H. Reiterer & O. Deussen (Hrsg.): Workshopband Mensch & Computer 2012
München: Oldenbourg Verlag, 2012, S. 541-544
Ein Video zum Beitrag findet sich in der Digital Library: http://dl.mensch-und-computer.de/

Augmented Shelf: Digital Enrichment of Library Shelves

Eike Kleiner[1], Benjamin Schäfer[2]

Universität Konstanz[1]
IT University of Copenhagen [2]

Abstract

Libraries are well known as work places and thus have a common way of everyday use. Unfortunately, there is a gap between the physical and digital contents of a library and its media. By expanding the physical, tangible media with digital information, many new possibilities for interaction would open up for users. With the help of a prototype, we want to show how it is possible to shrink this gap with the use of *blends* and *augmented reality*. The *Augmented Shelf* allows for an overlay of digital information and additional functionality over a certain inventory in real time depending on the position of the user in a three dimensional space. The users are able to highlight physical artifacts, leave virtual commentaries and search for related media.

1 Augmented Shelf

The idea of using augmented reality in the surroundings of a library was at latest brought up by Rekimoto and Katashi (1995) in the mid-nineties. They outline an application for a handheld device that allows users to find specific books by using their natural voice. Additionally, the device is able to answer questions related to those books. Even 15 years later new concepts and prototypes keep appearing, trying to close the gap between the physical media and their digital information and supplementary functions. One of those concepts applied a combination of cameras and projectors to achieve a meaningful enhancement of the physical media (Löchtefeld et al. 2010).

In the considerations about the idea of the *Blended Library* (Heilig et. al 2011) arose the question of how to combine the domains of the *real world* and the *digital environment* in an intuitive usable and fast learnable way to create User Interfaces for libraries, which are not only settled in the virtual world. With the adoption of concepts such as *Blends* (Imaz & Ben-

yon 2007) and Augmented Reality (Azuma 1997) a prototype[1] was designed which supports users browsing the physical shelves enriched with digital functions and which offers continuative information for the physical artifacts at hand.

The basic principle for the design of the prototype is for the users to be able to control the level of detail of the provided information and functions with their physical distance to the bookshelves. To achieve this, three views with a gradient level of detail are defined (see figure 1):

1. The first view is called *Shelf View*, which is active when the whole shelf is in focus. This view shows all the topics a shelf features and helps the user to navigate to the right shelf.
2. The *Overview* that adds simple metadata to the media of a shelf and allows the user to select objects.
3. The *Detail View* shows more detailed metadata of a selected medium. Furthermore, this view offers some additional functionalities: The user can retrieve a digital full text of the medium, look it up at an online (book) store, highlight the medium in the *Overview* with a distinctive color, look for more details of the media next to the selected one, create and browse comments about the medium, and browse and select related media.

The distinction of multiple layers correlates with the native activity of browsing (Bates 2007) and supports the demand of the VIS-mantra (Shneiderman 1996) which states that the user should be able to go from an overview, that helps to orient himself, to the degree of detail he desires. The *Augemented Shelf* permits the user to switch between three layers by physical approach or distance from the frame. The selection of certain media and the use of the offered functions of the *Detail View* are carried out by touch input.

The following four *Blends* were created to achieve intuitive usability and allow a fast uptake:

Augmented Reality

Crossfading the real and digital world creates a blend directly in front of the user's eyes. This requires very little of the users cognitive power because it is obvious which part of reality is being amplified by virtual functionalities. In order to achieve this effect the *Augmented Shelf* crossfades a camera picture of a frame or respectively the media of a shelf with additional information and functions that allow for a direct interaction.

Eye

The eye blend is based on the focusing character of the human eye. This was transferred to the progression of the three layers defined above. With the use of a camera picture in combination with the physical approach to the shelf, less and less is visible on the pictures the camera takes. At the time the digital overlay starts, the real picture tends to disappear more and more and the focus narrows down to a specific medium.

[1] A video of the *Augmented Shelf* is available at http://vimeo.com/30309400 (Access: 07/30/2012).

Figure 1: Iterative process of focusing a medium (f.l.t.r. Shelf-, Over- and Detail View)

Freeze

The freeze blend stands for the preservation of a state for a longer period. Groceries are being frozen to prevent them from decaying. Analogous to this notion, there is a possibility in the digital world as well: saving documents for the later use. The user can freeze his momentary view of the shelf or medium in order to be able to change the position of the device without changing the camera picture. This function holds the possibility to look at a certain shelf at a later point in time while changing the position in the real world environment. The implementation of the freeze blend within the *Augmented Shelf* uses an ice metaphor. Thereby the symbol, which activates the freeze, is made of ice crystals. While the freeze is activated, the momentary display window is stopped and being displayed permanently as a still frame. At the same time, a frost border is displayed on top of the still frame and the whole display window is colored blue to signal that the picture is frozen.

Pinboard

A pinboard blend was used for the commenting feature. Pinboards are conveyors of information and support indirect communication between several persons. With the *Augmented Shelf* users are able to write on virtual sticky notes with a digital pen and stick them to a separate medium. These notes can be browsed and looked at afterwards by all users. To avoid spelling errors and other possible mistakes, users are able to redo their input or completely discard their comment (see figure 2, right).

Figure 2: Left side: Activated Freeze-Mode. Right side: Input and presentation of comments

2 Demonstration

The setting consists of a notebook with a touch-sensitive and pivotable display that has the capability for touch and pen input. Additionally, the Prototype will run a tablet device. Participants of the demonstration are able to test the *Augmented Shelf* device on a prepared shelf with optical markers to experience the advantages and disadvantages of the augmented reality approach in the context of a library.

References

Azuma, R. T. (1997). A Survey of Augmented Reality. In *Presence: Teleoperators and Virtual Environments*, 6, 6, pp. 355-385.

Bates, M.J. (2007). What is Browsing - Really? A Model Drawing from Behavioural Science Research. In *Information Research* 12, 4.

Heilig, Mathias; Rädle, Roman; Reiterer, Harald (2012). Die Blended Library: Benutzerorientierte Verschmelzung von virtuellen und realen Bibliotheksdiensten. In *Benutzerorientierte Bibliotheken im Web*. Bekavac, B., Schneider, R., Schweibenz, W. (Hrsg.), De Gruyter.

Imaz, M., Benyon, D. (2007). Designing with Blends: Conceptual Foundations of Human-Computer Interaction and Software Engineering. MIT Press, Cambridge.

Löchtefeld, M., Gehring, S., Schöning, A. & Krüger, A. (2010). ShelfTorchlight: Augmenting a Shelf using a Camera Projector Unit. *Adjunct Proceedings of the Eighth International Conference on Pervasive Computing. Workshop on personal projection*.

Rekimoto, J., Katashi, N. (1995). The World through the Computer: Computer Augmented Interaction with Real World Environments. In *Proceedings of the 8th annual ACM Symposium on User Interface and Software Technology,* pp. 29-36.

Shneiderman, B. (1996). The Eyes have it: A Task by Data Type Taxonomy for Information Visualizations. In *Proceedings 1996 IEEE Symposium on Visual Languages*, IEEE Comput. Soc. Press, pp. 336-343.

Contact Information

Eike.Kleiner@uni-konstanz.de, University of Konstanz

Benjamin.Schafer@web.de, IT University of Copenhagen