Bridging Books: The Printed Book as a Support for Digital Experiences

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ABSTRACT

It has been 20 years since Pierre Wellner published the article *Interacting with paper on the digital desk [1]* where he challenges us to imagine a space where "Instead of replacing paper with computers we could enhance paper with computation". Two decades after, we see the development of multiple projects that expand the expressive possibilities of traditional books by combining and crossing different media. Nevertheless the interest generated by those projects is limited, most of the time, to the research communities. The purpose of this IDC 2013 workshop is to bring together a community of researchers, publishers and authors to reflect and discuss the present and future impact of mixed media books.

Categories and Subject Descriptors

H.5.2 **[User Interfaces]**

General Terms

Design, Experimentation, Human Factors, Languages.

Keywords

Picturebooks, e-picturebooks, books, gesture interaction, storytelling, HCI, Tangible Interfaces, Tangible, Augmented

1. INTRODUCTION

In the early 70s, as stated by Jürgen Steimle [2], "one consistent refrain has been that computational devices would replace paper and the future would be increasingly paperless". But today, 30 years later, we are still very far away from becoming exclusively digital. For hundreds of years paper has been used to support a wide range of activities, which minimizes "the learning curve for paper based computation" [3]. On the other hand, paper does not offer the same possibilities as digital media, "such as dynamic content and hyperlinking" [4]. Therefore, the combination of paper and digital media in user interface design, to access the best of each medium, has been a topic of interest both for researchers and designers. Even in the age of tablets and e-books, the traditional printed book (in its many physical permutations) remains an active object of interest by explorers of intersections between physical support and digital medium. Following this trend, many approaches have been made around developing new book technologies and techniques.

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2. BACKGROUND

Over the years, the book artifact has been explored from many perspectives considering its form, affordances, materials, purposes and content, as well as the aesthetics. This exploration, combined with new technological possibilities, has allowed the development of a great variety of innovative projects such as augmented books or books with embedded sensors and electronics, which have emerged in the last 20 years. Among the vast number of mixed media book projects, the following are some significant examples:

The SIT book (Sound-Image-Text) (1999) [5] provides a reading experience that combines the look and feel of a physical book with music and sound effects. By activating electric field sensors located in the bookbinding, users are able to control the audio.

Listen Reader (2001) [6] is an electronically augmented paper-based book, with printed images and text that provides an immersive reading environment: a comfortable chair, a hardwood reading stand, paper pages in a soft leather book binder and a sound system embedded in the binder. A multi-layered interactive soundtrack with music and sound effects is triggered by the user's actions.

The MagicBook (2001) [7] is an augmented reality book where different media, including 2d and 3d graphics and animations, are integrated within the book pages and the surrounding space through a handheld device with a screen and a camera that recognizes visual markers.

SequenceBook (2010) [8] is an interactive picture book, consisting of a physical book, which is placed on a table, with a projector above and a speaker under the table. When the user flips the book,

the pages are recognized, triggering background music and images and text projections onto the paper pages. The system is designed to be a magnetic bookbinder, allowing users to easily shuffle the pages to make several patterns of stories.

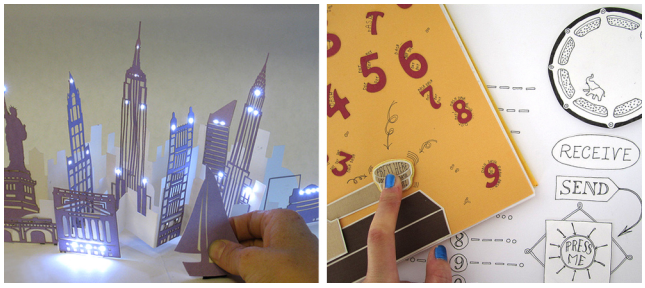

Figure 1. Electronic *Popables* (left) and *The Telescrapbooks* (right).

Electronic Popables (2010) [9] is an interactive pop-up book that explores paper-based computing, integrating traditional pop-up mechanisms with thin, flexible, paper-based electronics: it looks and functions much like an ordinary popup book, but is enhanced with interactive elements such as sound, lights and mechanical movement (Figure 1).

The book that turns its own page #2 (2010) [10] is an interactive book prototype that turns its own pages. This is triggered by an electric signal sent through the binding, which makes the material retract when it receives electricity. Additionally the book connects to the Internet and can interact with a phone.

The Telescrapbooks [11] are remote communicating electronic sticker books. They are constructed to look and feel as much as possible like traditional books, and to be completely customizable and craftable. The idea is for people to be able to design a personalized remote communication tool for themselves and someone they care about using simple circuits embedded in stickers adhered to wirelessly-communicating books. (Figure 1).

Elektrobiblioteka (2013) [12] is an interactive book that uses a hardback book as interface. The physical book has printed circuits of conductive ink that can detect when the book is open. The book connects to a computer via USB to control a dedicated website.

3. OBJECTIVES

In this workshop we propose focusing the discussion on steps to bring these ideas out of the lab and to the general public. Also we would like to network a community that has been meeting informally in recent years to discuss these themes with the goal of organize a regular meeting to discuss these topics and eventually organize a special publication on this subject. This workshop aims at:

Bringing together researchers, editors, publishers, designers and illustrators whose work is closely linked to books and have an interest in exploring mixed-media projects;

Envisioning and discussing possibilities for practical applications of these projects;

Creating a community focused on mixed-media children's books;

Programming activities related to the community: future meetings and eventually a publication on these topics.

4. POSITION PAPER CONTRIBUTIONS

We welcomed position papers on topics from the domain of mixed-media projects, addressing creative explorations that preserve, reinvent or repurpose the functions and affordances of printed media, especially mixed-media books for children. Additionally we encouraged participants to submit videos of their work and asked them to bring prototypes to the workshop.

