



Video Play: Playful Interactions in Video Conferencing for Long-Distance Families with Young Children

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ABSTRACT

Long-distance families are increasingly staying connected with free video conferencing tools. However research has highlighted a need for shared activities for long-distance family communication. While video technology is reportedly superior to audio-only tools for children under age 7, the tools themselves are not designed to accommodate children's or families' needs. This paper introduces four design explorations of shared play activities over video conferencing that support family togetherness between children and remote adult family members. We build on research in CSCW and child development to create opportunities for silliness and open-ended play between adults and young children. Our goal is to scaffold interaction across distance and generations.

ACM Classification Keywords

H.5.3. *Synchronous interaction.*

General Terms

Design, Human Factors

Keywords

Family Communication, CSCW, Video Conferencing, Games, Children, Play, Books

INTRODUCTION

Recent reports [1, 3] document the uptake of free video conferencing tools like SkypeTM among geographically distributed families, especially those with children. These families, with parents or grandparents across many miles, may not interact in person frequently but they still work to create a sense of togetherness through the use of communication tools such as phones, email, and video chat. For families with young children, video chat is reportedly superior to audio-only phone calls for children and adults for a number of reasons. First, video seems to be a better match to young children's developmental stages. Especially for children under age 5, the visual nature of video allows

young children to show their ideas as well as telling them through words. Children may stand on their heads to demonstrate a new skill, hold up artwork to share an item they created, or make silly faces to play together. Further, children under age 8 who use the telephone often require a high level of prompting and scaffolding from more skilled adults, seemingly because they have not yet mastered the art of conversation [7]. Video also allows more social cues, such as eye gaze, gestures, and facial expression, to be transmitted, easing conversation. The shared nature of video chat allows adults to more easily support and help young children connect with distant family members. However, video conferencing in itself may not be enough to help remote families engage with young children.

Families with regular video chats need to work in order to create ways to connect with young children [1]. While video is a vast improvement over audio calls for families with children, it remains difficult. Play may provide a means for engaging children and supporting interaction with them at a distance.

The motivation of our work is to support families to connect with distant children through play. Adults naturally engage with young children through *play* rather than *conversation* [4, 5]. Recent research in family communication over a distance [1] also highlights families using play as a common strategy to engage children in remote communication.

However, it may not be easy to play over video conferencing with out any jumping-off point. Our hypothesis is that different kinds of shared activities can help scaffold [17] families' play over video conferencing, which we call Video Play activities. Our interaction designs are informed by Vygotsky's Zone of Proximal Development in which learners are provided with help to achieve goals which are slightly beyond what they may have achieved alone. This notion of *scaffolding* applies both to adults and children. We can scaffold adults to play in ways they may not usually play with distant children. Further, activities can be designed to encourage adults to scaffold children in new kinds of play and learning.

We sought to explore playful interactions first through game mechanics and then book reading to investigate how these different activities might provide insight into how

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families can communicate through play. These are not the only shared activities that could be supported through Video Play, yet they represent a large stroke of the types of play that are already part of families' lives.

In this paper we will discuss a series of four prototypes we created to explore the design space of video-enhanced distance play. Following an iterative design methodology, we conducted a series of light-weight tests with families to evaluate our prototypes and inform subsequent prototypes. We will outline core design principles and then describe the four explorations, two of which focus on a game mechanic for simple interaction and the later two on books where reading structures a play activity. Following the description of each design we will also highlight our findings from trial testing with users and analyze them in the context of our design principles.

RELATED WORK

A number of projects from HCI research have focused on new ways to leverage video conferencing technologies in the home environment. Work like ClearBoard [9] that focuses on face to face interaction presents one example of how open-ended basic activities like collaborative drawing can support relationships over a distance. Technology probes [8] addressed how always-on video links could connect distant families, and Sharetable [15] suggested the opportunities for shared activities like playing board games over video conferencing. Video Playdate [16] explores an array of video-conferencing configurations, both novel and traditional, to facilitate free play between young remote children. This exploration is a promising demonstration of open play at a distance, and we hope to build on it by layering some structured activities over the video conferencing to both complement and inspire more open play between young and old.

