

# Experiences from Designing a Tangible Musical Toy for Children

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## ABSTRACT

This poster describes the design and early evaluation of MusicPets. MusicPets allows children to store audio, such as (composed) tunes or recorded messages, on tangible containers embodied by soft toys. Results show that children enjoy creating tunes and appreciate the possibility to record them on physical objects so that they can later 'show' them to others. They would also use MusicPets for exchanging messages and playing DJ using multiple prerecorded soft toys. MusicPets not only fosters musical creativity but also promotes collaboration among children.

## Keywords

Children, tangible, musical, toys, kindergarten

## ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces – Evaluation/methodology, User-centered design

## INTRODUCTION

Designers and researchers increasingly explore the role of novel interfaces and interaction paradigms in the context of applications for children. Our focus in this perspective is on musical toys for preschool children that facilitate tangible interaction. The advantage of tangible user interfaces for electronic music composition has already been investigated in several projects (e.g. [2, 6]). In our approach we implement tangibility rather in form of a container than a tool, which allows children to store and transport audio data embodied by physical objects. The motivation for our approach was further to connect the potential of tangible user interfaces for children [3, 4] with music, which plays an important role in the development of children [5].

## CONCEPT AND PROTOTYPE

MusicPets allows children to record any audio data on soft toys. It consists of two base stations (for record and playback) and several soft toys equipped with RFID tags, which act as tangible containers that facilitate transport of

audio data. Children can compose music with the interface featured on the base station, they can record their own voice (messages or nursery rhymes), and they can use existing audio files by 'dragging' the file onto the toy. To replay previously stored tunes or messages the toy is simply placed on the playback base station.

As an initial step we developed a working prototype that served as a probe and allowed us to investigate different interaction patterns of MusicPets. The prototype featured one base station, which supported both, record and replay (Figure 1, right). Recording of external audio was realized with a wizard of oz prototype consisting of a microphone connected to the computer. To store an existing audio file on a soft toy the corresponding file had to be dragged onto the MusicPets application icon. The interface for composing music consisted of a slider and three buttons. The slider allowed setting the pitch and the buttons were used for recording, creating chords, and inserting pauses. The duration of any tone or chord was visualized through an array of eight light-emitting diodes. We implemented the prototype using the rapid prototyping toolkit Phidgets.

## EVALUATION

We evaluated the prototype with 29 children aged between 2 and 7 years over a total period of two months. Based on available literature [1] we chose to use three methods – evaluation with one child, collaborative evaluation with two children, and a workshop in a kindergarten class. We also prepared questions for interviews before and after the first two sessions. The goals of the evaluation were:

- Evaluating the usability and enjoyability of the probe



Figure 1. Children interacting with MusicPets (left) and the redesigned MusicPets interface (right).

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- Redesigning the interface together with the children
- Exploring possible uses of MusicPets
- Collecting general requirements for the design of tangible musical toys

Four children took part in the first session. The MusicPets interface was explained to them individually and they were encouraged to compose and record tunes. During this session we also held a participatory design workshop where we redesigned the interface together with the children, using colored paper, cardboard, and other materials. The improved prototype (Figure 1, right) was used for the remaining sessions. In the second session we used a similar setting, but the probe was evaluated with two pairs of children that had not participated in the previous session. We first explained MusicPets to one child of each group, who then had to explain it to the other. Twenty-six children participated in the workshop, which took place in a kindergarten class. The methods used in this workshop also included didactic methods, e.g. the children sat down on chairs arranged in a circle and a ball was going round for giving one of them the voice in order to avoid chaos. All children had the possibility to interact with MusicPets individually and in groups over the course of an afternoon.

## RESULTS AND DISCUSSION

The results presented in this poster represent only an excerpt of our findings. We hope that we will be able to reveal more details in the course of the project. The evaluation showed that the children were able to compose simple tunes of popular nursery rhymes with MusicPets. Furthermore we noticed during the evaluation in groups and the kindergarten workshop that they spontaneously started to interact collaboratively with the toy (Figure 1, left). The user interface of the first prototype had some usability problems that were identified after the first evaluation rounds (e.g. use of color, distance between buttons, etc.) and solved during the redesign workshop. Some additional changes remain to be addressed by the next prototype, especially concerning the interface for composing tunes.

Overall children enjoyed playing with MusicPets and the evaluation revealed the following main uses:

- Recording and exchanging messages
- (Collaboratively) composing tunes
- Playing DJ by placing different tagged toys with songs stored on them on the base station

The first session already revealed that children would use MusicPets as tangible containers for exchanging secret voice messages. The reason for this is probably that young children have very limited writing skills. We also observed that they had equally fun recording nursery rhymes with MusicPets.

Overall it seemed to be more interesting to the children to compose tunes or record messages than playing back previously stored audio. To further investigate this, it

would be necessary to conduct an evaluation over a longer period of time with more MusicPets base stations (both for recording and replaying), where children have one at home and one in the kindergarten, so they can transfer audio data. MusicPets would allow them to create tunes, tangibly embodied by soft toys, and ‘show’ them to friends or their parents – a behavior that was already observed in this study. We believe that this is a valuable contribution of MusicPets, as children currently do not have the possibility to physically ‘transport’ tunes in a similar way they do this with paintings on paper.

During the redesign workshop we noticed that since children are not familiar with standard conventions in user interface design, they do not seem to play an important role for them. For example our first prototype featured a round red record button, which was changed into a yellow rectangular button by the children. It is therefore important to consult children as design partners – a fact that was already noticed by others [1]. In addition, other specific aspects exist, that need to be considered, such as alignment of buttons, which should support collaborative interaction.

## CONCLUSION AND FUTURE WORK

During the evaluation we identified possible uses of tangible musical toys for children that will influence our further research in this area. As a next step we intend to further explore our concept by developing more prototypes and evaluating their application in a longer study.

During the kindergarten workshop we used several didactic methods that helped us in communicating with the children. Kindergarteners know these methods from their everyday work, whereas researchers working with children might not be aware of them. We therefore plan to further investigate didactic methods for kindergartens and their application in the context of research with and for young children.

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