PlayPals: Tangible Interfaces for Remote Communication and Play

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Abstract

PlayPals are a set of wireless figurines with their electronic accessories that provide children with a playful way to communicate between remote locations. *PlayPals* is designed for children aged 5-8 to share multimedia experiences and virtual co-presence. We learned from our pilot study that embedding digital communication into existing play pattern enhances both remote play and communication.

Keywords

Tangible Interfaces, Remote Play, Toys, Children.

ACM Classification Keywords

H5.m. Information interfaces and presentation.

Introduction

Anna and Jane are best friends, it is Saturday morning and both girls are at their homes. Anna is playing with her PlayPal dolls, making them breakfast, and Jane just woke up dreaming the most amazing dream. Jane sees her PlayPal moving and understands that Anna is awake already. Jane puts the walkie-talkie token in her doll's hand and says good morning. Anna responds with a cheerful good morning and invites Jane to join her play pretend breakfast. They both put on the dolls the video camera token and Jane tells Anna all about her

great dream, while playing with the remotely synchronized dolls.

figure 1. *PlayPals* among other toys.

There are many tools we can use to express ourselves and communicate. We can talk on the phone, send e-mails or text messages, leave voice mails, and share pictures or movies. Online communities and blogs allow virtual cultures to span across the globe. But most of these tools were designed with adults in mind. Young children have the choice of using the adults' tools: they can talk on the phone or do video conferencing, or else they communicate face-to-face. One approach to designing a communication interface for children is to modify something that already works for adults, for example making a cell phone that is easier for children to operate. Another approach is to look at what children are already familiar with and augment it with additional functionality. We chose the second approach, and took

an existing play activity where co-presence is inherent and adapted it for remote co-play.

Young children engage in activities that involve manipulating objects around them. When seven-year-olds play together they use figurines and accessories to build an imaginative world that expresses their thoughts and feelings. We wanted to design a system that will augment the already existing co-present play and add another layer of communication to enable a remote co-play and communication. We wanted to explore how the design will affect the children's play and communication.

Building on the body of research in the tangible interfaces field we have focused on the following themes: specific rather than multipurpose interface, familiar metaphor for easier understanding of functionality, and two-handed manipulation [2].

PlayPals is a system of two or more dolls that are remotely synchronized. When a child at one location moves one doll's hands, the remote synchronized doll moves its hands in the same way. Each child has a set of tangible tokens that are used as the dolls' accessories. When a token is placed in a doll's hands, it functions as a different communicating tool: for example, adding a "walkie-talkie" token to the doll, enables synchronous voice communication.

To test our design approach we have built a system of four connected dolls that when one child move the hands of one doll, the corresponding doll in the other location moves its hands too. We also added synchronous voice functionality (in the current prototype, using external computer support). We gave

the dolls to two eight-year-old girls and observed them at play with the dolls in three different scenarios: remote location-no voice communication, remote location-with voice communication and co-present play.

Following our pilot study we report on two important observations: (1) remote play with no real-time communication capability created an isolated play activity, and the anticipated co-play did not happen. When the synchronized voice channel was added co-play did occur. (2) The concept of remotely synchronized dolls intrigued the children's imaginations and as a result, it enriched their play and gave them new ways to communicate their thoughts and feelings. See examples in the "children's interview" section.

Related Work
A range of communication and sharing media tools exist for adults. However, only a few are designed especially for children. For instance, communicating gestures remotely can create a sense of co-presence [1] and robotic stuffed animals can be used as physical avatars for interpersonal communication [4]. However these projects have not been designed with children in mind. Internet infrastructure is being built to allow children around the world feel "bonds" personally despite language and technological barriers [5]. Research has also shown that embedding computer functionality in everyday objects makes it easier to perform complex tasks [2]. Children can intuitively use tangible media containers to author, edit, and share video remotely or during co-present play [6]. Dolls combined with sound recognition and gesture capture have been designed to retell and share a child's story to enhance the child's emergent literacy skills [7]. Inspired by this research, we propose that dolls can