Exertion interfaces have explored similar themes of social interaction and connection through remote play. Break out for two [10] demonstrated that partners who play full-body sports together over a distance are more likely to connect emotionally and socially than partners who played using a mouse. We build on their concept of using a shared activity and do engage children's full bodily movement in some situations. Our work differs from exertion interfaces in that our central design principle is not "exertion" per se, but rather "shared activities" over video conferencing, which may or may not require participants' physical exertion. Our approaches to including both the very young (1-5 year olds) and old (grandparents) may include sports, but also leads our work towards toy, media, and game design for children.

The general trend towards more full-body interactions leveraged in systems like Nintendo Wii and Sony Eye-toy may be more appropriate for children than GUI methods, and the Wii's success among the young and old highlights the importance of both interaction style and game design. The fact that some Wii games may be played over a distance and that the Wii may be augmented by children with familiar toys like guns, swords and the like, point to a

general trend towards distance and augmented play. Previous research on kindergarteners and video games demonstrated that even young children were very drawn to video games, but in a way that tended to discourage social interaction [2]. Our work aims to counteract this phenomenon by optimizing for interpersonal relationships rather than addictive game mechanics, for example by creating games that can only be played with another (remote) player present. While players may be motivated to play through extrinsic goals like reading a book or "finding something red," their intrinsic motivation in Video Play is not to win or reach the end, but rather to connect with one's partner through a shared play activity. Play tends to be more open-ended, spontaneous, and improvisational than conversation or typical technology games. In working towards collaborative interaction designs, we look also to the principles of Social Immersive Media [14]. Video Play is rooted in structured activities, but the activities are open-ended so that parents can scaffold and tailor the activities to the child's zone of proximal development, where activities are most salient for children [17].

Other projects are addressing the needs for shared family activities over a distance. Family Story Play is a physical book enhanced with a video chat screen and Sesame Street's Elmo character as a facilitating agent in the conversation. Family Story Play addressed shared activities over video conferencing through a system that enabled remote families to read together over a distance [13]. Some of our designs build on this work, however we are working towards digitally augmenting the books on screen to allow for a greater sense of togetherness. For example we place video feeds of the users inside the book graphics. We also are focusing more on the spontaneous type of play that may emerge while reading in this context than reading itself.

DESIGN PRINCIPLES

Our early designs are guided by a number of principles related to families, social interaction, and technology design. Our principles include:

- *Create a Shared Context.* Game designs should provide means to share an activity and thus envision the context of the remote player. For example, two distributed players may see two identical views of the game.
- *Provide Scaffolding for Conversation.* For example with conversation tips that prompt adults with age-appropriate content.
- *Limit On-screen GUI manipulation.* Leverage existing technologies like GUI's where appropriate, but focus on physical and multi-modal interaction that is intuitive to children and novice computer users.
- *Highlight Relationships through Open-ended Play.* The goal of our activities is to strengthen the interpersonal relationships of the players. We build on basic play patterns like dress-up and book reading that support children to share their thoughts, desires and emotions through the activity.

- *Build on Existing Play Patterns.* Leverage classic toy and game designs that relate to children's - and adults' - interests at stages of development.

EXPLORATIONS IN VIDEO PLAY

The following sections describe a series of four iterative design explorations that address games and book reading activities. Two lightweight gaming designs are presented together, followed by a presentation of two separate iterations on book reading activity. Design, implementation and user trial descriptions are grouped under each section.

Initial trials with families were intended to provide insight into efficacy of our design principles and as a basis for iterative design. A small number of in-lab trials with each prototype were video recorded and later analyzed. In our observations, we looked for signs of engagement, affect, and creation of dialogue.

In our early prototypes we explored simple, lightweight shared activities that distant family could share over video conferencing.

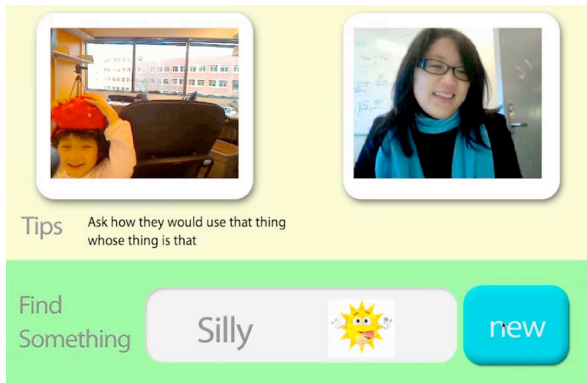


Figure 1. Find It presents simple challenges for children to find objects in their environment.

