Talking to Strangers: Using Large Public Displays to Facilitate Social Interaction

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Abstract. Alumni events and homecomings provide opportunities to reconnect and reminiscence with old friends and colleagues, i.e., they aim to reinforce connections between community members. Although these events explicitly foster social interaction, the first step in engaging with others can still be difficult. To help "break the ice", we have built *USIAlumni Faces*, a 'yearbook' application running on a public display that is operated via a gesture interface. We deployed USIAlumni Faces at a large university alumni event, which gave us the opportunity to observe and understand learning techniques for gesture interfaces and their role in supporting the emergence of social interaction in public spaces. We found that gesture-based interfaces support the natural diffusion of interaction patterns in public spaces through the observe-and-learn model, and that sensory-motor patterns can aid social interaction in public, as they act as conversation starters between both strangers and acquaintances.

Keywords: public displays, gesture interfaces, social learning, interaction design

1 Introduction

Alumni events and homecomings are important part of the university life: they provide opportunities to see and talk to old schoolmates and reinforce the connections with people that we have not seen in a long time. Most of the people catch up on the news and reminiscence 'the good old days', i.e., joint experiences created while they studied. These experiences are tied to different communities or social groups: some of the people took classes together; some of them were part of the university's sports team (e.g., soccer, basketball, or volleyball); some of them were part of a student organization; and some of them simply used to 'hang out' and go out on the weekends. The network of people we meet while studying is tremendous.

At the alumni events all of these people come together. Although these events are highly communal in their nature and stimulate communication and socializing, the first step in engaging in a conversation can be difficult: some people are shy and intimidated by social embarrassment, sometimes it is hard to recognize old friends, while at other times people's interests have changed and it is hard to find a common topic. In these circumstances, yearbooks can be a great aid for remembering the past

school days: people can recognize their friends from the time when they studied together, they can see the list of student organizations as well as sports teams, and they can find information about classes, projects, and other educational aspects.

The yearbook metaphor was an inspiration for the *USIAlumni Faces* installation, an interactive yearbook application running on a large public display and operated via a gesture interface. For the simplicity of the installation the yearbook application contained only the most important part of the yearbook, i.e., images of people, and did not include various lists (sports teams, student organization, classes, projects etc.). The installation was built to serve as the conversational 'ice breaker' by stimulating discussion around the presented content and by offering an interaction modality that makes user's actions publicly visible through the gesture-based interface and a large public screen.

The USIAlumni Faces was deployed at a large university alumni event in Lugano, Switzerland. At the event we observed and video recorded people interacting with the installation. On-the-spot observations and in-depth video analysis allowed us to identify a learning technique for gesture interfaces as well as their role in supporting the emergence of social interaction in public spaces.

This paper is structured as follows: first we introduce related work on social interactions around public displays, direct manipulation interfaces, and large-screen collaboration. After that we describe the USIAlumni Faces installation and the deployment setting. We present our findings from the observations and video analysis followed by a discussion on the natural spread of gesture interfaces through the *observe-and-learn model,* as well as their role as a conversation catalyst via *sensory-motor patterns*. We close with conclusion from our findings.

2 Related work

Our work intersects several active research areas, most notable social interaction around public displays, direct manipulation interfaces, and large-screen collaboration. We will briefly summarize related work in these fields in turn.

Public display systems have been shown to be an effective means to deploy situated social software 1, i.e., software systems that are designed for a specific community or social group. An early example of such situated social software is the Groupcast system by McCarthy et al. 2. Groupcast allowed users to upload profiles that reflected their interests within a working environment. After identifying users that were standing in front of a large public display via infrared badges, Groupcast would then show common interests of the people standing in front of it.[1] Public displays have also been used in semi-public events such as academic and industry conferences – events that have a similar setting to alumni events. McDonald et al. 3 developed three applications to help socializing at scientific conferences: Auto-SpeakerID, an application that would show the name and affiliation of a person asking a question on a large public display; Ticket2Talk, which showed the name,

[1] While the system initially showed the intersection of interests, it quickly became apparent that the *union* of interests was significantly more effective at starting conversations.

affiliation, and a user-chosen image representing his or her interests, whenever a delegate would pass a large public display; and NeighborhoodWindow, an application that showed both the intersection and union of peoples' interests on a large public screen, similar to Groupcast. The authors report that these applications did increase the sense of a community among the attendees.