take on gestures and be coupled with symbolic accessories. We designed *Playpals* by making play activities be both physical and digital. We aim to enhance remote communication and play. Our design approach derives from our case scenario of children aged 5-8.
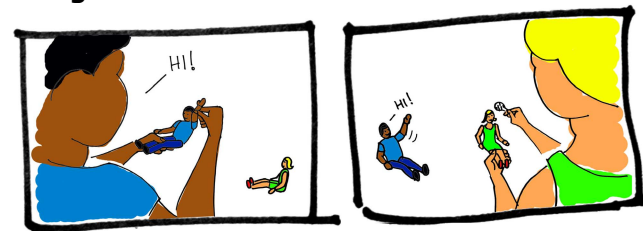
Design

figure 2. *PlayPals* can be used to transmit simple gestures between remotely located children.

From our case scenario we designed a specific interface. We chose pretend play for embedding the remote communication functionality. Gestures, voice and accessories are inherent to pretend play with dolls. We used synchronous voice, gestures communication, and miniature accessories as familiar metaphors to make the interaction more intuitive.

PlayPals are a set of two wireless robotic figurines that can communicate wirelessly following different tangible modalities with their electronic accessories. The dolls alone only communicate gestures, e.g. when a child moves the right arm on one doll, the right arm moves on the other doll (See Fig. 2). A set of miniature accessories with specific functions can be used together with the dolls to share a variety of media, a cell phone for synchronous voice communication, microphone for

asynchronous voice communication, a video camera for synchronous audio-visual communication and a digital camera for asynchronous visual communication.
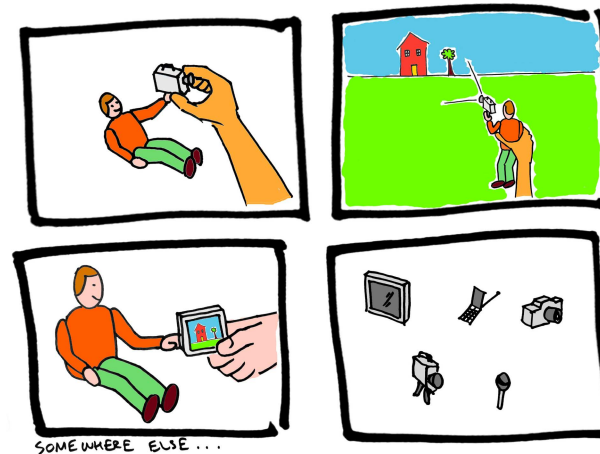

figure 3. *PlayPals* have accessories that allow them to record, share and display multimedia content, including audio, video and still images.

To make a recording, the child places a small tool (camera, microphone, screen) in the doll's hand. To share the recording, children need another doll that represents their friend. They can put the recording tool in the friend's hand to share the video or audio, or they can place the tool near a computer where the data can be saved. To display an image or video, a computer can be used or else a small screen placed near the doll or in its hand (See Fig. 3).

Prototype
The first prototype of *PlayPals* was built from existing cloth dolls with embedded passive gesture

communication. Each doll has a geared motor installed in each shoulder that acts as a sensor/actuator. Corresponding arms on a pair of dolls are connected by long cables so that moving one arm on one doll causes the corresponding arm to move on the other doll. Two independent pairs were built for the user study (See Fig. 4). We simulated the cell phone token by giving children headsets with voice over IP communication.
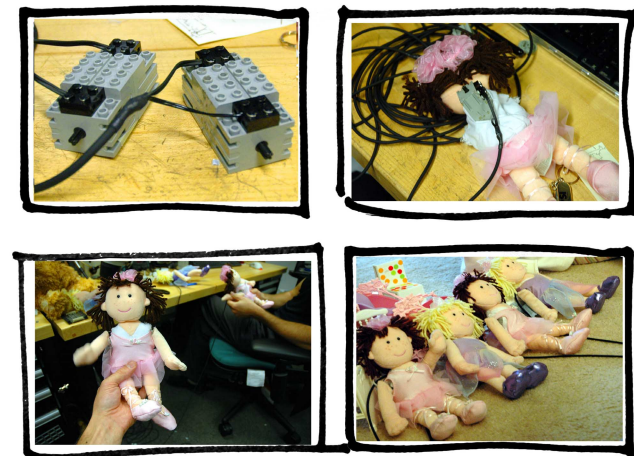