We received several submissions in response to our proposal that we have organized by theme.

4.1 Printed Books with Augmented Capabilities

For years augmented reality has helped to reveal the hidden universes of the books. As stated by Sherrer et al [13], augmented reality has already been used on books to "enhance reading experience, visualize products in selling catalogues, tell stories and teach". Focusing on children's storytelling possibilities of augmented reality, Koumis presents an educational augmented reality book for children [14]. Fiducial markers, located on each page of the book, allow accessing the illustrations rendered on Maya 3D models.

4.2 Paper Books Combined with Digital Information

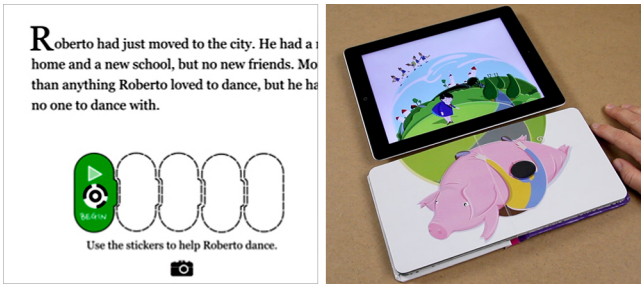

Figure 2. *A Computational Sticker Book* (left) and *BridgingBook* (right).

1. Michael Horn invited us to think broadly about the intrinsic value of former cultural forms – eg. games, tools – when designing new interactive systems. The linkage to social practices and the social, emotional and cognitive resources that these practices involve are the arguments behind this approach. In this context Horn presents an interactive sticker book [15] that supports emerging computational literacy skills for preschoolers and early elementary school children. The sticker storybook aims to introduce notions of computer programming and robotics (Figure 2). The current prototype presents the story of a lonely boy named Roberto who travels across a city in search of new friends. Each encounter between Roberto and the characters in the story prompts a programming activity. Dashed sticker outlines on the pages of the book indicate the structure of the programs that can be created, as well as the types of stickers that can be used. Each sticker includes a computer vision fiducial that identifies both the type of sticker and its placement relative to other stickers on the page. A mobile built-in camera is used to take a photograph of the page and a runtime interpreter controls an animated version of Roberto that appears on the screen of the device.

2. Konstantin Demblin presents an installation, consisting of a digital/analog hand crafted large format book (Din A0). The book was positioned on a table as part of an exhibition and visitors were asked to interact with it by reading the book and turning its pages. Each page has a code on one of its corners. A computer camera system detects the code and projects the content of the specific page on the physical page itself.

3. Figueiredo et al. [16] present a book prototype called the Bridging Book (Figure 2), a children's mixed-media picture book that blurs the line between printed and electronic books. Bridging book consists of a printed book with embed magnets and a digital device, placed side-by-side, with synchronized content. Thumbing through the book's pages triggers the digital content. The physical book requires no batteries or wires. In the current prototype, the printed illustrations on each page of the physical book are extended into the device's screen, offering further interaction. The content can be explored both linearly by reading and thumbing the printed book and/or exploring the interaction on the digital device.

4.3 Merging Paper Books with Electronics

Figure 3. *t-books* (left) and the *Sammelbuch* (right).

t-books, [17] is a toolkit consisting of an electronic platform, a paper book with slots on it and a set of picture blocks that children place on the paper book to interact and explore the narrative (Figure 3). The educational goal behind this interface is to create a "*playground"* that allows children to explore a certain narrative and alternative storylines by manipulating the story elements, while simultaneously taking advantage of the traditional book which serves as a framework and a guide for the construction of the narrative.

4.4 Building New Concepts Around the Book

The recognition of the book as an important cultural artifact has led many designers and researchers to reflect upon concepts relating books and digital media, concerning cultural practices and digital metaphors.

In an attempt to dissolve the boundaries between analog and digital media Stefan Woelwer presents the *Sammelbuch* (AssembleBook) [18], which reflects on new metaphors and the re-using of existing ones for intuitive use of computers in networked spaces (Figure 3). In this project, the author literally projects HCI elements onto real books, bringing back the tactile experience to the computer world.

4.5 Creating Bridges between Designers and Publishers

Anne Kostick, who has taken part in the previous Beyond the Binding workshop [19], is a consulting editor at Digital Book World. Her work aims to create connections between the book publishing industry and the discipline and practice of UX and all related design fields. Her contribution to this workshop is both to share and talk about her experience as a consulting editor as well as an author.

5. DISCUSSION AND RESEARCH AGENDA

Although innovative projects such as the ones presented here are generally received with enthusiasm, inspiring other researchers to further develop similar work, they seldom have an impact beyond the research community and their laboratories. High costs, the complexity of apparatuses and difficulties in envisioning practical applications are some of the reasons that can account for this.

However children's books, which could highly benefit from the developments already achieved in this kind of projects, do not necessarily reflect such tendencies.

Recently, some artifacts such as Sony's *Wonderbook* [20] and the *Tag* Reading system [21] from LeapFrog, give us clues about opportunities, beyond research project borders and let us glimpse possibilities for application and commercialization of new concepts and technical breakthroughs.

The focus of this workshop is to further push this process by bringing together researchers from various areas to discuss relevant issues such as:

- Technology: Information capabilities and physical/digital affordances

- Aesthetics: Interface design, communication through form, function or emotion

- Craft: New materials and processes for book invention and construction

- Creativity: Pushing the limits of the definition of the book, unconventional and provocative ideas

Further we will discuss concepts, possible applications and reflect over possible future directions, aided by different brainstorming supported activities and group dynamics.

We will propose the organization of a researchers network around children mixed media books, in order to potentiate the workshop's results and stimulate future collaborative development in this area.

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