

Beyond interaction: Tools and practices for situated publication in display networks

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ABSTRACT

The ability to engage users in content generation is both a major goal and a major challenge for public displays. While previous work has extensively explored the specific challenges associated with interaction processes, little attention has been paid to the broad range of issues that go beyond interaction itself. More specifically, public display systems do not seem to offer a set of tools and techniques that people may feel comfortable to use for whatever communication purposes they might have. There are no publication concepts that can frame expectations on how content creation, distribution, presentation and curation are handled by display systems. In our research, we seek to explore new publication concepts for public displays, and for that purpose we have developed instant places, a platform enabling people to connect with the places they visit and control the projection of their identity in public displays. The system frames interaction events within two specific publication concepts: pin badges and posters. We describe our first deployments at three different locations and the results obtained from usage data and in-situ surveys about content publication practices.

Categories and Subject Descriptors

H.5.2 User Interfaces: Theory and methods

General Terms

Design, Experimentation, Human Factors

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Keywords

Situated displays, public displays, context, user-generated content.

1. INTRODUCTION

Public digital displays have an enormous potential as focal points for social coordination, helping to create a shared sense of place, inviting people to action and setting behaviour expectations. However, the prevailing communication pattern in existing display systems has traditionally been narrowcast, a model in which displays are essentially seen as distribution points for centrally created content without much consideration for users. Observational studies indicate that people tend to perceive this type of content as not relevant to them and ignore it [10][16].

Support for interaction and user-generated content represents a promising direction towards more valuable digital public displays. The underlying assumption is that by allowing people to generate or in some other way push content deemed relevant to them, the displays would end up reflecting the social environment in which they are inscribed, and consequently their relevance to the people around them. However, this approach relies on the ability to generate regular contributions from the people around the display and this has itself revealed to be a recurrent problem. Huang and Mynatt [9] observed that individuals tend not to be motivated to supply content, or else have difficulty identifying appropriate content. Müller et al. [15] describe how public displays may be perceived as a stage in which people will only act if they feel confident about their actions and in full control over the presentation of self.

It thus seem that a potential desire to share content with others needs to be met by an appropriate control of the publication acts. While this also requires mastering interaction techniques, it clearly goes beyond the mere issue of how to interact. It embraces concepts such as selectively controlling access to personal data, a

full understanding of the publication process, and the integration of social rules as part of the dynamics of the system. Digital displays, however, have been very constrained in the range of content publication concepts they can support and in the situated practices that they can accommodate. Even though there is a wide range of interaction alternatives, both implicit and explicit, that can be used for the generation of content, there is not a clear mapping between possible interaction events and specific publication concepts. For example, what does it mean to send an SMS to a public display? How will it be shown? For how long? Will it also be shown on other displays? Is the identity of the sender going to be revealed? A similar reasoning applies to the use of social networks, such as Facebook or Twitter, as publication tools. While it may be simple to enable content from these social networks to flow to public displays, it clearly remains an open issue how this content generation approach may enable people to fully understand the scope and implications of their publication acts. A final challenge concerns expressiveness and the ways in which people may be able to express preferences or define the scope of a content publication action. While procedures for shared control in public displays have already been explored, specifying who can publish what, for how long, or under what circumstances, these models are still too rigid for the broad range of spontaneous and systematic publication practices that may be developed around digital public displays. They may require complex indications that are not compatible with the usage context of spontaneous situated interactions, especially if each system offers its own interaction possibilities and personalization approach.

In our research, we seek to explore new and flexible publication concepts for public displays that people can easily control and understand, but without requiring any complex procedures or parameterizations. These publication concepts should enable situated interactions to be interpreted as publication actions, scoping them in terms of authorship, reputation, moderation and publication range. The ultimate goal is to generate tools and practices that may be used across multiple displays and usage situations, enabling people to focus on the meaning of the interactions rather than in the specifics of the process.

