

# BibPhone – Adding Sound to the Children’s Library

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## ABSTRACT

In this paper, we describe the bibPhone, a prototype for recording audio annotations onto books and likewise functioning as the mediator for playing back annotations stored on books of the children’s library. Hereby the children’s library becomes an invisible landscape of sound tightly connected to the physical materials that is open for the users to explore and contribute to. The bibPhone exploits RFID and Bluetooth technology for establishing a wireless connection between the physical book and its metadata, which is stored in the central library database.

## Keywords

Sound annotation, RFID, children’s library, augmenting books.

## INTRODUCTION

In the last couple of years several projects have been seeking to define the future role for the library in a society where networked services are capable of offering most any of the materials and services found in the traditional library. Parts of this research have gone into children’s social and search behaviours in the physical library as well as in digital libraries [1]. Others have conducted research in various digital services for libraries e.g. library web sites, library search engines, sociable web based chat rooms connected to the library web site and digital comments on books; services and developments supporting future visions of the children’s library as digital, virtual and distributed [7, 9, 10]. However, little has been done in trying to combine the physical and the digital, making the physical space and artifacts in the library the interface for digital material.

## THE INTERACTIVE CHILDREN’S LIBRARY PROJECT

In the Interactive Children’s Library Project a group of industry partners, libraries and research institutions set out to define a whole new set of activities and services for the future children’s library. A major focus was on the potential connection and interplay between new and

already existing physical and digital infrastructures of the library. In the initial phases of the project the group made use of a wide range of inquiry and design methods to understand the use patterns of both children and librarians in the children’s library and for designing concepts together with these different users. Many of the methods included the children’s participation in different ways - e.g. in creating video diaries from their own physical perspective, focusing on the items that defined the library to them, and in constructing shared narratives in which we could envision a whole new type of library [2]. The shared narrative sessions were carried out as drawing sessions in the library in which the children and researchers together imagined the library on Mars. These sessions led to perspectives on the future children’s library that the further concept development could benefit from. An example of this is a child’s drawing and history of a *moon rock* that can dissect books and explain about its main characters and plot in un-written ways. This concept was influential in the development of the bibPhone prototype reported on in this paper. A detailed reflection on the entire design process is reported on elsewhere [4]. On the basis of the field studies the project group developed several concepts; one of these was what we in the first place called a *speaking funnel*, a *listening jug* and a *book spy*, see figure 1. Basically the concept should enable children to both listen and talk to the books on the shelves. The concept is fairly simple and based on our initial wishes to exploit physical and digital infrastructures already in the library. Some of the libraries in the project group had exchanged the traditional barcode tags on the books with RFID tags. This enabled reading the ID of a book without direct visual contact between reader and tag.

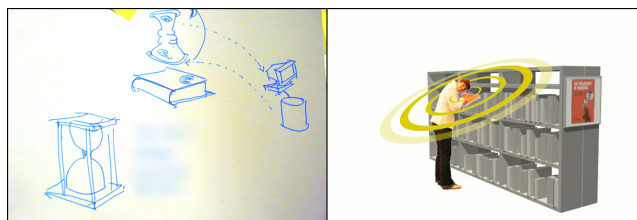


Figure 1. Initial sketch and concept rendering of the bibPhone.

Reading the ID could give access to the metadata on the book stored in the already existing central database. As the concept matured we gave it the name bibPhone – *bib*

coming from the Latin word for library Bibliotheca, and *Phone* from Telephone.

### THE BIBPHONE PROTOTYPES

While sketching on the initial bibPhone concept we came up with two different designs that in various ways could address individual and social interaction issues with the books. Thus we decided to develop both of these as the core technology was the same and could be replicated easily.

#### Technical Setup

The concept of the bibPhone can be realized technically in a number of different ways. However, to minimize the amount of hardware needed in the bibPhone device a Bluetooth chip supporting simultaneous audio and data transmission is used. Hereby all playback and recording of sounds can be done on a remote PC and the bibPhone itself is functioning as an advanced remote headset with one button and an attached RFID reader. The only requirements for the PC are a sound card and ability to connect to a database, meaning that almost any PC can serve as the backend for a bibPhone device. As each of the PC's serving a bibPhone is connected to the same central library database, multiple bibPhones can function within the same library.

