Vasque: A Privacy Preserving Casual Communication System based on a Circular Mirror Metaphor

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Abstract

An always-on video communication system can increase the opportunity for casual communication between remotely connected users, but privacy concerns prohibit the wide usage of such a system. To address this problem, we propose a new system for remote communication, which has wide-angle lens that faces the ceiling, and which allows an always-on connection while protecting the privacy of unintended users and keeping the background scenery naturally out of the line of sight. Furthermore, a circular mirror metaphor allows both local and remote users to participate in the conversation as if they were at the same roundtable.

Author Keywords

Video communication; privacy; casual conversation; circular mirror metaphor; daily life

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Design, Human Factors

Figure 1. The Vasque system.

A PC with a touch panel display

A wide-angle lens & Camera

Figure 2. User can begin communication by peering down towards the display using the wide-angle lens and camera that faces the ceiling.

Introduction

It is desirable for long-distance communication between people to appear as close and natural as possible. Many consumer-grade video conferencing systems achieve such communication, but it is still considered difficult to start a casual conversation where the communicating users feel as if they are in the same room and sitting at the same table. Users typically schedule the time of a video conference via email or phone call in advance. Owing to this additional step in communication, traditional video conferencing systems do not allow for casual communication. Furthermore, the location where a video conference is to take place is pondered over carefully since a place with background features containing bystanders, unrelated landscape, and other unnecessary and distracting visual images is undesirable. Further, always-on media spaces reduce the technical effort required to establish ongoing connections, which are effective for remote communication between households [1], but it is not desirable for a house to have always-on video broadcasting. To address these problems, we propose a new system called Vasque, which allows users in different locations to connect with each other and increase the frequency and opportunity for casual communication.

Vasque

As seen in Figure 1, Vasque supports casual communication by maintaining an always-on state while protecting privacy. The system comprises a circular mirror interface that incorporates a wide-angle camera that is oriented towards the ceiling to protect the privacy of users, and a touch panel display. Owing to the orientation of the camera towards the ceiling, a user can only see and hear the video image of the

remote user and only a local image when he/she looks down at the display. This arrangement alleviates privacy concerns because the same amount of information is exchanged between both parties. Moreover, by assuming always-on video communication, the frequency and opportunity for casual communication between remote users increases. In addition, the circular mirror interface allows users to join and start conversations as if they were at the same roundtable.

Privacy
Owing to the view provided by the 170° wide-angle lens, users reflected in the camera's field of view can be defined by their distance from the camera. With this system design, capturing of unnecessary images of background landscape and figures (Figure 3) is avoided. Furthermore, when there is no object moving within the field of view of the camera and/or a person is not within a certain distance, the system automatically mutes the voice channel, thereby alleviating privacy concerns by avoiding the inadvertent picking-up of communication.

Participant

The camera's field of view
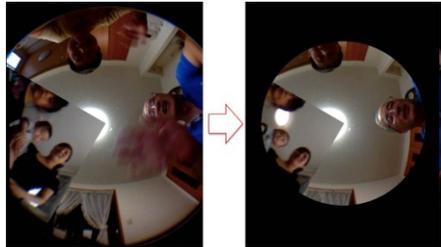
background landscape and figures
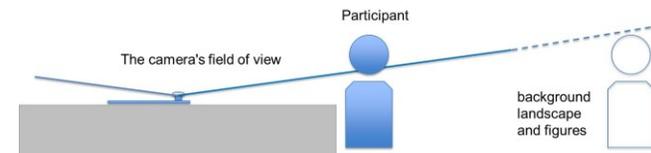
Figure 3. Owing to the wide-angle view of the lens, users reflected in the camera's field of view can be defined by their distance from the camera.
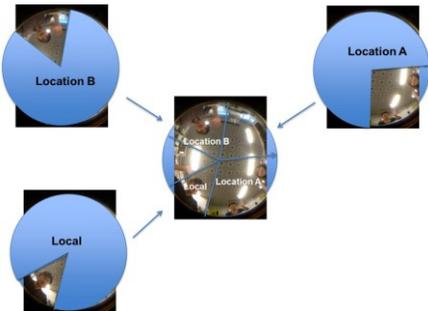
Depending on the state or relationship of a remote user with other people in the background, he/she may not see their entire figure, but only their faces or background. By
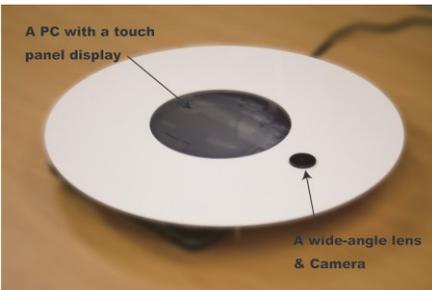
Figure 4. By adjusting the field of view using a "pinch" gesture on the touchscreen, the user can limit his/her shared view.