Game 1: Find It

Find It is an interactive game for an adult and child 1.5 to 6 years old. This game explores how simple prompts can encourage physical and tangible interaction among family members without requiring any special technology. The goal of the game is to find an object that has a certain property and share it with the other party. The players are presented with a simple GUI (Figure 1) with video conferencing windows of the local and remote views and a button for a new "Find It Challenge." If either player clicks on the button, a new challenge will appear for the literate (adult) players to announce. For example, an adult will announce, "Find something Red" or "Find something Silly" and then the other player has to run around the room and find such an item to share with the other player. The GUI also features a series of tips, which are interrogative prompts that encourage the adult to create a conversation with the child about the object they have found. "What is it that you have found? What does it do? Who is it for?" The

game is designed to be physical and active for the child by encouraging them to search in their environment for an object, to provide shared context in that the objects create a basis for shared context and conversation, and to be extremely simple to understand (i.e. no additional technology is required to play the game; the mechanic is simple enough that it could be played with a deck of cards rather than a GUI).

For young children, the adult will likely prompt the child to search for objects and tell stories about them. As children get older, they too may wish to challenge adults to "Find Something Silly," perhaps even racing to see who can find something the fastest, and they debate who has the thing that is the silliest. Future variations on the game can address supporting these multiple modes of play.

Game 2: Farmer's animals

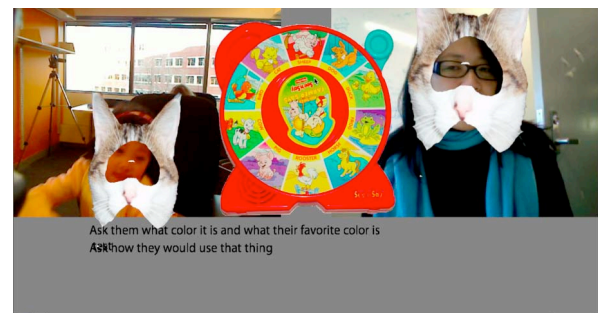


Figure 2. Farmer's Animals uses face tracking to digitally dress up the players.

Farmer's Animals is a game of digital dress-up in which the players wear digital masks of different animals. The UI is inspired by the classic children's toy "Speak and Say" in which a child will turn an arrow to point at an animal and pull a string to hear that animal's voice. In our game, a player will click on the virtual toy and watch the arrow turn and stop at a random animal. Face tracking software aligns a mask of that animal to the player's face so that the players can pretend to be the animals together (Figure 2). The goal is to support adults and children to engage in pretend play and storytelling that is developmentally appropriate for children ages 2-6.

Similar to Find It, Farmer's Animals includes tips for the adult player, such as "Ask what questions: i.e. What is your favorite animal." Other tips include "Use Character voices," and "Relate back to the children's experiences: Have they ever seen that animal before? Where?" The goal of these tips is to encourage parents and grandparents to engage the children in deeper conversation around the play. They were modeled after conversation prompts designed to support dialogic reading between parents and young children [11].

In interviewing adults who use video tools, we found that adults need support as much as children. This may range from helping them to overcome self-consciousness about looks and behavior, or remembering how to interact with

young children. Farmer's Animals is intended to help address some of these concerns by giving adults permission to act silly and support pretend play by focusing users' attention on pretend aspects of their appearances.

Games: Implementation

The Find It, Farmer's Animals were created using Processing and OpenGL. These prototypes used two cameras attached to the same computer and two monitors that were mirrored to achieve a video conferencing effect. Farmer's Animals used OpenCV's Haar feature tracker to track the faces of the users and overlay the digital masks. The Processing application simulated a video conferencing GUI system and used open GL to create alpha layer overlays on the users' video feeds.

Games: Trials with families

We are following a user-centered iterative design methodology, which incorporates user input at multiple stages of development. Along this goal we have done formative field research to understand how families currently use video technologies to connect with each other and have shared conceptual ideas with some of these families. We have also completed preliminary trials with two families (5 users) of both the Find It and Farmer's Animals games, to evaluate the effectiveness of our prototypes at creating engaging conversation and supporting relationships over video chat.

