International Conference on Artificial Reality and Telexistence
Eurographics Symposium on Virtual Environments (2017)
T. Huang (Editor)

Social Dining Experience using Mixed Reality for Older Adults

Jonathon Derek Hart[1], Gun Lee[1], Ashleigh E. Smith[1], Melissa Hull[1], Matthew T. Haren[2], Catherine Paquet[1], Julie-Ann Hill[2], Zack Lomax[1], Travis Ashworth[1] and Ross T. Smith[1]

[1]University of South Australia, Australia
[2]Test Kitchen SA Pty Ltd, Adelaide, Australia

Abstract

This project investigates a novel method of engaging older adults in meaningful mealtime social interactions through the use of Mixed Reality technology. We propose a novel dining system that aims to facilitate interpersonal interactions and enhance meal consumption in socially isolated older adults. We created a prototype which allowed the target audience to test and discuss our concept so we can iteratively improve a user oriented design.

CCS Concepts

•***Human-centered computing*** → ***Mixed / augmented reality; Collaborative interaction;***

1. Introduction

This project is investigating how Mixed Reality (MR) technologies can be employed to connect remotely isolated people to share a dining experience. The main target audience is older adults who are isolated and living alone in their own homes. Alarmingly, as many as 40% of over 70's who live alone are malnourished or at risk of malnutrition [PTM11] [RMK12] [LMCV14]. This compromised well-being is a major cause of nursing home admission and premature death [PTM11] [WH13].

Existing research [PSAMM*08] indicates that meal-time social interactions can promote food consumption in this vulnerable population [VK11]. Social isolation in older adults has been associated with a number of health indicators [SMBS11]. However, participation of older adults in communal meal programs is low [LG12] probably due to barriers in overcoming long-standing social isolation and the resistance to having visitors at their homes. We aim to leverage MR technologies to provide a novel method of connecting and sharing a meal experience between remote people.

There are a number of existing technologies that allow remote users to communicate while eating a meal such as a phone, Skype, Polycom and video conferencing systems. These tools are typically designed to support face-to-face communications and are not optimised to support the mealtime experience. They do provide an excellent method of connecting remote users but usually still employ planar screens that only capture part of the visual field and don't give users the feeling of being in the same location.

We propose to improve the experience by having the remote users feel more connected through a novel telepresence system and provide new tools and interactions that are explicitly supporting meal time activities. Communication technologies overcome this by creating connections with others which expands social networks and in turn reduces social isolation [CS16]. Our virtual dining experience aims to overcome these barriers by providing an accessible, positive dining experience for people at different locations.

2. Collaborative Dining Concept

We propose a novel shared remote dining experience that incorporates MR technology aiming to allow remote users to connect from their homes using an easy-to-use interface. The proposed system does not use any head-worn or hand-held technologies as they can make it difficult to eat in particular with older adults who may have lower mobility. Our proposal is to use an immersive spherical screen that is constructed around a dining table that supports three design concepts - a shared remote dining experience, a collaborative interaction space, and video conferencing.

The idea of a shared remote dining experience aims to provide a sense of co-location for two (or more) remote users where they will experience the same virtual environment shown on a large immersive dome display (shown in Figure 2). The system allows users to select a location where they would like to dine, such as a rainforest, a local picnic area, or a famous French restaurant which is displayed onto a custom dome-shaped projection area. The projection showing a part of 360-degree photography is tightly fitted around a dining table, providing a wide viewing area without requiring users to wear any Head Mounted Display.

A collaborative tabletop interaction space allows each user to communicate in a variety of ways besides a standard video-audio link and shared virtual location. Additional information can be projected onto the interaction space such as a representation of the enjoyment of the remote user over the meal, information about the shared virtual location (e.g. website or video), or even an interactive game. With a camera capturing the interaction space, a user

DOI: 10.2312/egve.20171365

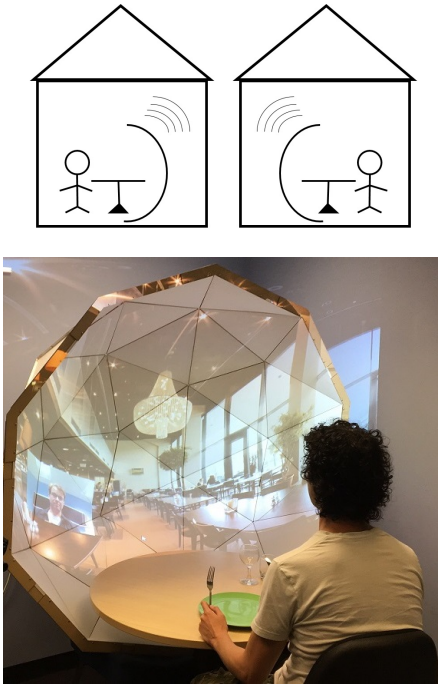

Figure 1: *Shared Remote Dining Experience: users share a meal from their homes interacting through a video-audio link.*

could also show the remote user a real object by placing it on their table. The passing of objects such as photos, medals, figurines, and cards opens the possibility of creating an interactive experience.

