Contact Management on the Wall: A Card-Game Metaphor for Large Displays

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ABSTRACT
Tangible and embedded computing brings technology integrates digital technology in the physical environment of everyday life. Thereby, families in private households are increasingly researched and supported. In this paper we present the concept and implementation of the FamilyFaces—a contact management tool supporting families when managing their contacts and information disclosure, and we report on initial user feedback. FamilyFaces is based on a card-game metaphor on large displays to provide wide-spread access to family members, from teenagers to grandparents.

Author Keywords
Large Displays, Card-Game Metaphor, Everyday Computing, Contact Management, Selective Information Disclosure.

ACM Classification Keywords
H.5.2 [Information Interfaces and Presentation]: User Interfaces—GUI, User-Centred Design; H.5.3 [Information Interfaces and Presentation]: Group and Organisation Interfaces – Computer-Supported Cooperative Work.

INTRODUCTION AND BACKGROUND

Tangible and embedded computing brings technology out of the traditional context of personal computers in work environments and integrates digital technology in the physical environment of everyday life [1]. In this respect, families and private households have been increasingly studied in the last few years.

In this paper we present the concept and implementation of the FamilyFaces—a contact management tool supporting families when managing their contacts and information disclosure. The FamilyFaces (cf. Figure 1) is based on the principle of an ongoing process of selective information disclosure of the respective family towards their social contacts. So, besides simply creating and maintaining contacts like in traditional address books, the FamilyFaces also allows the family to specify their preferences concerning the information they want to share with the contacts. For instance, the family can decide that a school friend of a child gets the number of the wired family phone, but not the numbers of the parents' mobile phones.

Figure 1. FamilyFaces scenario.

The notion of faces from Goffman [9] is highly relevant as a basic principle of contact management, privacy, and disclosure. It refers to the fact that individuals construct social identities that represent a subset of characteristics and information about themselves dependent on the temporal, spatial, and interpersonal context. This selective information disclosure is important as a means to support feedback to users on the information that others get about them and control over the type and amount of information [3]. Some systems are based on selective information disclosure (e.g., [19] developed the mySpace systems that allows users to specify for each contact the information that this contact can see).

Since privacy and information disclosure are dynamically adapted to changes in the social environment over time [17], systems are needed that provide an intuitive metaphor and easy interaction in order to support this ongoing process.

FamilyFaces uses a card-game metaphor on large displays. Using a card-game metaphor to make systems fun and easy to use has been suggested for GUI-based [18] and for ubiquitous systems [5]. The advantage of a card-game metaphor is that card gaming is known to many family members, from children to grandparents—and so, the system is easy to comprehend and easy to use.

In the following we give a brief overview of related work, we present the concept and implementation of FamilyFaces, we report on initial user feedback, and we draw conclusions.

RELATED WORK

The work related to FamilyFaces that we describe here refers to the card-game metaphor, and to touch-based interaction on large displays, as well as families and domestic settings.

The metaphor of a card-game has, as pointed out above, already been suggested for GUI-based [18] and for ubiquitous systems [5]. The idea of combining playing, work, and learning is quite old. Huizinga [14] has made it popular rather recently. Myers et al. [16] have suggested threshold and ceiling as two central criteria for good systems, where 'the threshold is how difficult it is to learn how to use the system, and the ceiling is how much can be done using the system'. Good systems should, therefore, have low threshold and high ceiling. A card-game metaphor has the potential to help achieving this goal.

Touch-based interaction on large displays has been used in several existing systems. For instance, touch-based interaction is widely used in public systems like ATMs and ticket vending machines; large displays have been used for awareness and communication in hospitals [2]; and touch-based interaction on large displays has been mainly supported in interactive walls and tabletops [13].

Several studies analysed the behaviour of family members in private households (e.g., [8] analysed domestic routines in households in England, [7] analysed the use of technology in the U.S.A.). These studies have in common that they emphasise the importance of understanding the private realm, but at the same time emphasise the difficulties emerging from subtle and difficult to detect everyday routines. Several systems target at families (e.g., [6, 20] report on the design and use of the Whereabouts clock that informs family members about each other's current position such as home, school, or work; [4] developed a motion presence system that facilitates coordination of family members and friends by informing them about each others movements). Most of these systems support the coordination and communication among family members, rather than between the family members and their relatives and friends. Within the families there are typically only little privacy concerns, but systems supporting the coordination and communication of family members with other persons need to respect and support privacy [19].