Participants and methodology

Two families — one mother with a 5 year old girl, and another mother with two sisters 2 and 5 years old — played with Find It and Farmer's Animals in a controlled lab setting. Children and mothers were set in adjacent rooms to approximate how the game might be played with a distant parent or grandparent. They could not see or hear each other without the help of our video conferencing prototypes. Each family participated in two evaluation sessions that each featured a unique game.

After a brief overview of how each system worked, the families were able to play with the system for as long as they wanted. At the end of the session, we conducted an interview with both the children and their mothers to gain insight into their experiences with the systems and prior family video conferencing experiences. The sessions were video recorded and later analyzed.

Initial Results

Find It seemed to warm up the children well in comparison to Farmer's Animals. Because it encouraged children to explore the space around them they were more active and engaged. The motivation and goal of having to find something seemed to be enough to keep kids wanting to play for much longer than their parents. Parents wanted the interaction to be more of a two-way and balanced game which was difficult to achieve in our lab setup in which only the children were provided objects to find. This feedback encourages us to develop further modes of play in future iterations.



Figure 3. After being introduced to the system together (top), a 5 year old plays Farmer's Animals with her mom and 2 year old sister (bottom).

Because Find It involved getting up and moving around to find objects, this often resulted in parents not being able to see their children directly and outside of our lab setting this would be even more of a problem. Perhaps a different system, including a portable or wireless camera would be more appropriate so that children and adults could remain in contact. In home environments a co-located parent may also be present which would change the social dynamics.

Parents did use the tips feature as a prompt to direct conversation, sometimes embellishing beyond what was suggested. Parents also explained in post interviews that the tips might be especially helpful for grandparents. In Find It, there was slightly less conversation based on the tips compared to Farmer's Animals, probably because in Find It children were motivated to continue finding other objects. However, in general the tips and the game play in both games elicited a playful response from the parents, who went further out of their way to act in silly ways than the children. We believe that this playfulness played a role in loosening the children up and engaging them. It is our hope that these games will elicit the same response in grandparents as well, who may have less opportunity to practice this skill; hopefully these games will make it easier for all. One question that arose is whether there exists a line demarcating what is "too silly." In the future, we would like to investigate where that line may be for different grandparents, parents and children.

In post interviews parents made it clear that they would like some way to record, playback and organize albums of interactions with their children over the system. They also wanted to be able to create more content with the children as an activity, for example drawing together or sharing drawings. We believe that the digital and physical artifacts that could be created from Video Play sessions may provide a strong advantage over more traditional means of communication, especially for grandparents who do not consistently interact with their grandchildren. Therefore these artifacts may become relevant for asynchronous communication as well as synchronous, and recorded artifacts may help family members to create stronger emotional connections with each other. We are working towards ways to easily create these artifacts within the system, the scope of these artifacts – whether pictures, videos, stories or art – and how they can be displayed and shared after they are composed.

Farmer's Animals seemed to excite children in the beginning. However they seemed to desire more motivation or goal directed play. Children were not able to be encouraged to make up stories about the animals, and parents also did not engage in story telling. After exhausting all the different mask choices there was little interest in the game. This suggests that the interface requires further scaffolding, either in terms of physical action and dramatic play, or in terms of story telling. We are considering including written stories, story prompts, and even cinematic elements that may cast the players as actors in a story landscape.

Our initial tests with users left us with a sense that it might be better to ground the play in an activity that might provide more content and scaffolding for both the children and the parents. We chose to explore shared book reading.

STORY PLACES

Story Places was an experiment to create an immersive shared book reading experience for children and remote adult family members. A physical book was connected to a laptop computer and allowed children to become characters in a digital representation of the book: the current page of the child's physical book was sensed by a book frame, and a digital version of the page content was displayed on screen. Turning a page of the physical book would cause the background image to change on the screen. The child would also appear on screen. A webcam captured an image of the child, and using background subtraction, superimposed the child's body into the image of the book content. The child could also "dress up" as a character in the book by placing a phicon (physical icon) of a character on the physical book. For example, placing a frog phicon on the book would place a frog hat on the image of the child's head (face tracking software positioned the frog hat on his head). Additionally, children could invite a remote family member to join the book-reading experience by placing a phicon in a tray to open a video call to a family