To explore these concepts we have developed *Instant Places*, a novel screen media system that enables people to manage the projection of their identity in public displays. With *Instant Places*, people can have an identity representation that allows them to explicitly and systematically manage their presence in public displays in a way that they can become comfortable to use in multiple types of usage scenario. The system supports two types of content publication concepts, posters and pin badges, which complement each other in the sense that each supports a different content publication paradigm. In this paper, we report on our first deployments at three different locations and the results obtained from usage data and an in-situ survey about the use of the content publication tools offered by *Instant Places*. The contribution of this work is two-fold: 1) a description of *Instant Places* as a novel system for connecting people and the places where they want to present content 2) a description of two publication concepts, posters and pin badges, which conceptualize different publication practices, while providing context and meaning to the content generation process. This contribution should provide new insight on how to support content publication processes in situated displays.

2. RELATED WORK

The publication practices around non-digital displays may provide a source of inspiration for the emergence of new practices around digital displays. Alt et al. [2] have conducted a study on traditional public notice areas (PNAs) to uncover some of the practices behind their operation and understand their role in the design of future generations of globally networked public displays. Four main issues emerged regarding the use of such PNAs, which point to design implications for future networked public displays: design for content variety and flexibility; design for specific uses enabling a great variety of notice boards and surfaces for different purposes; design for community communication by providing posting procedures that support locality; and design for information portability facilitating seamless take away procedures. A subsequent deployment of a digital PNA, called *digifieds* [1], has shown that many of the publication practices from traditional PNAs could be extended to the digital PNAs, and in particular their use for presenting locally relevant content.

The a priori definition of a user profile to contextualize presence and interaction events with public displays has been explored in other systems. In *Proactive Displays* [14], users attending a conference registered their affiliation, interests and personal webpage before the conference day and were given RFID augmented conference badges at the conference site. Throughout the conference, several displays reacted to the nearby participants showing and creating associations between their profiles and creating opportunities to socialise. The concept of spontaneous interaction based on the metaphor of a “digital aura” that is accessible in the proximity of the owner to expose the respective interests has been explored by Ferscha et al. in [8]. The aura is exposed through short-range signals and the exposed information consists of self-describing interest profile encoded in XML. Even though the system is mainly focused on spontaneous interaction between people with similar interest, the authors suggest that their approach could also be used to enable public displays to become active information appliances that delivered information depending on user interests and context. A key limitation of these approaches is that people have very limited control over the content publication process. The presentation of their profile or content associated with their interests is simply triggered by the detection of their presence as people walk around, without any form of situated control over what information to expose at any given moment. There is also the issue of convergence towards a set of interests that are common between people but expressed differently, and between the interests expressed by people and the ability of the system to produce an adequate reaction.

The connection with Social Networking Sites (SNSs) where people already have extensive descriptions about themselves and their preferences has been studied as an alternative for identity projection in public displays. *WhozThat* [3] uses the SNSs profiles of people nearby to create context information that can then be used to support spontaneous interactions or drive the music selection. People are expected to use a mobile phone running an identity sharing protocol that will advertise their on-line identities to the other nearby devices. This system does not consider the use of Digital Signage or any explicit selection of which information to share, but it is an example of using SNSs profiles as a sort of personal data aura that can be used to mediate digital self-exposure. Bohmer and Müller conducted a study on the exhibition of SNSs profiles in public settings [4]. Using

mockup images they asked people about their willingness to expose profile information in two types of what they called social signs. The first was a personal social sign projected around the person and showing parts of the respective profile. The second was an interpersonal sign, projected in such a way to link two people and representing some type of connection between them, such as having a mutual friend or sharing an interest. The study provides an interesting example of the type of identity projections that can be generated by these connections with SNSs.

