Designing for Virtual Touch: A Real-Time Co-Created Online Art Experience

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ABSTRACT

"[i miss your touch]" is a web platform that allows people who are in separate locations to co-create a real-time artwork within a shared virtual environment. This platform enables a live collaboration to occur between two participants and PluginHUMAN (the artists). [i miss your touch] responds to participants' movements. PluginHUMAN affect, in real-time, live video streams from participants' webcams. Their affected movements are combined and displayed together, allowing participants to play, dance and make art in a shared virtual environment. This project launched as a rapid response to COVID-19 lockdown and physical distancing rules. Our approach to designing a novel, real-time interactive virtual art experience may benefit game designers and researchers who seek to: provide players with the experience of virtual touch; those exploring embodied play; designers who are providing co-creation opportunities for players; and those interested in the intersection of technology, art and play.

CCS CONCEPTS

• **Human-centered computing** → Interaction design

KEYWORDS

Online, Virtual, Art, Web Platform, Virtual Touch, CSCW, mediated social interaction

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1. Introduction

During 2020, many people have been without physical contact with others due to COVID-19 pandemic lockdown and physical distancing rules. "[i miss your touch]" is a web platform designed as a rapid response to these unprecedented global conditions. This artwork provides a way for people to maintain meaningful connections with others and meaningful connections with art during "isolation" times. The [i miss your touch] web platform allows two friends, who are in separate locations, to play together and to co-create a real-time artwork within a shared virtual environment. This experience enables a live collaboration to occur between two participants and us (PluginHUMAN - the artists). [i miss your touch] responds to participants' movements. We affect, in real-time, live video streams from participants' webcams (Figure 1). Their webcam streams are combined, and their backgrounds are replaced with a plain black visual. We aim to make participants feel as if they are together, playing and making art in a single virtual environment.

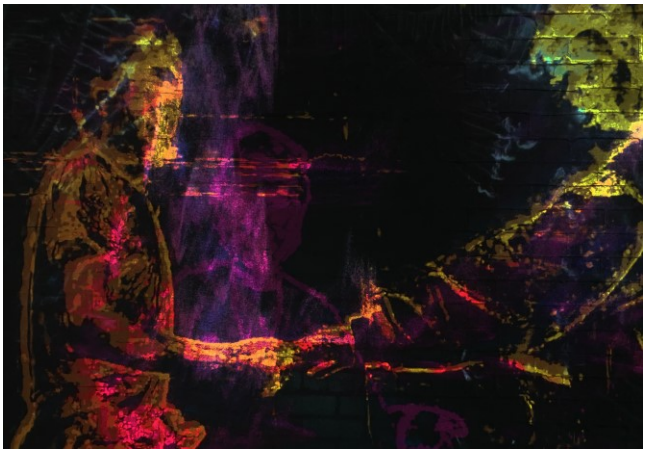

Figure 1: Participants "holding hands" in the [i miss your touch] web platform.

[i miss your touch] is a unique online interactive experience that is accessible to broad audiences. This work is seemingly simple. Yet it has required specialist programming in order to allow people to appear together in real-time in a single, shared virtual environment; without the need for participants to have specialist hardware, software or skills. [i miss your touch] is

accessible to anyone with a computer, a webcam and a basic internet connection. Through this project we democratise access to progressive, real-time, interactive online environments. We also potentially provided more open access for people to experience "virtual touch".

2. Related Work

[i miss your touch] is situated in an interdisciplinary field of computer science, fine art and game-play practices [6]. This project involves web platform design, participatory media art methods [3] and play practices [6].

There is a field of research that investigates how technology can monitor and track people's bodily actions and functions [1, 5, 9 11]. This research is also prevalent in the field of game design [13, 15, 16]. EEG systems have been used to track participant experiences whilst they are engaged in playing digital games and they have been used to help participants interact with digital art [2, 10, 24]. This prior work helps us understand how embodied play can be tracked, monitored and used to control digital systems. [i miss your touch] offers a digital experience that uses embodied methods to provide audiences with a playful way in which to engage with and create virtual art.