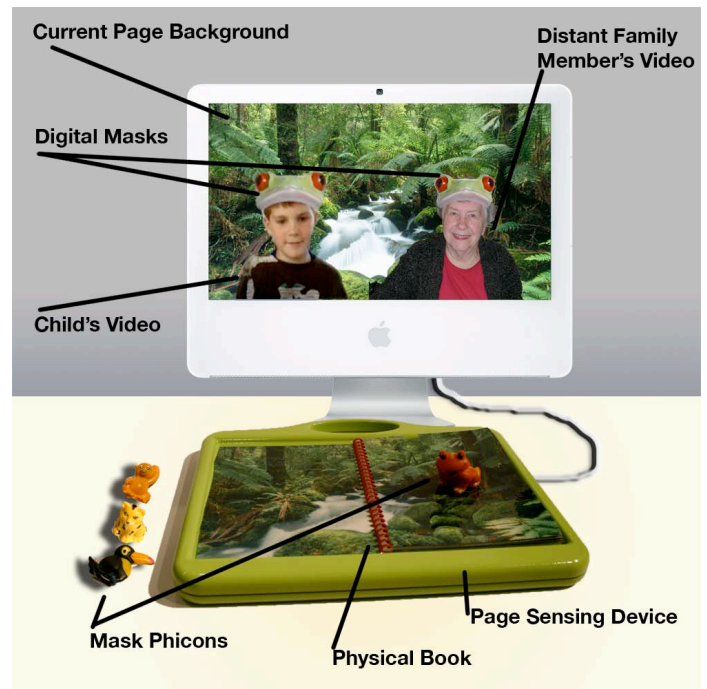


Figure 4. Story Places. Background of the child is changed to match the current page. Frog phicon placed on the book controls how the child is 'dressed up' (here with a frog hat)

member. We intended for the remote family member to use a purely electronic version of the book system.

Story Places Implementation

Story Places consists of two parts: a tangible book reading interface with phicons, and a digital stage. Special books are placed on the book reader, which has a series of light sensors, to read an encoded pattern on the book so as to know which page it is on, and an arduino microcontroller to talk to the computer. The book reader device also contains an RFID reader to sense the presence of mask phicons - small animal toys with embedded RFID tags. These mask phicons control the digital masks that are overlaid over the users faces, which are tracked using OpenCV's face tracking algorithm. The digital stage was created in processing which communicates with the book reader device over serial protocol, changing the background when the pages are turned. A simple background subtraction algorithm separates the users from the webcam video feed and superimposes them over the digital background image.

Story Places Trial

The system was piloted in a non-networked mode with 4 children, ages 6 to 7, in a lab environment. These sessions were video recorded and later analyzed. Our goal was to evaluate the viability of the interaction design, such as children's understanding of the physical-digital synchronization and gauging their reactions to the concept of "digital dress-up." Several interaction patterns became clear.

It was hard for the children to create their own stories and play with the different backgrounds. We had designed this

prototype for open ended play, so that the children could create their own stories with different characters and backgrounds, however this much freedom seemed to overwhelm the children. When prompted to create a story with the characters, almost all the children said "no" or that they "didn't want to." One large take away was that we had to provide more content for the children to play with, they would not always be willing or engaged enough come up with it on their own.

Although the phicons only changed the digital mask children still played with them in different ways, moving them around the book, having them jump, or smashing them against the book. Children seemed to understand and have fun with digital dress up. However, all children frequently shifted their attention between the physical book and the digital representation, indicating a need for seamlessness between the input and output.

Story Places Discussion

Feedback from children and other researchers on Story Places encouraged us to redefine our design criteria and work within the constraints of existing domestic technologies. While we have mixed feelings about abandoning tangible interactions in our designs (as we don't expect that purely visual interactions will be as rich as tangible ones for young children) enforcing a constraint to work within popular platforms allowed us to examine the limits of what simple games, content and activities can add to today's video conferencing technologies.

PEOPLE IN BOOKS

People in Books is a shared book-reading activity in which remote family members are superimposed as characters in the landscape of e-book content. Building off of findings from the Story Places and Farmer's Animals prototypes, we worked to create an experience more linked to content, to offload some of the pressures adults expressed in creating stories on their own.

