stones (bottom).

gating her token, the player receives immediate feedback by vibrations of the mobile devices (e.g. stepping on an obstacle causes the device to rumble).

This game's incentive for passers-by to join is to compete against others: who reaches the finish first, wins the level. Therefore, a player has to maneuver her token quickly and cleverly discover and re-use gesture combinations. If there are no players connected to the game, a movie about the game itself is shown to attract people's attention. As soon as the first player establishes a connection, the movie gives way to the actual maze again.

*Body controlled Tetris*

The third application adopts the game concept of Tetris[2]. In our version, the players can use their mobile device to control the game in two ways: (i) conventional input via buttons (see Figure 3) and (ii) moving around in front of the façade carrying the mobile device in a pocket. The first method should not need any further explanation for the player, since this kind of interface has been used with many game consoles. The second way of interaction aims at controlling the game without the need for a handheld device at all. The player's position in front of the façade is located via GPS and mapped to one of three areas: left, middle, and right. Each area is given the same amount of real space in front of the façade. E.g., if a user moves into the "left" area, the current stone shifts to the left accordingly. The stone will be moved as long in a particular direction as the user stays in the corresponding area. It continues to drop in the same row as soon as the player moves back to the "middle" area. There is no gesture to drop the current stone, but rotating can be done by the user spinning around her own axis – tracked by the device's compass.

To enable multiple passers-by to play together we extended the single-player Tetris concept: Players now "vote" for the direction they want the field to tilt to (see Figure 3). If there is just one person playing, the game will exactly follow her instructions. If there are more players engaged, the result is determined democratically. As an example: if one player votes for tilting the field to the left, but two other players vote for right, the field will eventually move to the right. If there is one vote for either way, the field will not move at all. Since both ways of interaction differ in effort necessary to perform the action, body movement overrules button pressing by a factor of three. This weighting has been implemented to entice players to use the less common and more arduous way of body interaction as well. Yet, it is up to the users to explore the impact of their actions.

This game's incentive for passers-by to join the game is the collaboration in front of the façade. We designed the game in a way that the movement of other people jumping around in front of the façade should motivate others to join. Additionally, the body interaction purposed a high fun factor. The number of players was unlimited.

*A Campaign Against Light Pollution*

This application was developed as part of a campaign to raise the awareness of light pollution in cities. The project puts an emphasis on the fact that many insects die every night because of lamps emitting UV radiation. To visualize this problem, on the façade a scene of a night-

[2] http://en.wikipedia.org/wiki/Tetris

**Figure 4.** Different kinds of insects are shown on the facade during their natural flight orientated by the moon (top). A user is able to entrap them on her mobile device by igniting an artificial light source (bottom).

ly sky with the moon in the background and various kinds of insects buzzing in front were shown (see Figure 4). In parallel, viewers can create three types of virtual lights in arbitrary sizes on their mobile clients: (i) high-pressure sodium, (ii) low-pressure sodium and (iii) high-pressure mercury. They differ in type and strength of emitted UV radiation. Depending on the chosen type and intensity, insects start to "fly" from the façade to the viewer's mobile device. After a few seconds, they will vaporize as a metaphor of their death caused by that unnatural source of light. The viewer can now choose to spark another type of lamp or to stop and thus reduce the pollution of her environment with light. To support that kind of interaction even further, the viewer's light is also visible on the lower part of the façade, varying accordingly to color, size and position (determined via GPS). The number of connected devices is not limited. Thus, a user group of any size can try to brighten up the virtual sky as much as possible, realize and reflect the consequences.

This media installation aims at drumming up the interest by providing an interesting scenery. Once stepped into the plot, users can actively change the environment by putting up lights and observe the interaction with other users. Users can even understand the impact other users have based on the feedback of the illuminative spots on the façade. In contrast to the games, this installation also conveys an educational message.

## User Feedback and Experiences

For a first preliminary user study we interviewed employees of the bank after they got the possibility to explore the capabilities of the applications. Since they work "behind" the façade every day, they have established a certain relationship to the façade – may this be either negative, positive or never minded. So far, the façade has only shown animated pictures and short movies, which were developed by designers and artists. There is a fixed time schedule that shows fine arts depending on the season, the hour of the day and the day of the week. After the employees were introduced to the functionality and the capabilities of the applications as described above they got 15 to 20 minutes to explore each application on their own and then we conducted small informal interviews.

In general, our participants were very excited about the new way of interactions that were possible with "their" façade. Especially the advertising manager of the company pictured out, that she could really image to embed this new kind of advertising into their marketing concept. As they are not allowed and do not want to show plain and direct advertising slogans or logos, they think of the new interaction we proposed as a good way to "connect" people to the façade, as it represents the brand of their company. The participants stated that a distinct connection feedback would have been helpful since sometimes they were unsure if their actions were detected. The importance of a short latency and direct feedback was already revealed during the testing-phase (*"Am I still connected?"*, *"Did this message get through?"*). Even though the latency was already low, in some cases it was not directly visible due to the game-cycles. Direct feedback seems to be even more important for such public displays than for conventional GUIs since the users are still unfamiliar with this new kind of interface and remote interaction. Furthermore users reported that they wanted their action to remain visible for at least several seconds so that they can verify and appreciate their input – especially in the *Recolonize* game.

During the tests some passers-by attention was drawn to the façade just because our test users were looking at it – the actual display did not catch their attention. This suggests that some kind of "viral marketing" happens automatically in front of the façade. But still some kind of idle mode and continuous visual movements are necessary to prevent boredom and preserve the façade's pulchritude to attract passers-by.

Generally we found, that the development and tests under real circumstances in public space are difficult, since the bank as the operator of the façade was afraid of presenting a software failure or embarrassing content publicly on the display. Aggravatingly, due to the costs of the media façade and the uniqueness of its environment we were not able to reproduce an identical test setting. Therefore we conducted simulations and laboratory tests. We developed a simulator of the display that shows the visualization embedded into a picture and 3D-model of the real façade.

## Conclusions and Future Work

In this paper, we presented four different applications to enable interaction with a media façade that is out of reach for direct touch-based interaction. We explored four designs for different applications with different approaches for motivating the passers-by to interact and keeping her engaged:

- For Recolonize we aimed for an enduring interaction with the façade since the users would loose if the leave the court,
- for the maze game we explored a classical game with a clear end and a distinct winner,
- for the Tetris-like game we explored collaboration and body-interaction in front of the façade,
- and for the media installation we investigated if we could set the users into an explorative behavior.

For future work, we plan to investigate how one can engage people more with the brand of the company operating a media façade. One idea is to use the game as a matter of advertisement and explore if the game has an impact on the users perspective on the company. After this first evaluation based on preliminary feedback and following the idea of deployment-based research, we are planning to make the mobile apps to play the games available in the market (*iPhone AppStore* and *Android Market*) with fixed timeslots to further investigate use times and user groups as well as spontaneous collaboration in front of the façade.

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