ReliveInVR: Capturing and Reliving Virtual Reality Experiences Together

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ABSTRACT

We present a new type of sharing VR experience over distance which allows people to relive their recorded experience in VR together. We describe a pilot study examining the user experience when people share their VR experience together remotely. Finally, we discuss the implications for sharing VR experiences over time and space.

Index Terms: I.3.7 [Computer Graphics]: Three-Dimensional Graphics and Realism—Virtual reality;

1 INTRODUCTION

In their germinal paper on Transformed Social Interaction [1] Bailenson and colleagues state that VR can allow for unique experiences that change the nature of "reality" such as modifying how spatial and temporal distance are experienced. One common aspect of virtual experiences in VR is that the behavior that occurs in them can be tracked, recorded and replayed [3–5] which can provide participants the experience of "time travel."

In this paper, we present a prototype system. ReliveInVR, allowing the unique experience of reliving past events to be experienced socially. As shown in the Figure 1, ReliveInVR allows people to immerse themselves in the reliving experience together and view the experience from any perspective independently. The system also provide the ability to pause, slow down or rewind the experience. Although several other systems [2,6] have utilized networked virtual reality systems to support remote interations, how people capture and share memories or experiences in VR over distance is underexplored. To explore this research question, we designed a VR archery game and conducted a pilot study with 9 dyads to compare our ReliveInVR prototype with other 2 common approaches for sharing VR experience: (1) co-watching recorded 360-degree videos on desktop, and (2) co-watching recorded 360-degree videos in VR.

In their qualitative responses, participants reported feeling more immersive and more engaged when they shared their experience via ReliveInVR. Participants also enjoyed the ability of moving around in relieving environment independently, which allowed them to discover new things and made the sharing experience more fulfilling. However, we also found that the affordance of agency in ReliveInVR also creates challenges for utilizing non-verbal communication cues. We synthesize the findings from our study, and suggest design implications for addressing these challenges.

2 PROTOTYPE IMPLEMENTATION

As shwon in Figure 2, we implemented a VR networked environment and a state-based replay system with SteamVR plugin and Photon Networking framework in Unity. The system initially captures the complete state of the virtual world, and then monitors and records all the changes at a rate of 12 times per second. Changes recorded include the position and orientation of VR headset and controllers, the position and orientation of all objects in the environment, and the animation states of in-scene objects. All changes to the virtual world are written to disk via serialization mechanism as they are enacted, together with a time-stamp. To allow participants to "relive" past activity, the system uses the recorded information to reproduce the scene and re-enact recorded operations. The recorded data will be read in turn from the recording, recreating the activities which occurred in the original experience. Through implementing buffering techniques, our prototype provides a "time machine"-like feature which allows users to play, pause, rewind and search a specific stamp of the recorded experience.In addition, the system also replays recorded audio streams including the game music, sound effects, and users conversations.

Figure 1: P1's point of view when P1 and P2 relive P1's experience through ReliveInVR prototype.

3 STUDY DESIGN

In order to explore how people share their VR experience over distance, we designed a VR Archery game with two different experience conditions (so each participant would see something different). Both participants were asked to play this archery game in VR separately, and then to share their experiences in one of three different conditions in separated rooms.

We then conducted a between-subjects laboratory experiment with three different sharing conditions: (1) co-watching 360-degree videos of their archery experiences on desktop, (2) co-watching 360-degree videos of their archery experiences in VR, and (3) reliving in VR using our ReliveInVR prototype. For the VR conditions, Oculus Rifts, a head-mounted display with 2160x1200 resolution, 90 Hz refresh rate, and 110 FOV was used. We recruited 18 participants (7 female) whose mean age was 20.45 years (SD = 1.6).