CONCEPT

The basic challenge when developing the concept of FamilyFaces was—like for the design and implementation of any kind of interactive system—to find a metaphor and interaction paradigm that is adequate for the users and the tasks at hand. We target at whole families—from teenagers to grandparents—as users. And we want to allow cooperative same-time same-place interaction among the family members, when managing their contacts. Furthermore, we want to foster explorative interaction with the system and invite the users to continually, playfully engage in optimising and adjusting their privacy configurations. Finally, we looked for a metaphor that implies the need for social gatherings and collective practise and therefore helps to remind the users that contact and privacy management is a group process.

Card-Game Metaphor and Touch-Based Interaction

We, due to the above reasons and requirements, aimed to find a commonplace metaphor and interaction paradigm. We decided to use a *card-game* metaphor and combine it with a *touch-based interaction* on a large display.

As the vehicle for our metaphor is a *card game*, we borrow single elements from different traditional games played with playing cards. A card game usually consists of a deck of cards, each card of identical size and shape and with two sides, the face and the back. Some card games—often called Patience or Solitaire—are played by laying out the cards on a table, typically covered by green felt. The interaction in these games involves shuffling the cards, laying the cards out, turning them around, and arranging them in cascades and stacks. So, in our metaphor the users get software representations of cards and can perform the described actions on them with a touch-based interaction.

We support touch-based interaction on a wall-mounted *large display*. The users can use a pen or their finger to drag and drop cards, to flip cards, and to double click on cards. The users can activate a context menu through a long-click, and they can access an on-screen keyboard by pressing a button on the display frame.

Contact Management

For *contact management* the whole family can use the large display to cooperatively manage their contacts and specify the information they want to share with their contacts. The intuitive card-game metaphor even makes it possible to support a complex approach for contact management and information disclosure.

It is based on the work of the sociologist Erwin Goffman [9] who describes the societal concept of faces as a set of fronts maintained by a person each only revealing a subset of personal information tailored for specific audiences. Based on this notion of faces we developed a mechanism for the management of selective information disclosure [12] for social entities with a common need and define the following concepts: *contacts* are individual persons who can receive and send information, and communicate (e.g., Aunt Mary); i*nformation sources* are the origins of the information (e.g., a GPS sensor measuring a person's location); *notification policies* are specified needs for particular information and the preferred presentation (e.g., an hourly SMS about Aunt Mary's location); and *faces* are combinations of the above: single or groups of contacts, plus an optional specification of the information sources to share with them and the notification policies for incoming information

FamilyFaces maps *Goffman's faces* to the card-game metaphor. The most central element of the metaphor is the card that, therefore, represents the most central concept of FamilyFaces, a single *face*. Analogue to a deck of cards, where the worth and uniqueness of each card is expressed by the card-face, by its value and colour, in FamilyFaces the individual configuration of a face maps to a unique configuration of contacts and need for privacy and information. Accordingly not values and colours but *contacts*, *information sources* and *notification policies*

define a face in FamilyFaces. The playing field allows the users to spread their cards over the green felt to view and organise them like on a tabletop in a solitaire game, reconfigure them in stacks or deactivate and even remove them. The detailed possibilities for interaction will be presented in the following part.

Family Interaction

The first time users interact with FamilyFaces they get an empty playing field on the left and three pools populated by icons representing the available contacts, sources, and notification policies on the right (cf. Figure 1). Via the context menu of the playing field the users can create a new and blank card representing a new Face and label it. In order to configure this face, the users drag contacts, sources and notification policies onto the card, which are then displayed in their specific card segment: contacts in the upper third, sources in the middle and notification policies in the lower third. While editing the layout of a card the according privacy settings are adapted in real-time. By dragging and so removing an icon from a card the user can undo all modifications.

When a card layout corresponds to the users need, they can minimise the card, to free the space on the playing field by double clicking on the card. A minimised version of the face configuration is shown at the bottom of the playing field, which is still active and provides full information but cannot be manipulated in this state. If a minimised card needs reconfiguration it can be retracted back to the playing field by a double click.

FamilyFaces offers two mechanisms for reusing existing faces as starting points for new configurations. One possibility is to simply copy a face via the context menu of the card, and then edit the copy. The second possibility is to generate a new face by combining two or more cards to a card stack. By dragging a single card or a stack onto another card or stack those cards merge into a new face by summing up all contacts, sources and notification policies of the two parts. Such a combined face is visually represented by a stack of the equivalent number of cards showing the accumulated items on the top card. Via its context menu such a stack can be broken apart again in its discrete parts.

In order to temporally deactivate a face in FamilyFaces, muting is introduced. When a face is muted the card is turned around and its configuration has no more impact on the data flow until the card is turned around again and accordingly the face activated again. To better distinguish different faces when muted, the backs of the cards in the deck have each a different colour.