Translating traditional, non-digital tools for social interaction into digital counterparts has also been shown to be an effecting approach for supporting communities. Churchill et al. 4 investigated the properties of paper-based notice boards before they built PlasmaPoster, a digital workplace notice board for stimulating serendipitous social interaction. PlasmaPoster posts were based both on user-contributed material, as well as on automatically downloaded/streamed web content. A large majority of the users found the content interesting and began conversations around it. We recently adopted a similar approach for designing a digital public notice area system 5.

While many prior systems focused on private and semi-public environments (e.g., alumni events) [2, 3, 4], Peltonen et al. investigated how people reacted to large displays in a public urban environment 6. They deployed CityWall, a large public display with multitouch support in the center of Helsinki, Finland. CityWall simply displayed random Flickr images that were tagged with 'Helsinki', and let users browse through them. An 8-day trial revealed that the support for parallel interaction would repeatedly prompt strangers to interact with each other, as their image manipulations often "spilled over" into another users part of the screen.

USIAlumni Faces builds on the above work and investigates social interaction around a large public display that involves neither colleagues nor strangers, but past friends and acquaintances. USIAlumni Faces also uses a novel interaction modality, a toy flashlight that acts as the main input device, thus opening the screen for onlookers while focusing control on a single artifact.

The USIAlumni Faces interaction model is based on the direct physical interaction of digital media (students' pictures) embedded in the physical environment (a large public screen). There is a growing recognition of the benefit of physical interaction, as it enables new form of experiential learning [7] and affords collaborative interactions [8]. Marshall 9 argues that the rich physical experience provided by the direct physical manipulation of objects is key to intellectual development. A growing number of studies (e.g., Kolb et al. [7]) investigated the capability of direct manipulation interfaces in supporting both individual and collaborative activities. User engagement has been found to be raised by the tactile experience provided by a touch screen (e.g. Jacucci et al. 10, Kierkels and van den Hoven 11) and by tangible objects used in an interactive surface (e.g. Jordà et al. 12). However, while evaluation studies of specific interfaces have recognized the advantages of various interactive tools on supporting human activities, a theoretical understanding of the psychology of interactivity 13 is still missing. Also, it is quite difficult to understand whether the interactivity is a value per se, or whether it can actually support the comprehension of contents.

A few studies go in the direction of demonstrating the benefits or the disadvantages of a specific Tangible User Interface (TUI) technology compared to other interaction modalities (mouse-based, multi-touch, analogical physical interaction) or interface styles (e.g. GUI). For instances, TUIs, physical (traditional) modality and a Graphic

User Interfaces (GUI) are compared for understanding the level of engagement of children in doing a jigsaw puzzle 14. In other cases, the assessment is focused on the user performance evaluation through the comparison of TUI and multi-touch interfaces (e.g. Lucchi et al. 15), or TUI, multi-touch, and mouse (e.g. Tuddenham et al. 16).

Our research within the USIAlumni Faces case study is focused on understanding the role of direct manipulation for supporting a "fluid" 17 and engaging interaction with contents, with the purpose of affording social and collaborative behaviors. The direct manipulation of digital media is claimed to be engaging since it enables "natural" interaction through the use of everyday objects 18. When objects and the actions connected to them are meaningful for users, technology becomes transparent and the interaction natural. Ideally, interaction is based on patterns that are evocative or denotative of the contents or effects, allowing people to not reflect on the medium they are using but instead focus on the content 19. Furthermore, gesture-based patterns make actions visible to both users and bystanders, thus improving mutual awareness and consequently the possibility for people to understand the activity of others 20.

Last but not least, USIAlumni Faces relates to previous work on large-screen collaboration, demonstrating turn-taking and shared learning patterns. Russel et al. 21 found that their touch-based (single touch), large public display application BlueBoard for workplace discussions and content sharing would naturally provide learnability through observable interactions, as well as emerging and fluid control through direct social interaction. Rogers and Lindley 22 found that screen orientation of a large display significantly affected collaboration in a workgroup setting: horizontal orientation encouraged awareness and collaboration while vertical setups stifled exchange. While USIAlumni Faces uses a vertical orientation, its setting is significantly different from Rogers and Lindley, who only looked at small groups that were tasked with collaboratively solving particular goals. Having a vertical orientation of the screen allowed us to draw in larger groups of people to share the display. Ha et al. 23 looked at the implications of different input devices on the interaction around a common tabletop application. While indirect input devices such as mice lowered the physical effort required and were more familiar to users, direct manipulation instruments such as styli offered noticeable gestures that made intentions more apparent, offered better coordination in joint tasks, and supported more fluid gestures. USIAlumni Faces direct interaction control through a toy torch explicitly supports learnability and openness through its visible gestures, thus aiding our goals of stimulating social interaction.