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2019 IEEE Conference on Virtual Reality and
3D User Interfaces
23-27 March, Osaka, Japan
978-1-7281-1377-7/19/$31.00 ©2019 IEEE

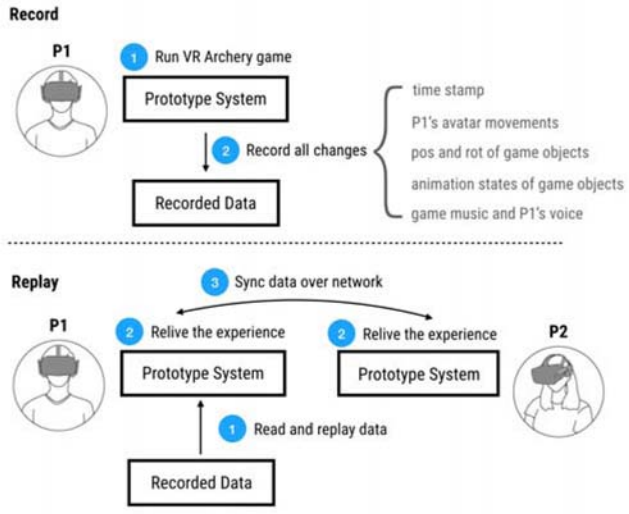

Figure 2: Record and replay tecniques in ReliveInVR prototype.

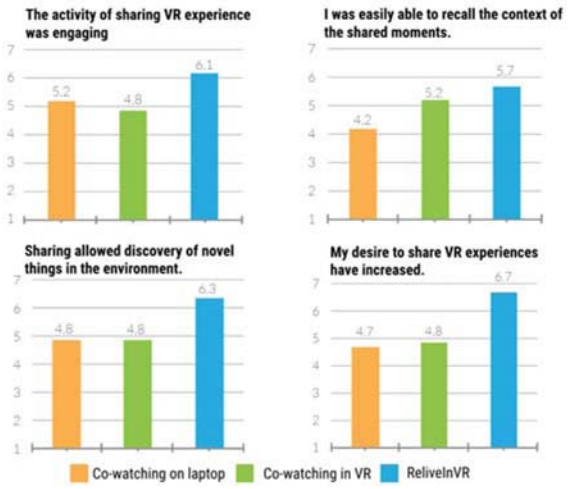

Figure 3: The results of four questions from the Sharing Experience category.

During the study, participants were randomly assigned to dyads and each dyad experienced one of three conditions. For the Desktop Co-watching, participants co-watched 360-degree videos on their desktops with their partner remotely via Watch2Gether, an online synchronized video player and Google Hangouts. For the VR Co-watching, participants co-watched the recorded 360-degree video in VR via Youtube VR. In the ReliveInVR condition, participants relived their experience with their partner using the prototype system described above.

After completing the tasks in all conditions, participants filled out a survey containing questions about partner perception, social awareness, clarity of communication and sharing experience. Then the researcher interviewed both participants individually.

4 Discussion and Results

Figure 3 shows the average of the questions in the sharing experience category; in which participants reported the reliving experience to be more engaging, to allow for more recall and shared discovery, and to increase the desire to share experiences in VR. Other categories are described in the supplemental materials.

ReliveInVR allows the sharee to actively experience the shared experience with the embodied avatar and full autonomy of movement. During the interview, participants highlighted the impact of free movement on the quality of the experience. P5 stated that "He can also have his own free will and also look around and experience new things. He can see things that I maybe didnt see.". Besides, participants also reported that agency afforded leads to greater social awareness. P9 said that "you can actually move, turn around to see what's behind of your partner, can see what direction they're facing. That made a difference because I felt closer with her."

Although our findings suggest that participants enjoy the freedom of an independent view, this independence creates challenges for utilizing non-verbal communication cues. Participants in ReliveInVR condition pointed out the challenge of tracking the recorded avatars and their partners movement when they used the teleport feature. The freedom of an independent view also creates challenges for properly orienting and understanding spatial references when participants want to share specific content. In addition, several participants had issues on navigating to the content they wanted to share. These findings suggest the following design challenges for reliving experiences: 1. improving the awareness of recorded avatars and others, 2. moving between individual and shared views smoothly and 3. making navigating to interesting moments easier.

5 Conclusion and Future Work

ReliveInVR that provides a new time machine-like experience which brings people back to their recorded VR experiences and allows them to relive and share them with others over distance. This shared reliving experience may be more immersive and more engaging than other methods of sharing recorded experiences. The ability to move around and view the experience independently allows participants to find new things and make the sharing experience more enjoyable. However, the current pilot study is very limited. We have insufficient participants to conduct statistical tests; and participants in each condition were run on successive days rather than counterbalanced. In the future, we plan to refine our ReliveInVR prototype based on this pilot data. We will then conduct a study with more participants and also measure objective metrics such as utterances and gestures. In this way we hope to further understand the user experience when people who are separated in space share the experience of time-traveling in virtual reality.

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