Collocated Social AR for Cake Customization

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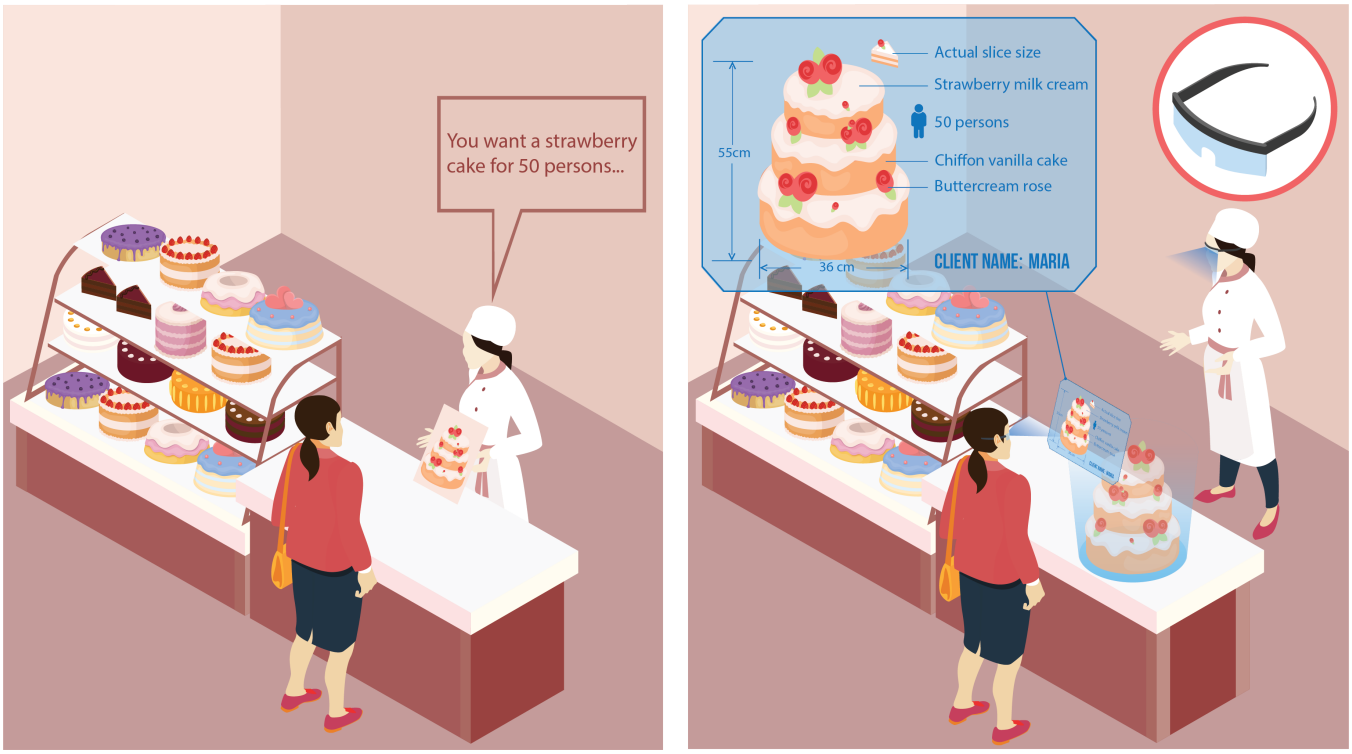

Figure 1: A collocated cake customization use case for social VR: (Left) A current scenario for cake customization, where the client tells the pastry chef what she wants, and the chef shows her reference pictures about possible designs; (Right) A collocated social AR scenario, where both the client and the chef can see the 3D design and specifications of the cake in real size, in real time.

ABSTRACT

This position paper describes a use case of social AR for collocated cake customization between a pastry chef and a client. The application of social AR in this use case aims to help visualize the 3D cake design in real time and project the details (e.g., flavor, colors, decorations, ingredients) of the cake in its actual size. Apart from the use case, the author is also interested in measuring social AR experiences, such as adapting existing questionnaires (e.g., presence questionnaire [26], social VR questionnaire [10]) or user experience measurement instruments to understand social AR communication experiences.

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CCS CONCEPTS

• **Human-centered computing** → *Collaborative and social computing design and evaluation methods*; **Interaction techniques**; **HCI design and evaluation methods**.

KEYWORDS

Collocated communication, product customization, co-design, augmented reality, social AR

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1 INTRODUCTION

Collocated social interaction refers to scenarios of "same time, same place", synchronous interaction between individuals in close proximity [5]. Contrary to remote communication scenarios, which have been extensively studied in social virtual reality (VR) fields with the focus on supporting social presence, rich non-verbal communications and immersive realistic interactions [4, 6, 10, 14, 22, 25], the studies of synchronous interactions focus on enhancing collocated experiences [15]. However, Olsson et al. [15] argued that current technologies are not optimal in promoting collocated social interactions. One common issue is that people often interact with mobile devices in most social gatherings, which has been noted to cause harmful social effects (e.g., alone together) [24]. Therefore, the enhancement of collocated interactions should consider developing technologies that do not isolate human users, but facilitate more direct human-human interactions, for instance, deliberately increase, intensify, encourage, or enrich collocated social interaction in a desirable way [15].