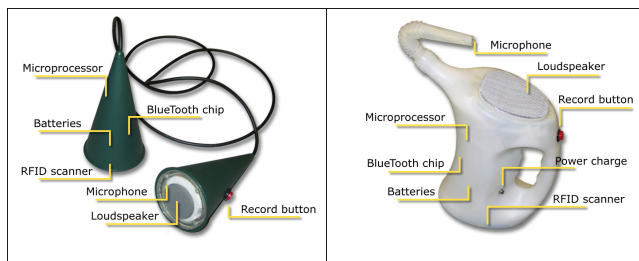


Figure 2. The technical components of the two bibPhone prototypes.

Each bibPhone consists of:

- A microprocessor handling communication between the Bluetooth link and the button and RFID reader.
- Bluetooth module for wireless communication with the backend PC (range approx. 20 meters radius - could be up to 100 meters).
- A rechargeable battery pack for power supply.
- An RFID reader for identifying books.
- A microphone for recording sound.
- A Loudspeaker for playing sound.
- A push button used to control the recording of sound.

These hardware components can be built into almost any physical form. In the first prototype, inspired by a doctor's stethoscope, we used two graveyard vases connected by a cable. One vase is for listening and speaking into, the other contains the RFID reader and is for investigating the books. In the second prototype we built everything into a plastic

oil can, including a loudspeaker that enables multiple users to listen to the sound at the same time - see figure 2.

#### The bibPhone Interface

As mentioned earlier the bibPhone is an experiment into combining physical and digital properties and infrastructures of the existing library. Thus we are faced with a new interaction challenge as the investigation of books is not done in the pure physical manor or in front of a PC. To deal with this new situation we put an effort into minimizing the complexity of the interface. By sticking to a single button and providing sound feedback we hoped that children would be able to understand the basic interaction technique. To emphasize the connection between physical and digital layers we designed the RFID antenna so it needed to be in close contact with a book to read its ID. As soon as the bibPhone detects a book the ID is sent to the backend PC that queries the database for that specific book. If there are sounds connected to the book the PC will start playing them and the sound is transmitted via the Bluetooth link to the bibPhone loudspeaker. If the book contains no sounds the bibPhone will respond to the user that *"this book is empty - press the button if you want to record a sound on this book"*. This also means that books do not need to be tagged in a certain way as long as they are present in the central library database.

If there are several sounds recorded on a specific book the bibPhone can be configured to play back the sounds in different chronological orders or set to play a specific number of sounds e.g. the first two sounds. This configuration is handled by the librarians who, through a small user interface, also have the possibility to decide whether the bibPhone can record new sounds or can only be used to listen to existing sounds. When a user has ended a recording and released the button the bibPhone replies that *"your sound has been recorded on the book"*. After this the sound will be played back for the user to hear it.

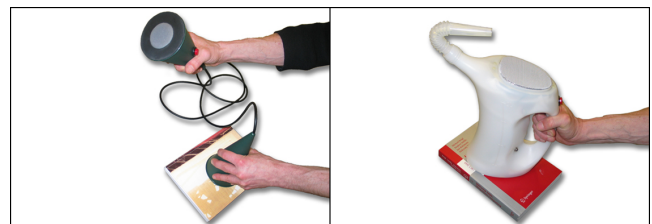


Figure 3. The two bibPhones and their different physical affordances.

If the bibPhone is playing a sound or a user is recording a sound onto a book and the bibPhone is moved away from the book the bibPhone will stop its ongoing action. In this way the physicality becomes important and the concept of the book as the container of sound is respected, see figure 3.

The two prototypes work in the same basic way but afford slightly different kinds of use. The vase prototype has a low volume sound and is mostly intended for a single user -

nevertheless, one user can do the scanning while another can listen and record sounds. With the oil can prototype the intention is to have higher sound volume, thereby enabling the investigation of books to be a social activity.

### Testing and Evaluating the bibPhone

The two bibPhone prototypes have been tested for approximately two weeks in two different libraries. The objective of the first tests was to check the durability of the prototypes and further to see if the basic concept of adding sound to books was useful both in the sense of guiding children to books of their interest but also as an open infrastructure for the children to appropriate. This has given a first hand insight into how children and librarians have used them and what could be interesting to develop further. On the basis of these tests we are not able to come up with any certain conclusions, however, we observed situations that can inform the next iteration of the design.

