The Family Room: A Multi-Camera, Multi-Display Family Media Space

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Abstract
The Family Room is a multi-camera, multi-display media space for families. It allows family members to easily share audio and video connections between multiple devices across different households. This is ideal for connecting grandchildren and grandparents for talking, viewing, and sharing activities. The common model used for video chat systems involves people calling one another and accepting or declining invitations. As an alternative, the Family Room uses a room metaphor where each device or location simply needs to join or enter a persistent virtual 'room' in order to share video and audio between locations.

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Video conferencing, families, media space

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Introduction
Video chat allows family members to connect over distance to converse and share experiences [6]. This is especially true for grandparents and grandchildren who live far apart. Yet it can often be really difficult for parents to setup a video chat environment to connect with grandparents [1][5]. Similarly, grandparents may

Figure 1: The Family Room shows multiple video feeds in a web browser.

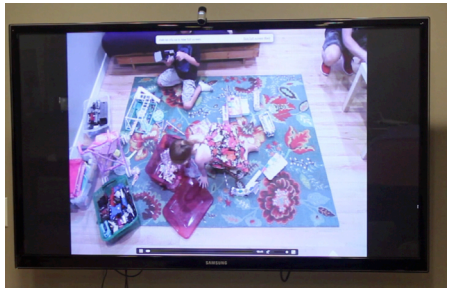

Figure 2: The Family Room running on a large wall display with a single location selected to show an overview of a play area.

find it hard to connect with the remote household. With commercial software, each household needs to setup an account and connect to one another. This process can often take significant time and effort and may require a lot of troubleshooting.

When connections are finally setup, other problems arise including issues framing children in the camera's view [1][6]. If only a single device is used, children may easily argue over who gets to use the video device. Commercial software (e.g., Skype, Google+ Hangouts) can allow multiple devices to connect together to alleviate this issue, however, setting up multiple devices together in a single call again requires a lot of work, multiple accounts, and parent scaffolding.

To explore and try to improve this design space, we prototyped a multi-display and multi-camera video chat environment called the Family Room, shown in Figure 1. Our goal was to create a simple, straightforward way for children, parents, and grandparents to connect over distance using multiple devices with video and audio connections.

Related Work

There has been a variety of family media spaces designed to support family connectedness over distance. The Family Window provides an always-on video connection between two homes [7], while Family Portals provides a connection between three homes [8]; neither provides audio links. Our work builds on these designs by exploring *n* device or home connections in a single shared space. We have also added shared audio across locations. The Share Table provides a video link and shared interaction surface between two homes with an emphasis on allowing parents and children from divorced families to play together [14]. Again, this focuses on home-to-home connections where only two locations connect.

Others have designed video chat systems that embed video within tangible objects such as children's storybooks [12]. Our focus extends this work to support the sharing of multiple activities (e.g., various types of children's play) beyond just storybook reading. We also see studies of how children use different styles of displays and camera configurations [15]. This is similar to our work, however, we have embedded the same display types within a single video chat environment.

There also exist workplace media spaces that use a similar connection model as the Family Room. In TeamRooms, intimate collaborators enter a shared online workspace, or 'virtual room,' where they can share collaborative artifacts. Colleagues can work together either synchronously or asynchronously. The Notification Collage provides a shared and persistent online 'bulletin board' that collaborators can connect to in order to share video snapshots and other artifacts [4]. The Community Bar builds on the Notification Collage by supporting multiple rooms or spaces that collaborators can join [9]. Our work builds on this research by applying a 'room metaphor' to family media spaces.

The Design of the Family Room

The Family Room runs in a standard web browser on computers, laptops, and tablets. Figure 2 shows the system running on a large wall display connected to a computer. With the Family Room, there is no need to download special software or create accounts for each

Figure 3: Children use multiple tablets to share video with grandparents.

location or device. A person just needs to navigate to a single password protected URL and startup the Family Room. Other families can then navigate to the same URL and connect to the Family Room. Each device's video appears in view at all locations and audio also transmits (Figure 1). Connections can be started and stopped and audio can be adjusted on a per device basis. Viewers can also choose to show one view full screen, as shown in Figure 2. Thus, family members may focus in on one particular individual or area, or see all of the different views that are currently connected to the media space.

The main difference between the Family Room and commercial video chat software (e.g., Skype, Google+ Hangouts) is the connection model that is used. Commercial video chat software typically follows a "phone call" model where a person selects a user from a contact list and then invites or calls them. Remote users can then accept or decline the invitation to start a video chat session. The Family Room 'flips' this model in an attempt to make it simpler to connect with others as well as easily support multiple devices. Rather than call one another, family members simply have to join a single persistent location (located at the Family Room URL) to be a part of the media space. When they join, they see and hear other locations that have also established connections. Thus, the Family Room uses a 'room metaphor' where people can come and go from the connection by entering and leaving the 'virtual family room' [4][9][13].

Design Experiences

Our design experiences and testing of the Family Room with our own children have revealed several useful scenarios and setups. First, a family can set up the Family Room to be 'always-on.' With the video running continuously, the Family Room acts as an awareness portal like other past family media spaces [7][8] so people can get a sense of what is going on at the remote household. This has been shown to increase feelings of connectedness in other research [7][8]. In this setup, families can also pause their video feed as needed, depending on their privacy concerns. We caution that an always-on configuration may not work well for everyone. Past research has shown it to be most successful for people who share a strong relationship [8].

Second, a family can connect to the Family Room for shorter durations of time when they want to converse with remote family members or share activities of short duration. This would be akin to a single video call. While the style of interaction is akin to a 'phone call' where people mostly converse, the model used to connect with others still relies on a 'room metaphor.'

More generally, we have also found that it can be valuable to have a large display showing each remote location as an overview of the room along with smaller handheld devices that show close-ups of different family members. This works especially well for situations involving multiple children, as shown in Figure 3. Alternatively, we have also found it can be valuable to place devices with cameras in various places in the room at different angles. This gives the remote viewers options for which views they look at. If children migrate throughout the home, tablets placed in various rooms can easily capture this movement for grandparents.

Discussion

While we have designed the Family Room to primarily connect grandchildren and grandparents, we see its value for supporting many other relationships over distance. For example, long distance couples may find it valuable for connecting their homes in a manner akin to how they already use tools like Skype to 'virtually live' together [11]. Yet with the Family Room, long distance partners could easily move throughout their home and still see each other using multiple camera views. The Family Room could also be used by adults to connect between their work and home locations to interact with a partner or children during the day [10]. Teenagers could use it for group 'hanging out' [2]. We also recognize that video chat systems can have the potential to bring about relationship issues [3][8] and this should be carefully explored as part of any usage of systems like the Family Room.

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