figure 4. The current prototype of *PlayPals* is based on geared DC motors (upper left) embedded in cloth dolls (upper right) so that the arms move synchronously between pairs of dolls (lower left). Two pairs of connected dolls were built (lower right).

Pilot Study
When designing with children in mind we try to anticipate their needs and activities. However, since we are adults it is hard for us to anticipate the way children actually use a system. We wanted to test our design assumptions with a three-part study. We chose

two eight-year-old girls who go to school together and play together quite often. We observed the girls at play; video-taped it and interviewed them afterward.

Part one: We put the girls in different rooms where they cannot hear each other. Each girl got two dolls; one doll representing herself and the other representing the friend. We explained that the dolls are synchronized and when they move the arms of one doll the synchronized doll in the other location will move its hands too. We asked them to play with the dolls for 20 minutes.

Part two: We added the synchronous voice communication functionality to the dolls and asked the girls to continue playing for additional 20 minutes.

Part three: We moved the girls to a co-presence space and asked them to play with the dolls in the same room for additional 20 minutes.

From our observations, we report that in the first part, where the girls couldn't communicate, but could synchronize the dolls, the girls played with the dolls as they play with their other dolls, engaging in pretend play. From time to time they would notice a movement of the hands of the dolls and would respond in counter moving of the hands.

In the second part, where we added synchronous voice communication, there was a significant change in the pattern of play and communication. The girls started talking right away about what they are doing with the dolls and created a virtually shared pretend play. This part was the most engaging for them.

In the third part, where the girls played with the dolls in the same space, they started off playing with all dolls together, but very soon they moved on to other things to play with.
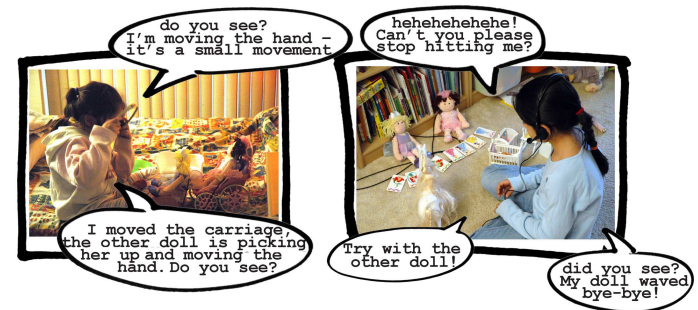

figure 5. *PlayPals* reveal that children using augmented toys for remote play engage in new types of communication.

Interview

In the interview the girls were asked about their experience and how they would use such a system. Here is a selection of their answers:
" I like it when one doll moves the other and that its doing the same thing"
" I would like, when I talk, that the dolls in the other place would talk with my own voice, but if we are playing they will make their own voices"
" I would like my doll to let my friend's doll know when my brother is making me angry"
" If I am awake and all my other family is asleep, the dolls can check if my friend is awake too with out waking our parents and then we can play together when everybody else is asleep"

" I can have my friend's doll ask my friend's mom something I am too shy to ask myself"

Discussion and Future work

The pilot suggested that embedding communication functionality into an existing play activity enable new forms of expression. During the interview children mentioned that they would use the doll as an intermediary to share their feelings with their parents. The children would express thoughts and feelings that otherwise are not easily expressed and enable remote play that is not dependent on the adults. We are conscious that our observations might result from the novelty of the system and that more comprehensive studies should be conducted to test these observations. We hope that this paper will serve the CHI audience as a starting point for future research on tangible communication interfaces for children.

Acknowledgements

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