User-generated content is the ability of the system to accept content originating from the users of the display. This is achieved by allowing people to post their own content for publishing at the display, either directly or indirectly through a reference to the content (e.g. a URL). Many displays have been created that support some variant of this feature. The Plasma Poster [6] system supports content (photos, text, web pages) submission through two interfaces: email and a web form. SMS and MMS have been extensively used as an interaction technique for the spontaneous generation of content. For example, the Joe Blogg project [12] includes a display designed in the form of an interactive artwork where people can send pictures and text messages through MMS or SMS. Bluetooth can also be used to spontaneously push content to a display system using either standard OBEX exchanges or custom mobile applications. Both Hermes [5] and Snap and Grab [13] use the OBEX feature to enable users to send pictures and other media to a display. The use of Bluetooth names to manage self-exposure has been explored in [11][7] as an essentially opportunistic alternative that is easily available on a broad range of mobile device. It allows people to enter predefined commands in the Bluetooth name of their mobile phone. When that person approaches a display, these commands can be obtained and interpreted as part of the person's preferences. The limitation of these approaches is the lack of a clear mapping between particular interaction events and the respective publication semantics. Rather than focusing on the particular interaction procedures that may enable content to be pushed by people to the displays, we aim to study publication concepts that allow people to understand and control what happens after the content reaches the display.

3. INSTANT PLACES OVERVIEW

Instant Places is a web platform for place-based screen media that explores new concepts for user-generated content. The key system concepts are places, identities, applications and locative signs.

3.1 Places

A place represents a symbolic environment that is perceived as a meaningful context for situated social interaction, e.g. a restaurant, a shopping centre, an office, or a city park. A place is expected to have at least a display, which will act as a seam between the physical space and its virtual representation. The system handles sensing and interaction information associated with places, e.g. Bluetooth devices present, and provides an integrated API from which this information about the current circumstances around the display can be obtained. People can signal a special connection with a place by marking it as favorite.

3.2 Identities

Identities allow people to explicitly and systematically manage their self-exposure in public displays. The identity profile constitutes a long-term and explicitly managed view of identity

that is created by a person to represent its presence in Instant Places. It includes core information that characterizes the identity, such as name, location, gender, age or preferences. This information can be masked with personas that describe how a particular identity should be exposed in the visited places, including nicknames that will be used for public identification. Currently, each identity has two personas that are automatically created at registration: the "favourites" persona for exposure in places marked as favourite; and the "other places" persona for exposure in any other visited place.

Identities can signal their presence in a place by initiating a new session in that place. Session activation may occur as part of multiple alternative processes, both implicit and explicit. Explicit session activation can be accomplished through a check-in mechanism available in our instant place mobile app. Implicit check-ins can be supported by association with Bluetooth identifiers and subsequent detection by Bluetooth scanners.

3.3 Applications

Applications can be created by any third-party and published for use across the display network. A place owner can subscribe to applications to have their respective content available on the place displays. As part of that subscription process, the place owner can configure the way in which the application is going to behave when being used in that place. This subscription process may also involve giving applications access to information about interaction events and place properties. This enables situated applications that generate content that is specific to that particular place. A place is thus an execution context for place-based applications that can adapt their behaviour according to the locally available resources and the current circumstances of that place.

3.4 Locative Signs: pin badges and posters

Locative signs are the key concept that we are exploring for supporting the systematic creation of user-generated content. The term sign is used to refer to the various types of locative media that are supported by instant places and was chosen to reinforce the idea that the ultimate goal of any of these forms of locative media is to present a sign in the form of content shown on a public display. A sign has a specific URL and constitutes a social object around which social interactions may emerge, such as commenting, sharing and collecting. Currently, Instant Places supports two types of locative signs: Pin Badges and Posters. These two models complement each other in the type of usage that they support, and they will now be described in more detail.

