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Urban HCI: PlazaPuck - An unowned, moveable, public interface

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Abstract

The design of public interfaces follows other criteria as that of mobile or desktop applications. Performative elements enhance the interface and additional requirements of physical robustness are to be taken care of in the design process from the very start. Here, we report on how these two aspects impacted the design of a novel interface called *PlazaPuck*, created for everyday life on public plazas.

1 Introduction

Dalsgaard remarks in his "Eight challenges for urban media façade design" that the possibly most salient challenge for interaction designers is that the urban setting prompts new forms of interfaces or alternative assemblies of existing ones (Dalsgaard & Halskov 2010). Such new interfaces types are not only needed for media façades, but for any interfaces that find their use in public space. (Fischer & Hornecker 2012) presented a framework based on such a novel type of interface. By providing a typology of spaces, it supports understanding, describing and analyzing spatial configurations of people e.g. in front of media façades. With PlazaPuck, the system under development, we want to test if this framework is valid even if there is no external display (media façade). We see our development as a continuation of Susanne Seitinger's research on Urban Pixels (Seitinger, et al. 2009) where she explored the notion of unbound interfaces and of technical flexibility through RF transceivers, and her work Light Bodies (Seitinger, et al. 2010) where she explored performative aspects of portable, hand-held lights that respond to audio and vibration input.

2 Main Design Aims

Previously we have gained experience with the three major interface types present in urban installations or interventions: (Semi)fixed, moveable and camera-based. Considering the emerging situations that each of these interfaces typically create, we found that moveable interfaces the least inhibit the formation of a social space. Attention can switch quickly without losing control of the interface. The interface accommodates the movements of its user's body. Bystanders can easily see what is happening, and intervene in multiple ways. A second reason for creating a moveable interface is that this allows us to explore different spaces in the city without heavy equipment. Thus, we might be able to get an understanding of what type of interface could work 'better' in certain contexts and environments than others. While 'better' still has to be defined, it may mean: less likely to be vandalized, regularly used, supporting sporadic or regular enjoyment, etc. The urbanist William H. White (Whyte 1990) discovered that conversations in urban environments happen much more likely on corners and in front of entrances. Similar insights are expected from deploying PlazaPuck.

Our main design aim is to promote values that enrich our public space similar to those mentioned by Carr et al. in their book "Public Space" (Carr, et al. 1992) such as *active engagement*: Moving through, communicating, play, discovery; and *passive engagement:* observing, viewing, involvement. Different to pre-programmed spectacles such as façade mappings that have become very popular in urban environments, the design of the PlazaPuck interfaces rather aims at everyday life situations. We can compare this with fountains that are also artificial attractions, often used in an interactive manner, e.g. by children running around in them and adults enjoying the play around it. Further requirements were: robustness and toughness of the interface, utilization of directions, utilization of 'people as display', scalability, low latency for real-time interaction, ability for synchronization (multiple interfaces can act as one), and flexibility.

3 The PlazaPuck System

The current state of the system is shown in Fig. 1. CNC machined from black Acetal. The PlazaPuck is sized 40x40x10cm and weights approx. 6kg. The device has a wheel in the middle of its lower side (middle picture), so that it can be conveniently pushed around and turned with one foot. The triangular pockets are separators for a 50pixel multicolour low resolution display which is used for supplementary user feedback. The LED strip is standard mass produced hardware made for media façades. More meaningful content can be displayed on a 40x8 pixel red LED display in the middle of the puck hidden underneath a matt, black, semitransparent, curved acrylic lid. User input can be provided via a pressure pad (in trapezoid shape) or an inbuilt compass. All data is transmitted via XBee Series 1 transceiver.