People in Books strives to create longer engaged richer interactions that have been reported with other book-reading systems [13], while enhancing a sense of "family togetherness" by creating the illusion that the remote family members are in the same virtual space - in this case, both in the context of a familiar story book. The design arose from our analysis of families' trials with the earlier prototypes, in which people did not seem to have a strong sense of "togetherness." With People in Books, our goal is to create a greater sense of shared context, togetherness and provide scaffolding (i.e. content) that explicitly direct adults in a children's activity. Unlike Farmer's Animals, which requires a great degree of inherent playfulness among both children and adults, People in Books introduces a familiar book-reading activity that any adult (and child) will understand.

In the prototype, users' video feeds are immersed into the Children's book "Where the Wild Things Are" by Maurice Sendak. This book relies heavily on the background illustrations, where the characters travel to many locations

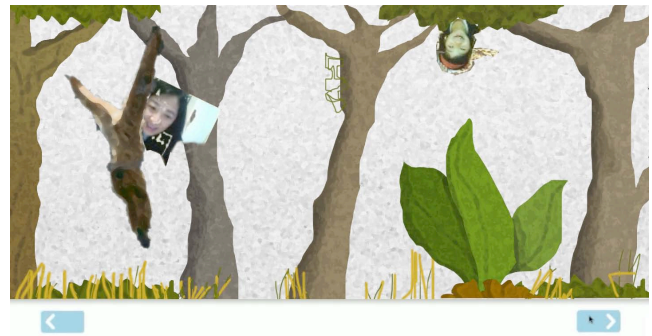


Figure 5. People In Books lets users inhabit the space of story books. Here the child's video is super imposed over the background page of a children's book about a jungle, which makes her seem as if she is hanging from the trees. The Mother's video is placed behind a swinging monkey. Controls at the bottom turn the page.

and perform different actions. We believed that children and parents would more easily transport themselves into this world and act like the other characters. Instead of replacing the main characters, or simply putting the users' faces over the characters, we chose to have the users occupy the same space and go along the journey with the main Character as if they were his friends, following him. The text of the book was unchanged and did not make any mention of these other characters. It is worth mentioning that there are many different ways of placing users inside of a book, and in further work we would like to explore other interactions.

This system builds off of educational research that shows that both children's language and print skills improve when parents read in a style that encouraged their child to actively participate during book reading interactions [11,18].

People in Books Trial

Several weeks after testing Farmer's Animals and Find It, a mother and her five-year-old daughter from the initial trials used the People in Books prototype in their home. The mother was seated at a kitchen table with a laptop computer, and the daughter was nestled under the table, viewing an external monitor and camera. A single application drove both monitors with the displays mirrored, to simulate a remote reading session. Parent and child could not see each other without the software, but they could hear each other normally. We plan to conduct a longer in situ study in the future, but present our initial findings.

Two researchers briefly introduced the prototype to the mother and daughter and asked them to read the book. After the reading, the mother and daughter were interviewed. The session was videotaped and screencast, and the footage was later transcribed and analyzed.

Compared to the other Video Play games, People in Books stood out as the most successful at supporting longer interactions and creating a greater sense of family togetherness. At the second page of the book, the mother