A pin badge refers to a particular institution, cause, campaign, sports teams, artist or brand that people may identify with. On the identities web site, people can associate pins with their individual profiles. The pin badge is composed by a name, a set of tags, and a set of content sources from which it should be possible to generate screen content, e.g. a YouTube channel, a Flickr photo collection or a blog feed. As people check-in to places, this information may be exposed as part of their situated identity and used to characterize presence and places, as well as a source of content in itself. Pin Badges will normally be presented as part of collections that package a set of semantically related pins. Collections provide context and critical mass for dealing with sets of pins in an integrated way. The expectation is that the more popular collections may have dedicated apps that generate content optimized to the nature of the collection. Collection topics are

open-ended (from sport- or art-related subjects to causes), but collections are assumed to be curated. Their content may thus be assumed to be accountable, although not necessarily appropriate for every place. The main moderation practice, however, is the selection of the applications that give visibility to the content from specific collections.

A poster is a media item with content for public displays that can be created by an individual user and distributed by many through presence in places. Posters aim to provide an open means for self-expression, with which people can create content they consider relevant for the places they visit (for example, promoting an event, a cause, or an art creation). Posters can be authored by anyone who has an Instant Places profile. The authoring process is done at the Instant Places web site and is very simple: upload the poster picture, give it a short title and description, and schedule its availability for display (currently limited to one month from the poster creation date). Once posters are published they cannot be changed. Their reference and the respective resource remain unchanged, providing the basis for attaching conversations and supporting moderation processes. As any other sign in instant places, posters include visual content for screen presentation, but they may also include additional information to be seen on mobile devices and potentially taken away. Since poster creation is fully open, moderation is needed, but the existence of permanent references to the user who is distributing the poster and to the poster itself, can considerably facilitate this process and prevent it from becoming an obstacle to open publication. Using the instant places mobile application, people can distribute posters when visiting a place. Place owners may then choose to refuse or approve that specific poster, but they may also have a set of rules that will enable implicit acceptance in certain circumstances. For example, certain users may be granted the role of trusted users, enabling any content distributed by them to become immediately available or they may have trust relationships with other places, allowing any content previously accepted at those places to be presented locally. Posters are expected to be short-lived (1-2 weeks) and strongly locative.

The goal of locative signs is to provide publication concepts that people may easily understand and control. Instead of having a single content publication procedure with multiple configuration parameters, we seek to create a small set of concepts that are already embedded with specific assumptions about how and for how long the respective content can be distributed and presented. Our goal is to understand to what extent the existence of these publication mechanisms with specific properties may constitute a way to overcome the problems associated with having too many publication parameters and not being able to stay in control over their effect. We expect that the canonical policies embedded in Pin Badges and Posters could help users better understand the consequences of their actions and reduce user burden.

3.5 Architecture

The high-level view of the Instant Places architecture is represented in Figure 1. It includes a set of web sites serving different stakeholders, more specifically users, place owners and developers. Instant Places applications are developed by third-party developers and hosted somewhere on the web. They use the instant places API to generate place-sensitive content. The place domain includes any type of situated resource (sensors, displays, etc.) that is associated with a place as well as the mobile devices

carried by place visitors. These are the seams that link physical presence with virtual events in Instant Places.

The mobile client, currently an Android application, enables people to be part of the Instant Places experience in the places they visit. After checking-in at a place, people can use the application to post posters to be displayed at the local screens, but they can also consume content directly on the mobile application, including information about that place, the list of current presences, information provided by locally active applications and the place activity stream. This stream provides references to multiple place events such as user check-ins and content presentation events. Even though check-in can be accomplished through many other means, more advanced features, such as poster distribution and situated persona management can currently be supported only through the mobile client.