A video-audio link shows the remote user embedded in the projected background and can also be displayed on a feature in the environment. For example, above a table and in front of the chair to make it appear as if the user sitting in the chair.

3. Implementation

The dome display is constructed using laser cut pieces of cardboard and plastic around the base (shown in Figure 2). To project a 360-degree virtual location images on the 180-degree dome, a projector displays half the height and width which translates to a quarter of a 360 image being visible. The software of the prototype system is built using the Unity game engine.

4. Focus Group

We have followed a jointly designed methodology that engages with end users during the design process to accommodate user requirements and improve acceptance of the prototype. Our intended user group is older adults over the age of 65. We conducted two iterative focus group sessions at a community bowling club with a demonstration of our early prototype including a single Geodesic dome. For demonstration purpose, we had an actor on a laptop in a different area of the room as a remote user. We also demonstrated Google Cardboards to display 360 images of local and remote landmarks, trying to break down the barrier of resistance to try new technologies before they attempted the much bigger prototype.

We received wide range of feedback both positive and negative. One person who was thrilled about the prototype said "Yeah, so you're well on the way to get it there. You cunning little creatures! You've been working on this without telling me". Another person was initially resistant to the idea, however during the discussion she became more accepting of the concept and how it could benefit her.

5. Conclusion and Future Work

We proposed a novel shared remote dining experience that incorporates MR technology. A proof of concept prototype system combining a geodesic dome with 360 photography, a remote communication link, and table-top interaction space creates a unique MR dining experience. We have field-tested this prototype with older adults to get feedback from the target users. We received various feedback both positive and negative. Despite various levels of resistance to new technology, based on the valuable feedback we received, we can continue to make improvements and enhancements.

For future work, we will continue running focus groups with updated designs and additional features. For example, we can use 360 video to encourage conversations, such as a plane flying across the dome. We are also planning to improve the dome design using material that can be inflated and deflated or a collapsible construction for easy transportation and minimal setup and dismantling time.

References

[CS16] CHEN Y. R., SCHULZ P. J.: The Effect of Information Communication Technology Interventions on Reducing Social Isolation in the Elderly: A Systematic Review. *Journal of Medical Internet Research 18* (2016). 1

[LG12] LEE K. I., GOULD R.: Predicting congregate meal program participation: Applying the extended theory of planned behavior. *International Journal of Hospitality Management 31*, 3 (2012), 828–836. 1

[LMCV14] LUSCOMBE-MARSH N., CHAPMAN I., VISVANATHAN R.: Hospital admissions in poorly nourished, compared with well-nourished, older South Australians receiving 'Meals on Wheels': Findings from a pilot study. *Australasian Journal on Ageing 33*, 3 (2014), 164–169. 1

[PSAMM*08] PAQUET C., ST-ARNAUD-MCKENZIE D., MA Z., KERGOAT M.-J., FERLAND G., DUBE L.: More Than Just not Being Alone: The Number, Nature, and Complementarity of Meal-Time Social Interactions Influence Food Intake in Hospitalized Elderly Patients. *The Gerontologist 48*, 5 (2008), 603–611. 1

[PTM11] PEZZULLO L., TAYLOR P., MAPP K.: Cost benefit analysis of an intervention to improve the nutritional status of community dwelling older australians. *prepared for the Australian Meals on Wheels Association*, January (2011). 1

[RMK12] RIST G., MILES G., KARIMI L.: The presence of malnutrition in community-living older adults receiving home nursing services. *Nutrition and Dietetics 69*, 1 (2012), 46–50. 1

[SMBS11] SHANKAR A., MCMUNN A., BANKS J., STEPTOE A.: Loneliness, social isolation, and behavioral and biological health indicators in older adults. *Health Psychology 30(4)* (2011), 377–385. 1

[VK11] VESNAVER E., KELLER H. H.: Social influences and eating behavior in later life: A review. *Journal of Nutrition in Gerontology and Geriatrics 30*, 1 (2011), 2–23. 1

[WH13] WILSON L., HEALTH R. P.: A review and summary of the impact of malnutrition in older people and the reported costs and benefits of interventions. *Preventing Malnutriotn in Later Life*, May (2013). 1