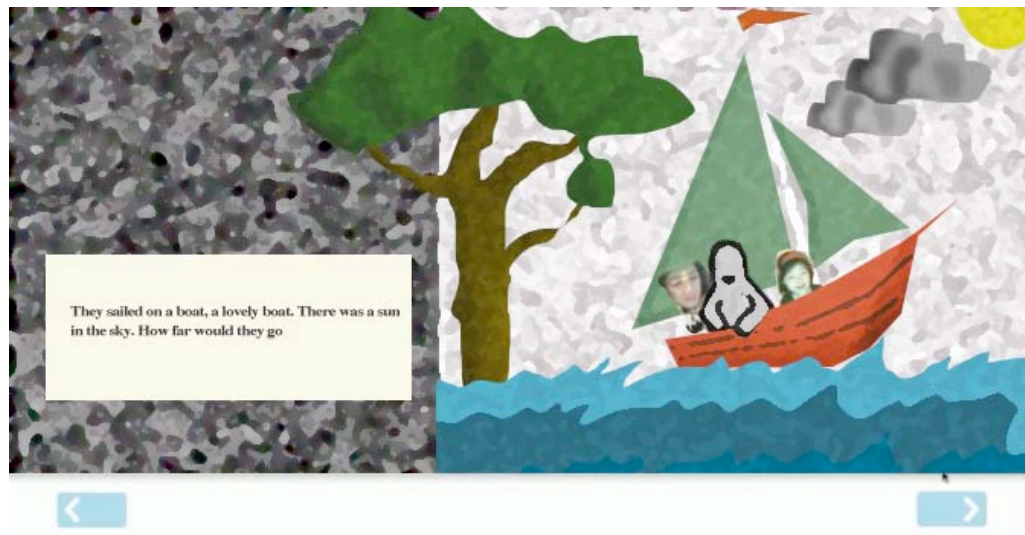


Figure 6. People In Books. Video feeds of the mother and child are placed on the boat in a page from a children's book.

commented, "This one doesn't feel like we're separated. I feel like [I am] more close with Nicole." The family continued reading. Mom: "Oh where are you Nicole?" Daughter, "I'm over here (pointing) inside the ... Up higher than you!" The mother and daughter engaged in dialogic reading styles we designed to support. The mother asked, "Do you know what that is Nicole? ...What do you think Nicole? What's that? Can you guess?" And the daughter responded, "He thinks he smells good things to eat."

In the post-interview, the daughter commented, "I wish I could do this again." When asked why, she explained, "One of the pages you could hide and it was kind of fun." The mother continued, "this is a great way to read, attach to the story, to communicate. I can do this even here at home." Her daughter agreed, "When I'm sleeping in a different bed, mommy can still read from the computer." In future work, we hope to support co-located readers so that parent and child can see themselves in the book while sitting together side by side.

The mother compared this experience to her previous experience with Farmer's Animals. "It's more natural than the last one we did. Like we had a face, an animal face. That was funny, but this setting is very powerful. You're in a picture book. People naturally like to be in unusual settings." Imagining how this project could relate to her husband who travels frequently to new places, the mother began conceptualizing her own designs. "I would be interested in taking a picture, uploading it, and then you could do this, it would be powerful too, to actually be in the picture would encourage her to [engage]." In contrast to standard video conferencing, which clearly portrays that people are in separate places, 'People in Books' stages both the child and remote parent inside the world of the book where they can play together. The illusion of visual

togetherness seemed to give the mother and daughter the feeling of emotional togetherness we sought in conducting this work.

DISCUSSION OF DESIGN GOALS

In looking back on our design explorations and also to our design principles, there were some themes that evolved and permeated through the projects.

Shared Context & Virtual togetherness

Our work strives to create a sense of "togetherness" in various ways.

Video Playdate discusses the problem of intersubjectivity with children and video conferencing, suggesting that we view video conferencing for children "as an opportunity to play together 'inside the TV.'" She suggests accomplishing this by splitting the screen in two so that each child equal size, instead of the standard picture in picture [16]. We also visually portray togetherness in all of our prototypes by ensuring that both people always see each other on screen. Additionally in all of our designs, we ensure that the views are consistent across distant screens. This is important not just for young child, who sees things from their own perspective and assumes that everyone else sees the same, but also for parents or family members at a distance who need to scaffold children. It would also be easier for them to highlight specific content or interface components for the children if they are viewing the same thing.

But beyond this, in both Story Places and People in Books our interface attempts to break down the windows that normally confine users to separate places and instead bring them into a different world. Instead of "talking to grandma on the phone," or going to her house through video conferencing, children and long distance family are going somewhere else exciting together. We try to create the illusion of sharing a space that is integral to the activity, for

example by putting users inside of the book. People in Books goes even further by placing content in front of users, moving them around the scene, sizing them and rotating them relative to the illustrations to create a feeling that they are immersed in the world of the book. Children and long distance relatives can be on a boat together while reading about the boat. Being "together" with an activity allows you to *do something together*.

Physical Interaction

Given that telecommunications technologies are overwhelmingly non-physical (visual and aural) one challenge has been to engage children's physicality during remote play. We have pursued this in several ways. Tangibles are well known to foster communication, thinking and creativity for children [12] and Story Places employed physical icons as controllers. While engaging, they lacked the ability to share their state with remote parties. In screen based interactions, we sought to engage physical interaction without the use of tangible interfaces.