In order to irrevocably delete a card—and its corresponding face—it can be dragged onto the slot at the bottom left of the display and so will be removed from the playing field.

HARDWARE AND IMPLEMENTATION

FamilyFaces is used on the wall-mounted SMART Board SB560P from SMART Technologies with a Toshiba TLP-T60M for the front projection and a picture diagonal of 60" (152.4cm), and is running Mac OS X version 10.4.9 on a Mac mini PowerPC G4 1.4 Gigahertz.

FamilyFaces is realised in Java as a GUI Plug-in for PRIMI [11] and by extending PRIMIBase with the FaceModel, to decouple the model from the view. The FamilyFacesGUIPlugin is programmed in Java Swing and fully implements Drag and Drop functionality for all elements to best possible support the tangible interaction at the wall-display. All GUI elements are graphical and functional modified Swing components—like for example the green playing surface is an enhanced JDesktopPane—that were individually adapted to fit the expected look and feel derived from the game metaphor. The manipulation of the view is delegated to the FaceModel that maps the card layout to the specific privacy settings. PRIMIBase therefore was extended with a Face Class and accordingly with new methods for example to add and remove contacts, sources and notifications policies to a face and to propagate these modifications to the backend.

The Backend is an XMPP Server—the Openfire server [15]—which handles the Presence states and enables communication between the contacts and SensBase [10] as infrastructure for the handling of sensor events. SensBase centrally processes the input from all incoming sensors as exemplarily shown in Figure 2 for example for sensors that vision-based capture motion in a room, monitor the users location via GPS or that sense the usage of a phone and there software sided port as RoomMotionSource, LocationSource, or PhoneUsageSource. Based on the individual faces configuration this information is than directed to the entitled contacts.

So, overall the FamilyFaces system provides the technical means to integrate many sensors capturing contact-related information and presenting it in the ambience of the private household. For instance, software sensors can detect if a family member is using the computer and is online, hardware sensors can capture the positions and movements of family members via GPS or via WebCams.

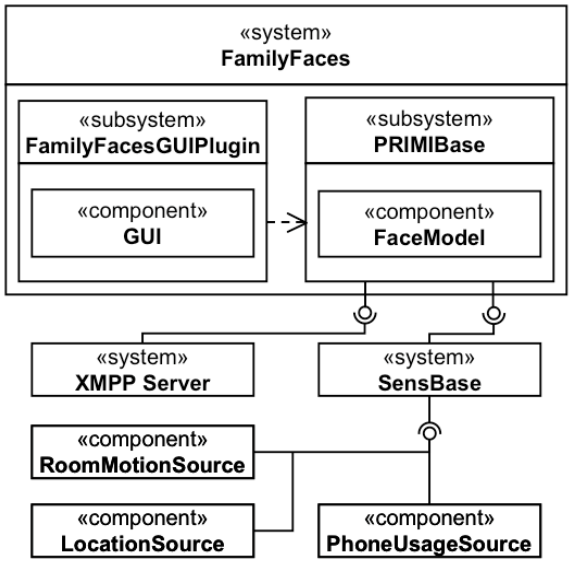

Figure 2. Conceptual diagram of FamilyFaces.

INITIAL USER FEEDBACK

We presented the FamilyFaces system informally from 13 to 15 July 2007 during the Cooperative Media Lab's Open House. Approximate 100 visitors were recruited—mainly students between 19 and 27 years as well as colleagues from other departments and interested visitors between 16 and 50 years. FamilyFaces was mainly used in groups of one or two members from our lab conducting the test and one to five candidates, so that most times two to seven people interacted with the display at a time. A nearby computer operated by a lab member simulated a remote contact, to clarify the effects of the current configuration on the respective contact. During our tests the displayed cards helped to explain the overall situation and concepts and lowered the entrance barrier in this complex topic. After we demonstrated the interaction possibilities with the wall-display, the playful metaphor encouraged the candidates to interact with the system itself. At the beginning of a session users tended to comment their actions in order to tell what their intended effect was and to get reassurance if they met this goal and understood the concept. Besides the playful metaphor the ludic, tangible interaction with the wall display was a further multiplier for engaging people in the interaction with the system, as it was clearly preferred against demonstrations of the same GUI on a desktop computer during the evaluation.

CONCLUSIONS

In this paper we motivated the FamilyFaces card-game metaphor and interaction on large displays allowing for low threshold and high ceiling when managing contacts and specifying selective information disclosure in faces with the whole family. We chose a card-game metaphor, because it supports a fast and easy start of use, and at the same time allows complex specifications of contacts and faces. We described its concept and implementation. And we reported on initial user feedback.

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