ABSTRACT
Family members often want to share experiences and events in their lives even when they cannot be in the same location at the same time. In many cases, at least one family member is mobile. Video conferencing systems permit sharing experiences and everyday events; however, it is often not possible to use them while mobile. To explore this design space, we prototyped a mobile media space called Peek-A-Boo that provides two-way live video sharing between a mobile phone and a digital frame in the home. Family members can use the media space to gather availability awareness and also share episodes of everyday life by augmenting voice calls with shared video. These features can help family members feel more connected when separated by distance through sharing experiences in the moment.

Author Keywords
Media spaces, mobile phones, families, awareness, video.

ACM Classification Keywords
H5.3. Information interfaces and presentation: Group and Organization Interfaces – Computer-supported cooperative work

General Terms: Design, Human Factors

INTRODUCTION
Family members often want to share experiences even when they cannot be in the same location at the same time [2,4]. For example, a parent at work may want to see his child’s first steps at home. Similarly, extended family such as grandparents may want to participate in the lives of their children or grandchildren and see their various activities, e.g., a child’s ballet recital [2,4]. Video conferencing systems can permit families to share these activities over distance, however, video calling is typically only available when using a computer at home. Laptops can support video calling while mobile, but only if the laptop has network connectivity. Moreover, the size and shape of laptops often makes them awkward for video calling when outside the home. Video conferencing systems for mobile devices are still in their infancy and users often face technical hurdles to use them [5].

Video media spaces have also been designed to support families’ sharing needs, and their always-on nature means families can passively share episodes of everyday life with little effort [2]. The drawback, again, is that such systems are currently not easily available outside of the home where a large number of family activities may occur.

To explore this design space, we have prototyped a mobile media space for families called Peek-A-Boo (Figure 1). We describe its design and expected usage in the associated video as well as the following sections.

PEEK-A-BOO
Peek-A-Boo shares live video between a mobile phone and digital frame in a family’s home (Figure 1). We prototyped this experience with an iPhone 3GS and touch-sensitive Tablet PC. Most media spaces of the past provided always-on video and/or audio connections [1]. We relaxed this requirement and made the media space easily accessible. The mobile client is turned on and off by launching/closing the iPhone application; this intermittent usage is the reason for the name, Peek-A-Boo. The home client is always running and visible on a dedicated display. Once the iPhone application starts, video is automatically transmitted between the two devices. Video frames are transmitted once
every second at 320 × 240 resolution; this helps reduce bandwidth issues. The persistent availability of the video connection means it is simple to connect between the two locations, requiring only a single button press.

**Mobile Client.** The mobile client (Figure 1, left) shows two video streams. On the top half of the display, users see the video as it is received from the home client. On the bottom, users see video sent from the iPhone. This provides the user with feedback in order to direct the iPhone’s camera at objects or scenes of interest. Given the placement of the iPhone 3GS’s camera on the opposite side of the device as the display, it is easier to capture video of a user’s context as opposed to the user herself.

**Home Client.** The home client (Figure 1, right) shows the video stream from the mobile client in the center of the display. The home client’s outgoing video stream is shown in the top right corner of the display to provide local feedback. A timeline along the bottom of the display shows previously received video frames. Users can select past frames to view them. When selected, these frames are displayed in the main portion of the display.

**Privacy.** Since the home client is always running and making video available to the mobile client, reciprocity is enforced to ensure the mobile user cannot surreptitiously view the home. This is done by automatically transmitting video from the mobile client to the home client when the user starts the iPhone application. Thus, it is impossible to connect with the home client and not leave a trail of one’s activity. Home users can also adjust blinds to obscure portions of the transmitted home video. Based on previous studies [2], we anticipate blinds to be useful when guests visit the home. When only family members are home, we expect privacy to be less of a concern [2].

**RELATED SYSTEMS**

Several systems have been designed that offer similar features. ASTRA allowed family members to send photos or notes from a mobile device to a public display in the home [6]. Our design is similar although it supports two-way sharing of continuously captured video snapshots as opposed to unidirectional image sharing. The Family Aware system allowed family members to share their location, calendar, messages, and photos between mobile devices [3]. Thus, again, it did not support live video sharing.

Apple’s recently released FaceTime permits live video calling between two iPhone 4s, however, usage is restricted to WIFI networks. FaceTime also operates like existing video conferencing systems and requires users to explicitly call one another. This contrasts Peek-A-Boo, which has an always available dedicated connection to one’s home, thereby permitting both asynchronous and synchronous use.

**USAGE SCENARIOS**

We see Peek-A-Boo supporting several scenarios of use:

**Connectedness.** Peek-A-Boo can help distance-separated family members share their everyday experiences and feel more connected. For example, when traveling or at work, a mobile user can connect to home with Peek-A-Boo and see his family’s activities. Thus, family members can share experiences such as a child’s first walk, story time at night, or bath time. Similarly, the mobile user can show family members at home what he sees or is doing. Extended family such as grandparents could also share experiences with their grandchildren or children. The mobility of the mobile client makes it easy to share events that occur outside the home, e.g., a child’s ballet recital or soccer game.

**Interaction.** Peek-A-Boo can aid interaction over distance by letting people augment their existing audio phone calls with video. For example, if a mobile user is at a grocery store and wants to show a home user several items of interest, she can enable Peek-A-Boo to share live video while talking on the phone. In contrast, the mobile user could similarly use MMS to send images of products, yet sending several images would be time consuming and not as instantaneous as using Peek-A-Boo.

**Availability Awareness.** For the mobile user, Peek-A-Boo can provide availability awareness of the family at home in order to time phone calls or other interactions. For example, if the mobile user is at work and her spouse is at home watching children, she can use Peek-A-Boo to see if he is currently occupied with the children before phoning to talk. This can help alleviate interruptions.

**DISCUSSION & CONCLUSION**

We have yet to formally evaluate Peek-A-Boo but we did use the system ourselves over the course of several weeks during its design. Currently, the largest limitation is the asynchronous usage by the mobile user. Live video from home is easily accessible by the mobile user, but home users must ask the mobile user to start the media space in order to see live video. We plan to explore this in the future.

**REFERENCES**