Swapping personal and public content with Digital Trading Cards

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ABSTRACT

Paper-based trading cards, such as Baseball and business cards, have content and value that can be transferred from one person to another by simply giving the card away. This paper describes "digital trading cards" with a form-factor like paper-based cards. Digital Trading cards are small, thin, inexpensive, and disposable electronic containers that offer an alternative to "beaming" information. They not only facilitate moving content between people but also moving content between people and public displays. This paper describes how two existing systems led to the need and creation of Digital Trading Cards.

Keywords

Trading cards; tangible interfaces; personal and public data

INTRODUCTION

There are a number of ways to access personal information away from the desktop computer: laptop computers are desktop replacements for many; PDAs carry small commonly used bits; web-based file repositories offer anywhere-access. In our organization Personal Interaction Points (PIPs) bring personal files to a variety of augmented office equipment in the building.

User feedback of PIPs shows that people want to share personal information with others. And clearly, users of laptop computers and PDAs also want to pass information to others. Currently, people "beam" small bits of information or use memory cards for larger files. These methods require the participants to have devices present at the time of exchange or be willing to loan an expensive piece of equipment.

Away from our offices we also find useful information on computer displays. Such public displays and kiosks are becoming increasingly common: in airports, train and subway stations they present schedules; in shopping malls they provide store and movie listings; in commercial buildings they provide directories of businesses; and at gas pumps they advertise "fresh coffee inside." In our organization we use the Plasma Poster, a large interactive public information display that behaves like an electronic version of a pin board or bulletin board, to display useful information (figure 1 left).

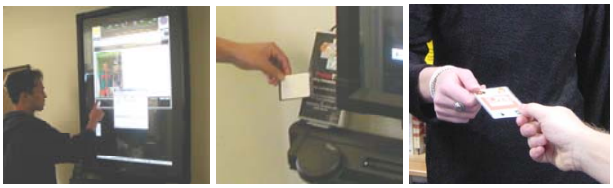

Figure 1: Shirou finds information, puts it on the trading card, and later gives the card to Elizabeth.

Although public displays are good at conveying visual information a field study of posting and browsing on these displays revealed that people also want public information for later use or to pass on to others [2]. While some public kiosks allow printing, this does not support transfer of rich media and other digital content.

Observations and reflection on commercial personal technologies, as well as our own experiences with PIPs and Plasma Poster, has shown the desire to swap personal information between people, and to allow information to flow from public displays to people. Our approach to these needs are tangible and disposable "digital trading cards" that offer the qualities of a traditional trading card and present an alternative to device-oriented approaches like PDA beaming.

SWAPPING WITH DIGITAL TRADING CARDS

Consider a scenario where Shirou sees information on a public display that he knows Elizabeth would like. Using a Digital Trading Card, Shirou swipes the card near the display, copying the information to the card. Later he hands the card and the information to Elizabeth (see Figure 1).

Figure 2 shows how Digital Trading Cards support a range of tangible information movement. A card is a buffer that transports personal information to public displays. This permits displays to act as drop-off points for asynchronous sharing with others. A card can also move information between different public displays. Finally a card loaded with personal or public information can be handed to others.

[1] WIDE Project, Keio University, Japan

Figure 2: Trading Cards provide easy movement of data from personal to public stores.

In many ways Digital Trading Cards are like floppy disks. They can be passed from person to person to swap information. You can load personal information onto them, and you can load information from public displays to them (Figure 2). Similarly, a card's content is "owned" by the card itself and not any particular person. Whoever holds a card can do anything with the card's contents, and once a card is given away the information is no longer available to the previous owner.

However, the compact form factor of Digital Trading Cards (smaller than a business card) makes them highly portable and people can easily carry many of them. (You can collect them, and trade them with your friends). Additionally, a cardholder's read/write interaction with public displays takes less than a second and with our implementation, can store unlimited content.

IMPLEMENTATION

The user interface for Digital Trading Cards takes advantage of the large displays at which they are used. Swiping a Digital Trading Card at a device with a card reader (figure 1) causes a *card content window* to appear (figure 3). Users can interact with the content in the same way they would files in a file system. For example, double-clicking on an icon will open the file with its associated application. Dragging a file onto the card content window adds it to the card. Files can also be deleted. This model extends to multiple cards; swiping additional cards produces additional card content windows and files can be copied by dragging between them.

Figure 3: The Digital Trading Card Content Window shows a card's contents as file icons.

For example, a user can move information from the Plasma Poster to a Digital Trading Card by dragging the poster bulletin board items onto the card's window. This causes the item to be written to the card. Conversely dragging an icon from the card content window onto the Plasma Poster's bulletin board adds it to the displayed content.

Cards are also used at the Personal Interaction Points around our organization to provide a "Copy to Card" operation for the user's personal files. At a PIP, the user first authenticates, using a login card, and initiates the copy by identifying the file. The system prompts the user to swipe a Digital Trading Card, and copies the file from the user's protected file store to the card. At this point the personal content resides on the card and possession of the card implies authorization.

SYSTEM INFRASTRUCTURE

Our implementation of Digital Trading Cards uses radio frequency identification tags (RFID), a kind of contactless smart card. When these cards are swiped near a card reader (20cm or less) the RFID tag sends a unique ID to the PIP or Plasma Poster device connected to the reader. A local service running on these devices creates the card content window whenever a trading card is detected (figure 3). This local service exports an API allowing other kinds of public display devices to provide their own custom interfaces and interaction. Because storage on contactless smart cards is limited, we associate each card with their own directory on a file server.

RELATED WORK AND CONCLUSION

Other approaches to moving information between people and devices have been device-focused, for example beaming information to and from PDAs. The "Passage objects" work [3] addresses some of the same issues as Digital Trading Cards with a different form-factor, interaction and security model. Although our implementation relies on RFID cards, iButtons [4] or memory cards are alternatives but less disposable.

This paper has proposed using small, thin, inexpensive, and disposable electronic containers called "digital trading cards" to support the movement of information between people and public devices. We believe the tangible and disposable quality of a digital trading card, although requiring some infrastructure investment, represents an appealing alternative to using more expensive portable devices.

Future work includes moving to web-based repositories for card content to scale outside of our organization, and to address content security that was not a concern in our open community.

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