3 The USIAlumni Faces Yearbook Application

As part of a university alumni event, we built and deployed an interactive installation called *USIAlumni Faces*, which projected a virtual "yearbook" (i.e., photos of the alumni organized by year and faculty) onto a large public screen (cf. Figure 1). To navigate and browse through the yearbook, participants had to perform a 'page flip' gesture with a custom-built input device – a Wii remote control and an infrared pen hidden inside a toy torch casing. The installation is perceived as an

interactive artifact that acts as a cultural mediator 24: the process of learning involves a subject (the learner), an object (the task or activity) and a cultural artifact. The interactive installation mediates the relationship between the subject and the object of any activity. Thus, the interaction with the artifact encourages the negotiation of meaning among the learners and, consequently, stimulates the learning process itself.

The artifact design followed a co-evolutionary process in which concept, technology, and activity design were carried out simultaneously so that each strand of the process informed the other. The gesture-based interaction model was defined in a laboratory setting, in which the most meaningful mapping of input actions (gesture-based) and output responses (visual-based) was assessed through several user trials.

The event provided a unique opportunity to observe and understand learning techniques for gesture interfaces, as well as their role in supporting the appearance of social interaction in public spaces. Over 200 people used the artifact during the event, which took place on a single day. One of the researchers introduced the system and explained its purpose, but no explanations were given on how to interact with the artifact. Participants then freely explored the interface in order to understand the interaction model. The researcher notified participants that their interactions with the artifact were observed and videotaped for later analysis.

Figure 1 A group of visitors interacting with the USIAlumni Faces

4 Findings

The interaction modality was spread through imitation: people learnt from each other how to interact with the artifact. The process of imitative learning is well known in psychology 25: the observer attempts to copy the behavioural strategy of the other and to reproduce the intentional actions of the other, including the goal toward which they are aimed 26.

People looking at the others playing with the artifact internalized the interaction modality and then customized it: in a few cases we observed people created their own strategies for interacting with the artifact (such as click on the right/ left angle or making a short and quick gesture for flipping the page). There were also cases where some of the users, incidentally, discovered new interaction modalities (e.g. click in the middle of the page).

Just in few cases a new user asked for an explanation on how to interact with the artifact. In those cases either other people showed the interaction modality by performing the gesture, or in cases when no other people were around the research intervened to show the pattern without giving any oral explanation.

During the event small and big group of people stepped in front of the artifact: the individual interaction was rare while the interaction of group (from 2 to 8 people) was that more usual. In a few cases two people used the input device together (Figure 2), but majority of interaction with the device is individual while the others suggest the information to be looked for.

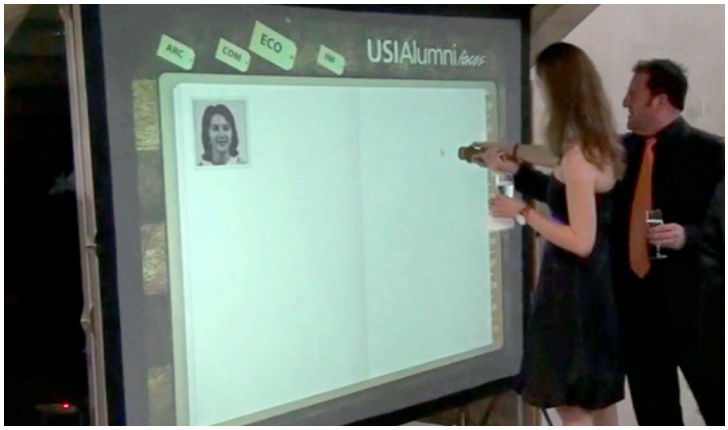

Figure 2 Two people use the input device together.

Also people 'passed' the interaction from one another in turns. In average, one interaction lasted from two to ten minutes.