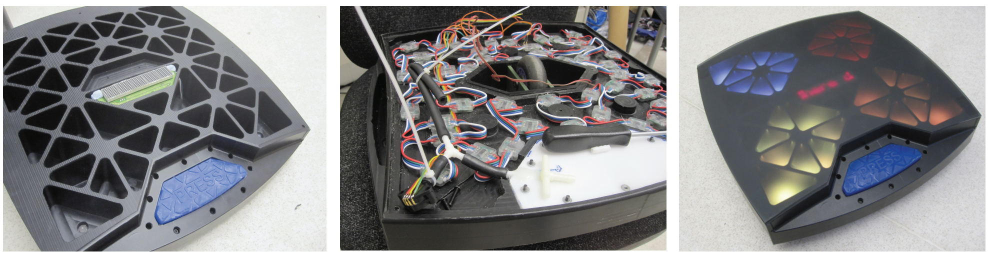

Figure 1: The CNC machined PlazaPuck with low and higher resolution display, pressure pad and wheel.

Data transfers from the sensors and to the displays are streamed to an external host computer, where a Java application implements the logic. This rather unconventional solution allows for fast prototyping of LED animations and fast changes of the activity flow even in-the-wild, because no opening of the device for reprogramming of the microcontroller is needed. Additionally, absolute positioning data can be fed into the logic in Wizard-of-Oz manner. The system remains scalable, and multiple interfaces can potentially be orchestrated through one logic. Also, the system can later-on be integrated much easier into additional or existing media architecture, e.g. laser projectors, media façade, soundscapes etc.

3.1 Technology and Use Cases

During the development process typical complexity problems emerged. When adding more sensors and actuators, timing became a problem, especially because of the number of LEDs that need to be refreshed. No operating system such as RTOS is used. In the future, a more distributed or "internet of things" like approach will be considered. By equipping each sensor and actuator with its own RF transceiver and microcontroller that implements its drivers we hope to achieve faster prototyping cycles. Systems like specknet's orient motion capture device (based on CC1100), panStamp (based on CC1101), DUL Radio (based on NRF24L0) or Seitinger's Urban Pixels (based on CC1010) already use this approach. Devices could then consist of one or multiple sensors, with the advantage to be able to construct interfaces on a bigger spatial scale that fits the urban environment.

The design also considers multiple ways of accessing the interface via a "hidden" AJAX frontend that can be easily accessed over a WIFI AP. People may connect to create their own pattern and post it to the device. This method allows integration of observers who want to engage in a more passive way. Furthermore it allows us to blur the boundaries of the performance frame (c.f. (Benford, et al. 2006)). Another use case similar to Light Stories (Pihlajaniemi, et al. 2012) where citizens can add stories to the device, could be considered because plaza situations demand these more than walkway situations. Further use case ideas go from "mimicking the other", direct referencing of the surroundings, to games and tourist applications.

3.2 Preliminary Findings

Our first testing at George Square in Glasgow was done on a moist evening at ~6°C (~42 °F) temperature and confirmed that our primary design goal was accomplished. The prototype did not break even when a teenager (Fig. 2) used it as a skateboard-like device. We found that 2.4 GHz Radios are not particular good for radio transmission slightly above ground level. It is still unclear whether the extreme positioning of the antenna was the cause of the

Figure 2 : Designing for robustness is a must: A teenager using the PlazaPuck as a skateboard.

short range, or the temperature, or humidity and wet ground. Continuous transmission was only possible up to 5m distance, which meant that we had to remain close-by. This resulted in a situation where people easily understood, that the device “belonged” to the people sitting there with the open laptop. While some people were changing their path across the square to inspect the device, being personally associated with the device created a ‘gap space’ that passers-by continuously avoided. Surprisingly this ‘gap space’ emerged not so much around the interface itself, but rather between us (sitting on the bench) and the PlazaPuck on the ground (as if people were trying to not get between us and the device). In order for more unbiased observation, the un-owned nature of the device has to be promoted. This will hopefully be achieved through better wireless connectivity in the future.

Clearly, the interface has achieved the promotion of performative interaction if we look at Fig.2. However, the actual content currently lacks immediacy, also because of the wireless connection problem. More immediate feedback to user actions is needed to improve the usability of the device. If this can be achieved with a system-architecture where all data is ‘on line’ is currently unclear. While data rates seem to be sufficient, interruptions in the communication channel are the greater problem at the moment.

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