We handed the bibPhones over to the librarians and wanted them to administer how they should be used in the children's library. They were fascinated by the new potential way of communicating with the children through the books and some of them used a lot of time recording comments and reviews onto the books. Librarians are usually dependant on their memory when guiding children on a specific book or they can direct children to written reviews on the library website. Our findings were, however, that many children do not read these and thus miss this guidance. Through the bibPhone librarians can store their initial review of a book right after reading it for children to hear.

To increase the amount of sounds on the books the librarians invited school classes down to the library to record reviews of books they had been reading in school. These books were placed on a specific shelf and in that way parts of the library shelves started to contain sounds. No matter how fun or fascinating the bibPhone might seem it is a part of an open information system similar to [3, 8] and thus only interesting if the system is filled with content produced by the users. As we have only tested the bibPhone for a rather short period of time it is hard to say whether they will really become a parallel practice for investigating books along with a regular visual browsing.

However, we discovered that most children found it fun to use the bibPhone to listen to what others had recorded on the books, but making own recordings seemed to be embarrassing, see figure 4. This might be due to the awkward situation of talking to a book or the difference in privacy between writing a review and speaking it out loud. What we saw was that instead of selecting or rejecting books by looking at the cover image - as we observed during our initial field studies [4] - all books held potential interest, making the children go more systematically through the book shelves with the bibPhone.

The two prototypes proved to afford different kinds of use. The oil can was used in groups whereas the vase was used individually. Even though the future library, according to the librarians, is a place of noise and activity in addition to the traditional conception of the library as a silent place for reading, it seemed that the users of the oil can found the loudspeaker somewhat intrusive.



Figure 4. The bibPhone in use in the library.

In the weeks of testing we only had a few technical problems such as bad recordings when the battery level was low and problems connecting to the database when scanning books on the outskirts of the Bluetooth range. Apart from that the prototypes were running steady and thus proved to be a platform worth developing further.

In the following we will discuss some of the ideas we got from testing the bibPhones in real libraries.

### Discussing the Future Potentials

There are many other applications that could be designed for the bibPhone infrastructure that could address and exploit the linking between physically distributed books and digital information. During talks with the librarians we discussed how content inside the books might be activated along with the bibPhone. We thought of designing storytelling games inspired by [6] or treasure hunts in which prerecorded messages are linked to specific books telling the children to find certain passages in the book that will lead to the next clue or the next book. Unfortunately we did not manage such a setup but are hoping to test this in the near future.

Another idea that we are working on is to see the book as a physical link to real-time data. For example, a book on the weather could link directly to the local weather forecast or a book on soccer could play back the world cup semifinal from 1970. Hereby the landscape of sound becomes much more dynamic and perhaps more interesting to revisit which corresponds to our initial idea of turning the library into a place different from networked services.

In the current tests we have focused on books but many of the librarians thought it would be interesting to tag other materials and maybe even architectural elements within the library so the bibPhone as an example could respond "this shelf contains books ranging from a to c". Going for this scenario might be coupled with using a regular Bluetooth mobile phone instead of a dedicated device as the bibPhone is at the moment. However, this might also remove some of

the playful aspects that the current designs induce and thus be more suitable in the adult's library in line with [5].

A final issue that we have discussed with the librarians is how to maintain the system in the long run. Thousands of sounds will accumulate and it will be hard to filter them without going through each and everyone. Not so much to avoid naughty comments, as they are a part of all open systems, but to remove broken and bad recordings. However, an argument for not filtering and going through all sounds is keeping the mystery of the invisible landscape of sound in which two friends can have a book that no one else knows about where they exchange secrets and stories.

#### CONCLUSION

In this paper we have described and presented the bibPhone concept and prototype that enables children and librarians of the children's library to record and listen to sounds connected to a book. Hereby reviews and comments are linked to books which add new layers of use to the children's library. Despite a short test period the bibPhone has proved to be an interesting concept, prototype and infrastructure for multiple purposes within the children's library.

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