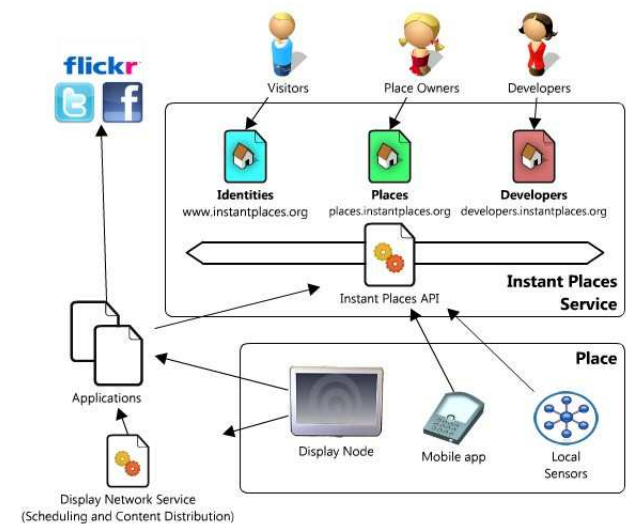


Figure 1. Instant Places Architecture

4. RESEARCH DESIGN

In this paper, we report our findings in regard to the publication concepts supported by instant places. In particular, we aim to identify some early directions in regard to the ways in which people appropriate these publication opportunities.

4.1 Deployments

To support this study, we have created three instant places deployments, two located at our University and the other at the Café-Concert of an Arts and Shows Centre (c.f. Figure 2).



Figure 2. Café-Concert deployment

The University locations were a bar, mostly frequented by students throughout the day, and our own department. The Café-Concert location is also a bar where the public varies according to schedules. On weekdays, during the day (afternoon), the public is mostly juvenile (14-18 years old), and at night it's a more adult public (between 28 and 40 years of age) and the place tends to be much more crowded. In this deployment people could go to our identity management service to create a profile, possibly using an external account, such as Facebook or Google. They could also go to the Android Market to install the instant places client that would then allow them to manage their presence and publish content in the displays.

For the displays we created three applications that were meant to give visibility to people and their content. The first was a presence application showing information about the currently present personas, the second was the Instant Posters application that displayed posters that had been distributed at that location, and the third was the Instant Football application that displayed the football pin badges being used by visitors and content associated with the respective football teams (c.f. Figure 3)

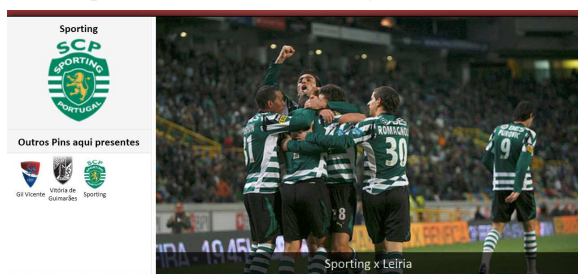


Figure 3. Football application being driven by pin badges

Displays were also used to show a few videos by local artists and content aiming at enticing or instructing users for using the system. A QR code for downloading the Instant Places mobile client was displayed along with the usage instructions on the display. Additionally, small postcards containing usage instructions and enticing messages were distributed at the deployment spots.

4.2 Usage data

The results reported in this paper refer to a period of three weeks corresponding to the initial stages of the deployments. During this period, a total of 31 accounts have been created, all of them based on either Facebook or Google profiles. At the University, we had a total 37 check-ins and at the Café concert we had 7 check-ins. The fact that we only had an Android client has clearly been a limitation to system adoption. This was obvious not only from direct feedback from people, but also from the observation that the 37 accounts created have only generated 11 android application installations.

Only 4 users have adopted any pins, 10 pins in total. This seems to indicate that pins were not so successful in conveying their role, which may have resulted from some additional complexity inherent to the longer chain of connections (pin creator, pin user and pin application) that was probably too complex to be mastered in a 3 weeks period. Selected pins were mostly about football, which is not surprising since those were the only ones gaining visibility through the instant football application.