An interesting element that demonstrated the attendants' wish for sharing was "pointing" (Figure 3): people indicated, using their fingers, the picture/s on the screen and commented with others (in many cases they laughed!). Indeed, someone touched the screen hoping that they would magnify the picture.

The artifact demonstrated not only that interaction patterns were easy to understand and mimic, but also that they could stimulate social interaction. In particular, we observed that during the whole event, people who met in front of the artifact have started a conversation; in many cases, they continued also after the stopped interacting with it. We observed multiple occasions where people that never met during the university started talking in front of the artifact and had the opportunity to introduce each other. Unexpectedly, pictures also acted as memory aids: they allowed people who had not seen each other since graduation to recognize the person standing next to them through images displayed on the screen. The images also stimulated people

bringing up memories and stories from the past: they began to tell interesting anecdotes about their life at USI. Often people engaged in the conversation called their friends to join them. In one interesting case a girl took a picture of the displayed images.

Figure 3 A group of people pointing and talking while playing with USIAlumni Faces.

Although the artifact was mainly designed for the adults it was also engaging for children. A couple of children approached the device and started playing with it; they were very absorbed by the interaction modality not really by the contents even if the pictures fascinated them. One of them in a few occasions asked the mother to pick her up in neck to change the faculty and the years.

5 Discussion

Overall, the concept highly motivated people to use the artifact: people enjoyed looking at their own pictures, and those of their classmates, from their first year in University. The artifact was also a catalyst that encouraged and animated both strangers and acquaintances to start a conversation, and in many cases, to reminisce together about the good times they had at the University. Our findings are organized around two key results: 1) Public spaces support the *natural diffusion* of gesture-based interaction interfaces through the observe-and-learn model; and 2) Sensory-motor patterns aid *social interaction in public*, as they act as conversation starters between both strangers and acquaintances.

Natural Interaction Diffusion: Gestures can enrich the user experience by creating an additional level of interest and intuitiveness in the way a user can control and interact with a system 20. Additionally, gesture interface in public spaces also support the ability to "diffuse" the interaction technique to bystanders through an observe-and-learn model. Our analysis of people's behavior during the event showed that the gesture-based model increased the visibility of actions, and that it supported the understanding of the user's intention in performing the action. People who observed

the interaction of others were subsequently able to learn the interaction technique with ease, a process of *natural diffusion*.

Social interaction through sensory-motor patterns: The observe-and-learn model described above not only made it easier for people to learn the gesture-based interface, but it also encouraged spontaneous interaction among attendees. The sensory-motor patterns offered by the artifact gave users the opportunity to share their intentions. Some users, e.g., used excessively large gestures with the input device, even though small movements sufficed, in order to signal their openness for social contact.

The artifact also stimulated *social debate*, as well as *collective usage*. People tried to interact collaboratively, e.g., one user flipped the page using the torch while another tried to zoom using his hands (which wasn't supported by the interface, however). In many cases, two people used the torch together by either repeatedly passing it between each other, or by grabbing and moving the torch holder's hands. This confirms previous findings, e.g., from Brignull et al. 27 and Peltonen et al. 6, who observed similar *teacher-apprentice* relations between collaborative users of a shared interactive displays.

Our choice of a yearbook application also confirms some of the findings around the social use of photo-sharing applications, e.g., by Taylor and Cheverst 28, which proved to be a good tool for strengthening or re-connecting social relationships. During the alumni event, we observed several such "re-connects" between old friends in front of the display. We are currently evaluating a number of additional deployment options of similar public display installations, e.g., in public parks, in order to further explore the role of public displays in fostering social interactions.

6 Conclusion

Homecomings and alumni events enable schoolmates and colleagues to reestablish their connections and reminiscence 'the good old times'. Although these events are highly social the initial step in starting a conversation can be difficult since most of the people change after graduating (e.g., physically appearance, change of interest). To ease the starting step we have built USIAlumni Faces, an interactive installation that serves as an 'ice breaker' by displaying a 'yearbook' that is operated through a gesture interface. The interactive artifact was deployed at a large alumni event where we observed and video recorded people interacting with it. Our initial findings from the observations and video analysis reveal the natural diffusion of gesture patterns in public spaces, i.e., people were able to learn the interaction modality through the observe-and-learn model. The observe-and-learn model also acted as a social catalyst that sparked conversation and discussion among people. To further verify our findings we are planning to adapt the artifact and deploy it in several public spaces, e.g., public parks, bars, and community centers.

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