

# Data Souvenirs and Reflection in the Home

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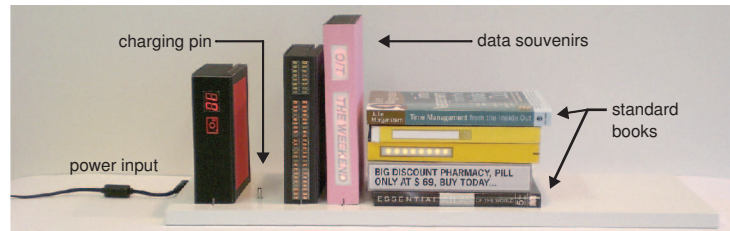
**Abstract.** We present Data Souvenirs, book-like electronic objects that display various forms of information with the goal of supporting reflection and reminiscence. Data Souvenirs draw on the ability of electronic data streams to provide new perspectives on data in and around the home while taking on a less distracting, more reflective form than existing domestic technologies.

Several authors highlight the importance of self reflection in technology design [6, 9]. Sengers *et al.* [9] define reflection as “bringing unconscious aspects of experience to conscious awareness, . . . making them available for conscious choice.” They argue that “critical reflection is crucial to individual freedom and our quality of life in society as a whole, since without it, we unthinkingly adopt attitudes, practices, values, and identities we might not consciously espouse.” We agree with this argument; we further argue that many technologies for the home offer poor support for contemplative activities like reflection, and in fact often serve as a distraction from such activities. Blurring work/home boundaries, the tendency of multi-purpose computers to be a distraction [2], and the ability of entertainment technologies like televisions to support passive consumption [7] offer poor support for reflective activities.

Additionally, we observe opportunities for technology to “bring unconscious aspects of experience to conscious awareness”. Electronic data streams provide opportunities to observe and present data about people’s lives back to them. For example, several technologies support reflection via sensors (e.g. [3, 5, 8]). Romero and Mateas [8] argue that these *alien presences* can “open unusual viewpoints onto everyday human activity, create pleasure, and provide opportunities for contemplation and wonder.” These technologies highlight the potential for new perspectives on data to encourage critical reflection. We consider the relationship between the form of technology and support for reflection. While the form of many domestic technologies does not adequately support reflection, technology does have promise in encouraging reflection by providing new perspectives on data. To rectify these issues, we draw on the physical form of the book.

## 1 The Experience of Books

The physical form of the book is an ideal vehicle with which to explore reflective technologies. This argument follows from three reasons: books support focused engagement, books are at hand but not in the way, and books acquire meaning over time.



**Fig. 1.** Data Souvenirs on their charging shelf, along with other non-electronic books.

- First, books support focused engagement. Unlike desktop computers that allow users to easily move between tasks, books support in-depth exploration of a subject; individual books are not designed for multi-tasking. Books also encourage extended interaction – once a book is chosen from the shelf, some physical commitment is made to looking at the contents.
- Second, books are “at hand” but not in the way. They “live” on bookshelves, which can house many books without seeming cluttered. Similarly, books themselves can be present but tidied in the environment. When the environment is messy, books can be arranged by stacking or placement on a shelf. Books are also portable. They are light enough to carry in one hand and small enough to stack. They are often placed around the home: on tables, next to the bed, or in the bathroom. These affordances allow books to be at hand without creating a chaotic environment. As a result, books support *ad hoc* interactions as people move about the environment, enabling *reflection-in-action* [9] in daily life.
- Third, books can acquire meaning, helping people to create a particular self-image [4]. Books are meaningful objects in many households – Csikszentmihalyi’s study of household objects revealed that books were among the most commonly listed special objects [1]. The unique physical form of specific books, as well as the markings they acquire with age, gives them individual character. We argue that this character encourages reflection on the relationship between the contents of the book and the state of the reader as both change over time.

For these reasons, we have chosen to use the form of the book as a tool for exploring reflective technologies. We now present *Data Souvenirs*, a realization of this concept.