During the Find It game this behavior was very apparent. One child when asked to find something silly, found a red deflated ball and proceeded to bounce it around, shake it, and finally wear it as a hat. This play facilitated conversation and laughter. Find It allows for more physical interaction by having a human in the loop; this other actor serves many roles to encourage play and conversation, acting as an audience, a participant, part of the game mechanic.

By building scaffolding and bringing in physical objects from their surroundings, children and parents can improvise and repurpose these objects to create more dynamic communication in play. Traditional digital interfaces can be very rigid and deterministic, but if we create them with an eye for improvisation children will be more free to explore and open to imaginative play. Tangible objects do not have to directly be sensed by the interface for them to scaffold physical interactions for children; our designs suggest they can succeed as props and topics for discussion.

Scaffolding

A large goal of this work has been to provide scaffolding for interactions between distant families. We have explored in our prototypes different ways to create this engagement, from content, physical objects to tips and prompts.

A large take away from Story Places and somewhat from Farmer's Animals, was the need for more content. Both projects were primarily blank slates, with minimal enhancements such as digital masks and different backdrops. Although our goal with the backdrops in Story Places was to allow the children to have a world where they could create their own stories in the jungle setting, in the end the children seemed more likely to bounce around and play with the face tracking than engage in pretend play. In contrast, People in Books was more successful at providing better scaffolding for play. By grounding the children and family members in a book with a written story, children seemed to feel like they were part of the story, and could

act out different roles. This also seemed to be more natural for parents too, who had trouble encouraging their children to come up with stories on the fly. They could now rely on the words on the page but also engage children in questions about the setting, for example about the boat they were on. Content allowed for more conversation. But content also allowed the adults to act more silly, and better engage the children. One parent commented on how it seemed that this type of interaction would be great for grandparents, because "because they don't know how to approach children" and this type of system would warm them up to the children.

As discussed in the prior section, physical objects seemed to spur discussion and interaction. We even witnessed interaction across the video stream, where the child spoke about the clothing her mother was wearing when looking for something blue. It seems likely that there could be other ways of bringing in real world objects, without embedding them with sensors like in Building on Everyday Play [19]. The tight coupling between physical objects and games or interfaces could instead be facilitated by family members, especially when the goal is communication and conversation.

We continue to explore the use of simple textual prompts that may help parents or other family members. However it has yet to be seen if these prompts are as successful as building the scaffolding into the design. It maybe harder for parents or distant family to attend to both actively playing and remembering to look for prompts and act on them. There seems to be a large space for exploration in providing scaffolding for conversation during distance play.

FUTURE WORK

Our current prototypes only allow for lab based study, so we intend to build fully functioning prototypes that can video conference over the web, with the aim to run an in-situ study over the course of two weeks in which a family and a long distance relative can use the prototype in their own home. We hope to gain much insight into play and interaction patterns, when children are more at ease and also learn how this type of interaction would fit into a family's daily life and busy schedule.

We would also like to explore how these types of interfaces can support asynchronous interaction between long distant families. How can technologies allow families to record and share this content, and how can we make it easier to find and look back at interesting and memorable interactions? We are currently looking at ways to leverage distance communications to support remembering and nostalgia.

In addition we would also like to explore how to make these interfaces more flexible for different types of users, whether children or grandparents. Our interfaces could grow with children and present age appropriate material. But also the interfaces could be changed to better suit a grandparent or a parent, as some parents may see their

children all the time but grandparents may have less frequent interactions.

CONCLUSION

Video Play presents four shared activities to support long-distance family communication. By augmenting traditional video conferencing tools with open-ended play-based activities, we are working to support the needs of young and old family members to connect over a distance. Our prototypes are designed to meet the needs of young children ages 1-7 and their adult family members, and provide scaffolding for both children and adults to engage in playful activities and conversation while using video conferencing technologies. Results from initial trials indicate that the activities engage both young children and their parents in sustained play, and our notion of parental scaffolding is effective but incomplete. Through an iterative design process, our work moved towards book content as a means for providing this scaffolding and results from design explorations and trials indicate possible future directions for video based activities for distributed families. Future work can build on these initial experiments and work towards longitudinal evaluations of this research.

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