Regarding poster creation, 9 users created 15 posters. 4 users have explicitly distributed 9 posters for publication. We have also

analysed the content of the posters published during the evaluation period to understand how the content publication features of instant places were being appropriated by people. The posters referring to the promotion of events were the most common category and were mainly about sports and cultural events scheduled for the coming days. All these events had some form of digital presence (e.g., web sites), and this has been reflected on how posters were created, as many of the pictures used for the posters were clearly downloaded from online sources and published as is. Most of these pictures had a vertical orientation, thus not taking full advantage of the horizontal screen orientation. In some cases, the information on the poster was not at all perceptible, except maybe from a very close distance from the screen. These specificities of display content are well known to the professionals that create display content, but in their first experience as content creators participants could not be aware of them. Still, a few people did have the care to adapt their poster content to the specificities of the medium by creating high resolution content adapted to the screen layout. For example, a photographer wanting to promote his work by exposing some images from his portfolio, and being confronted with our one image limitation per poster, created interesting poster pictures, each made of a themed composition of several related photos and taking full advantage of the horizontal display.

4.3 Perspectives on content publication

To complement the usage observations and enrich our knowledge about the users' view on content creation and distribution with posters, we have also conducted an in-situ survey. The survey took place in two of the locations and was conducted within the display setting to make it as contextualized as possible. Prior to the delivery of the survey, a brief explanation about the platform was provided to the participants, covering the objectives of the research, and more particularly of the survey itself.

After a short section with demographic data, there was a first question consisting of four drawings depicting white screens. The question invited participants to consider the locally existing display and represent or describe on the drawings content that they would like to publish on that specific display to be seen by others. The next questions were anchored on the content that participants had represented in those screens drawings. Participants were asked about their preferences regarding the way in which that content could be shared, more specifically: where (location) they would share that same content; for how long; and why. In this particular situation, the purpose was to understand what could motivate poster sharing and which strategies one could implement for the distribution of content in other places. Other objective was to understand the relationship between content types and publication time.

Participants were recruited directly at the Café-Concert and at the University bar. We have had a total of 30 participants (12 male-18 female), 19 at the Café-Concert and 11 at the University bar. The most common ages were 18, 19 and 20, with 6, 8 and 5 individuals respectively.

Regarding content that participants expressed they would like to publish on the screens, the main observation was a striking difference between the answers at both locations. While at the Café-Concert, the most common content type could be classified as promotion of events (13 occurrences), at the University the most common content type was "academic information" (8 occurrences). Considering that the age groups were similar, this

seems to suggest that participants have a strong sense of what content may be more appropriate for each place and that they would adopt different publication practices depending on the places where they would go.

However, in the questions about content sharing, participants have expressed a willingness to have their content distributed to other locations. In particular, when asked, for each suggested content, if they would like to have that content disseminated to other places that they also visited, 60% of the responses were supportive of that idea. This means that most of that content was not exactly perceived as being specific to the location where the survey was being conducted. Similarly, when asked about having other people disseminating that content to other locations, the most common option (75%) was that anyone could publish that content anywhere. This suggests that most people have indicated content that they perceive as public as for which they do not have any sense of ownership. This idea is also confirmed by the question about the time that the content should be available and why, where the most common answer was some variation of “so that as many people as possible may see it”.

5. CONCLUSIONS AND FUTURE WORK

We have described instant places, a novel system for place-based screen media, and the results from its first public deployments. A major conclusion from the deployments is that overall the way which the system separates the concerns of place owners, place visitors and application creators seems to worked well. Even though this was a limited deployment, we never felt any need to deviate from the model to achieve what we intended to create. Regarding user-generated content and the publication concepts, posters have clearly gathered more attention, probably because the concept was easier to grasp than pin badges. People have started to engage with the system, and from the surveys, we were able to confirm that they would be attracted by the idea of publishing content that they want others to see and even distribute as widely as possible. Instant Places is now available as a research platform where we expect to conduct an extensive set of additional experiments on new models for connecting people with places for the purpose of content publication in public displays. As part of our future work we expect to study how people can take advantage of these concepts to achieve multiple publication strategies, possible in cooperation with others. We also want to study multiple moderation and reputation practices for place owners and develop additional publication concepts that may support different publication practices and scopes.

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