## 2 Data Souvenirs

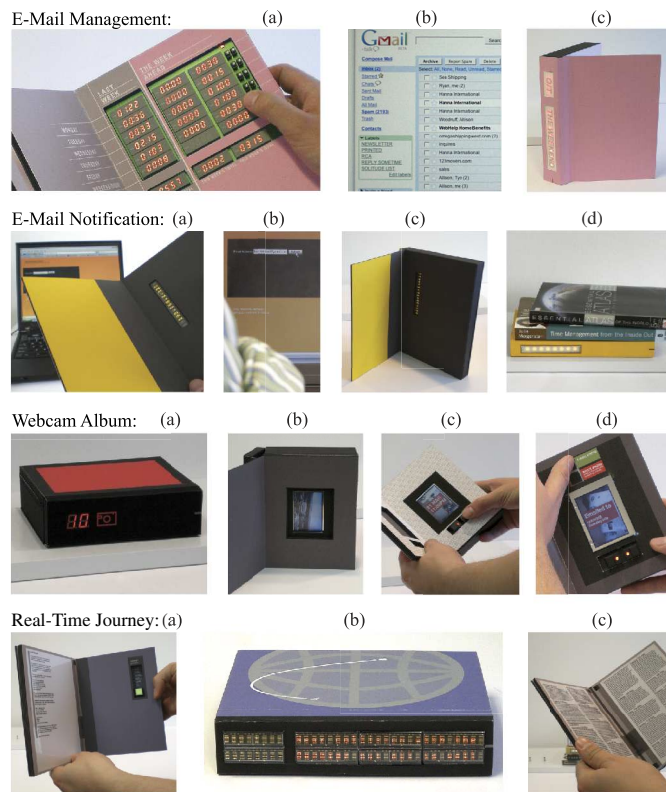
Data Souvenirs are electronic objects inspired by the form of books and the potential of sensor data to support reflective activities. Here we describe their physical construction and discuss four examples. The physical construction of Data Souvenirs draws on the form of children’s books that make use of laminated cardboard pages. We chose this construction because it supports the integration of various types of electronic equipment, such as buttons, segment displays, or LCD screens through the use of pages of varying thicknesses.

Each book consists of a display on the spine and one or more internal screens or buttons. Control circuitry is stored in the back page of the book. This hardware includes a Gumstix computer (<http://www.gumstix.com/>) and wireless network card attached to a custom board with power circuitry, LED light controllers, and connections to off-board

components such as buttons and displays. The design uses the same primary board for each book, with a custom board containing the display and interactive controls that vary across books. We also built a charging shelf providing charging power pins that interface with sockets on the bottom edge of each book (see Figure 1). Each Data Souvenir is connected wirelessly to a different source of data. The first three Souvenirs collect data about people living in the home; the other presents data from outside the home. We present each in turn. Accompanying storyboards are shown in Figure 2.

- The *E-Mail Management Souvenir* tracks the amount of time spent using e-mail. The device has a grid of clock displays showing the time spent on e-mail each day during the current week and the previous week. It also displays goals for e-mail usage. On the weekend, the spine lights up, highlighting “The Weekend” and allowing the user to set a goal for the week ahead (a). During the week, the souvenir records how much time the user spends using e-mail (b). If the user uses more e-mail than her goal, the device subtly notifies her by turning on the over time (O/T) light (c).
- The *E-Mail Notification Souvenir* has LEDs on the spine that light up to inform the user whenever she receives a new e-mail message from a particular address, allowing her to keep tabs on important messages without having to check e-mail on her computer. When first reset, the souvenir displays its Internet address on a display in the book (a). Going to this web page allows the user to enter an e-mail address to be monitored (b). The display is updated to show the address being monitored (c). Then, when the user receives e-mail from that address, the spine lights up (d). Users might have several notification souvenirs, each connected to a different e-mail address.
- The *Webcam Photo Album* consists of a small LCD screen linked wirelessly to a portable webcam, which users can position anywhere they would like. When the camera detects movement, an image is uploaded to the souvenir. The spine displays the image count, increasing whenever an image arrives (a). The inside of the album can be viewed through three different pages: the first shows just the most recent image (b), the second exposes buttons for navigating between images (c), and the third contains controls for e-mailing images to the user or for deleting images (d). The album could be used to collect images from a variety of sources. The camera might be placed in the garden to capture images of wildlife while residents are gone, by the front door to capture a history of everyone who enters the home, or in the living room to capture an alternate perspective on the activities that happen there.
- The *Real-Time Journey Souvenir* presents data from outside the home. Specifically, the souvenir plays back pre-recorded journeys in real-time. The user can select a journey to replay using the back cover of the book (a). Then, short journey updates appear on the spine in real-time (b). When the user is interested in finding out more about an entry, she can open the book and read the full text (c). The pace of the updates might vary significantly. In our example, the diary of an immigrant sailing to America, the display might read “still at sea. . .” for weeks, followed by a flurry of activity after the ship lands.

Colleagues and other community members whom we have shown our Data Souvenirs have reacted favorably to those that integrate an electronic display and printed pages, such as the Real-Time Journey souvenir that has electronic text on the spine but printed pages with the full text of the journal inside the book. This form provides the ability to view changing data on the spine of the book as an ambient display and to physically interact with the data printed inside the book. Additionally, Souvenirs are designed to integrate with other, more traditional information artifacts. For example, the charging shelf we built (Figure 1) is designed with extra space to support the inclusion



**Fig. 2.** Data Souvenir storyboards

of Data Souvenirs and traditional books. We are interested in exploring further the relationship between digital elements of Data Souvenirs, their tangible, analog elements, and the rest of the environment.

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