Moments: Family Video Recording Right Here, Right Now, on That Day

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Abstract

It is easy to forget how widespread video recording and surveillance has become in public places, but what if similar technology could be used help families capture priceless memories, check in on each other, or observe changes in their domestic activities over time? This project presents the design of an always-on family video recording and playback system called Moments. The goal was to explore privacy concerns and reflection in home settings. With Moments, video is recorded in one or more home locations continuously, but playback is restricted to the same location and time of day. As a work in progress, this paper describes the initial design process and implementation of the Moments system.

Keywords: Photos and video, families, surveillance, memories.

1 Introduction

The ubiquity of cameras in public places like retail stores, for example, means that someone with access can retrieve video of nearly any event in the space at nearly any time. In a store, the event might be a theft or the behaviour of employees. But what if similar technology could be used to help families record important moments in their lives, or help keep them present in the action rather than operating a camera themselves? A child's first steps could be captured effortlessly by a ubiquitous camera array in the family home. Instead of watching through a video camera, parents could watch with their own eyes while their kids blow out candles on their birthday cake. The whole family could participate in an event for the first time, while cameras record the best moments without intervention.

While beneficial, ubiquitous video recording in the home brings up a unique set of concerns. *What locations should the system be designed for and installed?* There may be areas of the home more suited for continuous recording like common spaces such as the kitchen or family room. Other spaces may be less interesting (like an isolated hallway) or appropriate (perhaps a bedroom) for such recording. *When should recording take place?* Video could be captured in all places at all times, or only when someone is home, or even during specific times like meals. There may be times when a family might wish to pause recording, like when certain customs are practiced or when visitors are present. *Where should the recordings be stored and accessed?* Families might be concerned about their recordings being accessed outside of the home, or by non-family members. The video and metadata could be stored in the home itself on a private network, offering potentially higher security than if it was stored offsite. *What kind of media should be recorded and for how long?* One could capture images periodically with a multitude of frequency options, or one could capture continuous video. It is also possible to capture various amounts of meta data like the room media is captured in and the number of people in the media. Families may be concerned about whether other types of media (like audio) are recorded, too, and the implications of such recording.

Throughout the rest of this paper, we explore these ideas and the design solutions we chose for an initial version of a media recording system for families called Moments. Next we describe related literature followed by a description of our design.

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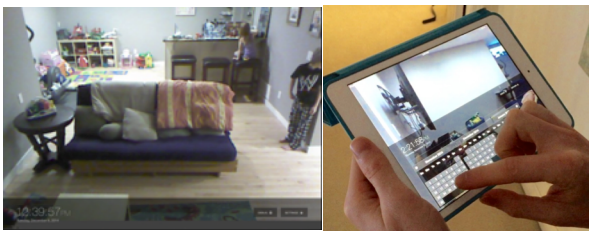

Figure 1: Moments showing video from a previous day.

2 Related Work

The videoProbe [1] is a camera and display system that captures still images automatically after detecting movement. It is intended for use in family homes, and synchronizes pictures with other videoProbes in remote homes that are part of the same family network. Our system also captures images in family homes, but focuses on continuous capture where there is no video transmission to outside locations. The Other Brother [2] is a small device for use in the home that captures unplanned or spontaneous photos, along with audio and video based on the direction and volume of ambient sound. It focuses on "lightweight" recording—natural rather than posed media. Our system focuses on video only and not audio or stills, and the review experience is more closely tied to a physical location and time than the spontaneous media shared by the Other Brother webpage. TIMELINE is a system that facilities the recording and rapid review of video (Nunes, 2007) from multiple workspaces in a lab setting. Participants may watch each other work in real time, or see recorded footage from earlier. Our system is related in that it also records continuous video, but our viewing application centers on previous events and has more rigid constraints (time and place) to guide the viewer experience. The Family Window [4][6] and Family Portals [5] are always-on video devices that share live video feeds with the homes of remote family members. Our system also focuses on video and helping connect family members, but our approach addresses differences in time rather than distance. Our system also focuses on in-home access to recorded video by a single family, and not the sharing of video outside the home.

3 Prototype Design

Moments is a video capture system for family homes and includes distributed video cameras (Kinect sensors), and a playback application where the footage can be reviewed. The goal of the system is to record family activities in shared spaces at all times (such as the living and dining rooms), and replay them at the same time and place on a later date (the next day, week or year, for example). The system is designed to help users reflect on past moments and experiences that took place in certain areas of the home.