Augmented reality (AR) can generate artificial environments in which users can interact with virtual objects. AR facilitates and promotes collocated social interactions by overlaying virtual elements onto a real-world space [12]. The overlayed virtual elements can be in diverse formats. Baldauf and Fröhlich [1] presented an augmented video wall, demonstrating a collocated interaction technique for public displays by utilizing AR on personal mobile devices and applying animated video overlays accurately superimposed upon the public display. The mobile AR application created the illusion of private views to a shared public display, and triggered conversations among visitors (e.g., compare their private views). Benko et al. [2] designed an interactive AR device *MirageTable* that allows users to visualize and interact with virtual 3D objects spatially co-located with real objects on the tabletop. *MirageTable* shows the potential of the projector/depth camera system to simulate the *Holodeck* scenario [1]and move the interactions from computer screens to the space around us. Kästner and Lambrecht [8] proposed an approach to visualize a large amount of 3D navigation data within the *Microsoft Hololens*. Paasovaara et al. [16] studied the social interactions triggered by *Pokémon GO*, a famous location-based mobile AR game. They found that the game design promotes encounters between players, and the players gain benefits from exchanging information with each other. Based on the findings, they presented design implications for the design of mobile applications or games aiming to encourage collocated social interaction. By combining AR and 3D printing technologies, Li et al. [11] proposed an AR system that supports collaborative navigation by overlaying virtual visual information (e.g., routes) on top of a scaled-down 3D printout of a topological terrain.

[1]The *Holodeck* is a fictional stage where participants may engage with different virtual reality environments. https://en.wikipedia.org/wiki/Holodeck, retrieved on September 21, 2020

2 USE CASE: COLLOCATED SOCIAL AR CAKE CUSTOMIZATION

Given the potential of AR technology, and the personal interest of the author [2], this position paper proposes collocated cake customization as a future use case for social AR.

Rarely is there a celebration without a cake. Customized cake services enable clients to collaboratively personalize their cake in shape, color and flavor with pastry chefs [23]. However, the customization process is not easy for both clients and chefs, which usually starts in a face-to-face meeting. Most of the follow-up communications are through text messages with the aid of reference cake pictures, which is insufficient for them to fully communicate their creative thoughts and to have a clear image of the final design [19, 27]. Cake customization requires professional skills. Based on 2D reference pictures and texts, it is not only difficult for clients to express the ideal decorations they want [13, 27], but also challenging for pastry chefs to immediately visualize and show the size and decorations of the cake to the clients [19].

This position paper proposes using social AR to improve the efficiency in the cake customization communication, and enhanced the shared understanding in the negotiation process by allowing the pastry chef to design the virtual cake using AR and overlay a 3D virtual cake visualization onto the real-world space, in real time and in the actual size of the cake. So, the client can immediately see the size and decoration of the cake. To realize this scenario, the following requirements are needed to be considered for developing a social AR system:

- Allow collocated users to share the view of the AR overlayed information and 3D virtual objects.
- Allow collocated users to use intuitive gestures to interact with (e.g., grab, hold and manipulate the size of) 3D virtual objects.
- Allow users to see colors, textures, and real sizes of the design outcome in 3D visualizations in real time.
- The virtual information should assist the collocated communication, and should not distract users.

3 MEASURE SOCIAL AR EXPERIENCES

The real power of virtual experience is that: even though users know it is a perceptual illusion, they still respond to it realistically [20]. Measuring and understanding virtual user experience (UX) should not only focus on utilitarian aspects (e.g., user cognition and performance) of human-technology interactions, but also on user affect, sensation, and the meaning as well as value of such interactions [9]. Self-reported questionnaires have been the typical method for evaluating the virtual UX , with the emphasis on the ability to produce a sense of "being there", and simulate real world interactions. Metrics for evaluating presence and immersion have been developed and widely validated, such as the presence questionnaire by Witmer and Singer [26] and the Slater-Usoh-Steed questionnaire [21]. Li et al. [10] proposed a social VR questionnaire for measuring not only the presence/immersion experiences, but also quality of interaction, emotions, and social engagement.

[2]The author is an HCI researcher, and at the same time a cake designer, who owns a café called *Cake Researcher* in Delft Netherlands, https://www.cake-researcher.com

Apart from the proposed use case, the author is also interested in adapting existing UX measurement tools to measure and understand social AR experiences. For instance, adapt the social VR questionnaire [10] to measure the immersion, social engagement, and quality of interaction; integrate the *affective slider* [3] in AR overlayed graphics to enable users to continuously assessment their own emotions; involve target users (e.g., clients asking for customized cakes) and professional users (e.g., pastry chefs) in cognitive walkthrough experiments [18]to understand the nuances of the social AR experiences, such as social cues, premixes in collocated social AR communication.

4 TRANSFERABILITY TO OTHER COLLOCATED INTERACTION USE CASES

The cake customization use case is transferable to other collocated communication use cases. For example, the audio-visual overlayed interfaces, the realistic virtual objects can be easily replaced to suit medical and cultural heritage domains. The author foresees the potential of social AR for remote medical consultations, enabling physicians to explain the diagnosis and its clinical impact to the patient using 3D visualization overlayed onto the outpatient office. So, the patient can share the medical decision making with the physician, and have proper expectations towards the outcomes of the treatment [17]. Social AR can enable users to relive history through interacting with the 3D mock-ups of the heritage artifacts projected onto the real museum environment (e.g., dressing up in a historical costumes) [7].

5 CONCLUSION

This position paper contributes a new use case for social AR, including a graphic (Fig. 1) explaining the use case, a set of requirements to realize this use case and some suggestions about adapting existing measurement instruments to understand collocated social AR communication. It also discusses the the transferrability of the use case to other collocated social interaction use cases, such as medical consultations and museums.

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