Figure 5. The Vasque system divides a video image into pie slices and places them on the circumference of the circle while sharing the image on the main screen.

adjusting the field of view using a "pinch" gesture on the touchscreen, as shown in Figure 4, the user is able to limit his/her field of vision to be shared with him/her, thereby ensuring privacy from the background people.

Circular mirror metaphor
The Vasque system divides a video image into pie slices and places them on the circumference of the circle while sharing the image on the main screen (Figure 5). This gives users the perception of peering down into the same mirror, thus enabling a sense of togetherness.

Visual relationship
User can select a "slice" of the image freely and arrange a visual relationship for each participant by dragging the image slice accordingly. Therefore, it is possible to arrange visual relationship into a conversation metaphor to allow a real-space conversation. As shown in Figures 6 and 7, the face-to-face arrangement of slices allows for a more formal conversation while an adjacent arrangement of slices allows for a more intimate conversation.

Pilot User Experience

We recruited a total of twelve participants: eight students from our research laboratory and a four-member family including a seven-year old child. We grouped them into three groups of four people each as Lab A, Lab B, and Family A. In each group, one participant sat in one room (called the remote participant) while the other three (local participants) sat in another room. Participants sitting in the two rooms had a free conversation for 10 minutes using the proposed Vasque system. Then, we assessed the experiment by recording videos and conducting interviews/surveys following the test.

Discussion

Effect of the circular mirror metaphor
A Lab group remote participant mentioned that because he could see all the other participants' faces on one screen equally, it was easier to communicate with all of them simultaneously, while the other participants mentioned that they felt as if they were in the same location as the remote participant. One Lab B participant said that he felt closer to the remote participant, but ironically felt distant from the local participants. Some local participants felt that the remote participants had a positive impact on the group conversation. Further, most participants in Lab B and Family A stated that the direction and perspective of the eyes of the remote participants were natural and thus eye contact could be made effectively. Thus, we can conclude that the Vasque system apparently reduced the distance between participants.

Merit and demerits of the wide-angle lens
The Family group participants mentioned that they use FaceTime via iPads in their daily life. Usually, the child in the family could use the device all by herself and would place the camera very close to her face when using FaceTime at home, making it difficult for a remote person to look at the other members of the family. However, when the Family group used the Vasque system and the same child placed her face similarly close to the display, the shared image view could not be monopolized by the child. The remote participant said he was able to see the other faces freely and equally. Further, many participants mentioned that the act of peering down at the display to have a conversation was fairly comfortable. However, some participants also mentioned that maintaining such a position became somewhat tiresome for long periods of time. We believe
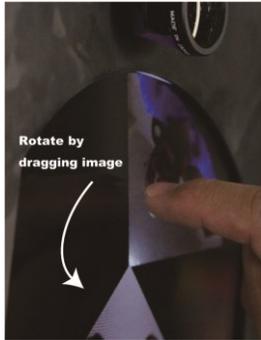
Figure 6. User can select an image slice freely and arrange a visual relationship for each participant by dragging the corresponding image.

Figure 7. Screen shots showing an example where visual relationships are arranged by dragging image slices.

that using a larger display with higher resolution may help eliminate this problem, but at the same time, our system has the potential to increase the frequency and opportunity of casual visual communication between remotely connected users, which does not require efforts to be invested in scheduling conversations via phone calls or emails.

Related Work

There are several research projects related to video communication systems in homes that assume an always-on system. Family Portals [7] is an always-on video media space using which a user can obscure his/her video feed by adjusting slate blinds using a slider. SmoothCurtain [3] enables users to control privacy and to flexibly change the communication style by using a curtain. Neustaedter et al. [8] proposed a home media space design by providing feedback from the achieved privacy level through audio and visual cues. In all of these systems, the user can set the privacy mode by pushing a button or by operating physical curtain. By contrast, we use natural placement and a simple peering down action to control privacy. t-Room [4] and Hydra [2] are suitable in cases wherein a meeting session is scheduled in advance. In contrast, our proposed system supports casual communication.

Conclusion and Future Work

In this paper, we proposed an always- on video communication system called "Vasque" that facilitates casual communication between remotely connected people. By orienting a wide-angle camera towards the ceiling, users can see and hear a remote person's local video image only when the remote person peers down towards the display. The always-on state increases the frequency and opportunity of casual conversations. In the future, we intend to carry out several long-term

experiments using several people in various life situations and to improve our system while analyzing privacy concerns and changes in communication among participants.

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