We designed Moments using an autobiographical design approach [6] where one of the authors used it in his home with his family, including three young children and his wife. The system

was used regularly to capture activities occurring in the home, and the design was iterated based on this usage and the family's needs. Improvements were made to easily pick and move through dates and show one location at a time, along with architectural changes to ensure data is kept on a local server within the home. Next we describe the final design iteration and the rationale behind our design choices.

3.1 User Interaction

Users interact with Moments in two ways. Firstly, interaction is passive as cameras in one or more locations continuously record family members as they go about their everyday activities in the home. During our autobiographical design usage, we found that the best locations for capture were in more public areas of the home (e.g., living room, rec room, kitchen) where family members frequent. Secondly, a family member can review recorded video on a playback device (a tablet or smartphone running the Moments app) on a later date, but only when they stand near the same recording location at the same time as the recording originally occurred. The system offers families the opportunity to watch for patterns in their lives, and spot changes as they occur in family members and routines. It also brings up important questions surrounding privacy, and how much value families would find in this type of ubiquitous recording.

3.2 Usage Constraints

What makes Moments special is the unique set of constraints placed on the playback of its recorded footage. In order to watch a recorded event, the user must be in the same room at the same time of day as the event took place. Users can choose which room they would like to view footage from by physically moving to that room, and the app allows them to scrub (seek forwards and backwards) between the dates they would like to review.

The interaction decisions described have been made with intent. By limiting the viewing experience to the corresponding time of day, each view of an event can be made more valuable. That is because a particular event can only be seen once per day—rather than played over and over again like an Instagram, Vine, or Facebook video (or even surveillance footage). This also helps to limit surreptitious viewing and reviewing of moments that might be embarrassing, as one could do with an application designed more strictly for surveillance.

The benefit of constraining based on location is to create a strong sense of place in addition to the connection to particular a time. The event being reviewed happened right here, right now, back then. The idea is to form the best possible sense of the moment recorded, by using stimuli (the actual place and time) in partnership with the video.

We had also considered allowing users to create composite videos. For example, footage from multiple days could be overlaid or presented in a split view to allow family members to make direct comparisons between the slices in time. Ultimately, though, we decided that such a feature might complicate the system without adding significant value. Composite video can yield impressive results, like the time lapse films that Frans Hofmeester created of his children growing up [3], but they rely on significant skill and planning of their creators in terms of framing, position and blending.

Another important constraint to consider is the omission of audio. When reviewing an event in the Moments app, the user is exposed to the recorded video from the earlier date and the current ambient sound of the room. For example, a viewer might watch a recording of a loud birthday party from several months earlier, while hearing only the faint singing of birds outside or the hum of an appliance. We felt this experience would force the user to be present in the moment rather than have it "spoon fed" to them. It might even create a more surreal experience than if the audio had been included.

Another notable impact is that of the perception of privacy. In previous work audio recording has been identified as a particularly disturbing type of surveillance [8] with potentially more privacy issues than video [4][5]. By omitting it completely, we stand to create a system that addresses its system and user goals while creating less controversy surrounding privacy.

3.3 Implementation

The system's frontend is implemented as a web application that is used to review recorded footage. The backend is an array of computers, location beacons and Kinect cameras that gather and record the data for the frontend to display. Our software combines the still images into video, which can then be requested by the tablet / phone application based on the current location, time, and requested date. All data is stored on a local server within the family's home, so there is no concern over access from those outside of the home.

To help alleviate concerns with large amounts of data storage, we reduce the frame rate of the recorded video for points that do not contain people. However, we chose to still record video at these points in time in order to capture changes in the ambience of the room (e.g., lightning changes) that might still be interesting for family members to see.

4 Conclusion

This paper outlines the design process and early implementation of the Moments system. We have identified the constraints that we are interested in exploring (location, time, sound), discussed our initial implementation strategy, and categorized some of the usage scenarios we anticipate users will find for Moments.

In the next phase of our project we plan to explore the long-term usage of the system over months and even years to understand how it affects family routines, what privacy concerns people have, and how usage and behaviour change over time. The system will continue to be used in the family's home so it can be tested under realistic conditions.

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