Related Work in the Field of Art

Some interdisciplinary fine art projects involve participatory or co-design practices. These practices allow the public to work alongside artists in making creative projects [3, 4]. These practices often stem from community art methods [4]. Some contemporary art practices use virtual reality and social media platforms to help audiences uncover new levels of an artwork [6, 19]. Artists also use technology to allow people to contribute to aesthetic aspects of an artwork [8, 19, 20]. Such practices uncover new ways in which audiences can be active participants in the formation of art. [i miss your touch] offers audiences the opportunity to use basic technology tools, such as a computer with a webcam and the internet, to actively create and control the core elements of a virtual art play experience; we invite audiences to become active participants.

Related Work Utilising Similar Technologies

[i miss your touch] involves two remotely located participants. This approach is situated in a field of work involving online or internet connected design [2]. Video conferencing software such as Zoom [23] and Microsoft Teams [15] allows people to interact via video and audio. Microsoft updated Teams' capabilities in July 2020 providing a "together" mode [15]. This mode allows users to be seen together with a shared background. These software suites provide people with limited scope for bodily interaction. Individuals are either presented in separate boxes or windows on the screen, or they have a shared background but are not able to visually overlap their movements. Each person's image is contained in a separate location on the screen. [i miss your touch] offers participants the opportunity to engage in bodily activity that is presented in a shared virtual location. Their movements can visually overlap allowing them to appear as if they are hugging or shaking hands.

Designers have explored innovative ways to virtually connect people who are different locations. This has involved remote bodily play [17], remote "body drawing" play [12] and hugging over a distance [18]. Previous projects have also involved virtual touch providing participants with the feeling that they are touching objects [14]. This prior work helps us understand new ways in which technology can be used to create the experience of virtual touch and to enable people to feel connected to other people who are situated in different geographic locations. [i miss your touch] allows two people who were in different locations, with no specialised equipment, to experience a sense of virtual touch.

3. The Design

In order to engage with this artwork, people are invited to make a booking via an established online booking system. People select a session from a range of regular weekly time slots. A participant can elect a friend, and the two of them will engage with the artwork at the same time. Or a participant can elect to engage with the work alongside one of the PluginHUMAN artists. Once a booking has been made, each participant is emailed a set of instructions and a unique URL. The URL becomes active as soon as their allocated time begins. Each persons' URL is active for twenty minutes. Five minutes is allowed for setup time, ten minutes is allocated for engagement with the artwork and five minutes is allocated at the end of each the session, this allows participants to close their browser window, and for us to prepare for the next session.

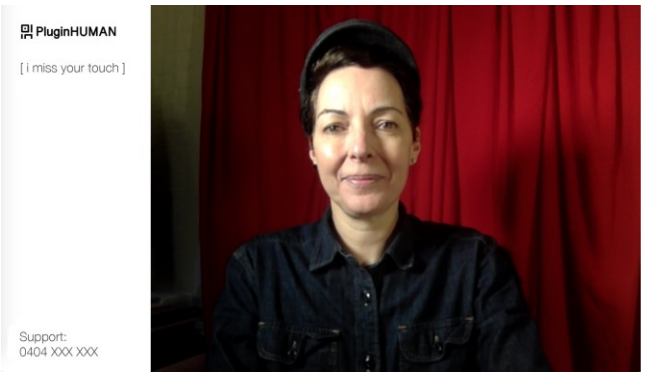

Figure 2: When participants enter their unique URL they see their webcam footage displayed in their browser window.

Prior to their session, participants are informed that they need to have access to: the internet; a computer with a webcam, and the Chrome internet browser. Once they enter their URL, they may need to select "allow"; so that Chrome can access their webcam. They will then see their webcam footage displayed in the artwork's interface (Figure 2). There is a phone number displayed so that participants can contact us if they experience technical difficulties. After a few seconds, they will see a pop-up window stating "Connect Now". Once participants select this button, they enter the [i miss your touch] web platform (figure 3).

The [i miss your touch] web platform displays three video windows (figure 3). The bottom two windows show raw footage from each persons' webcam. The larger window at the top displays combined, effected video footage; this window shows the two participants together in a shared virtual environment (figure 3). An electronic soundtrack was composed for this artwork. Participants both hear this music. They cannot talk to each other. They communicate via playful movement. If required, we can send participants text instructions. This text appears above the two smaller video windows (figure 3). These instructions include statements such as "Starting soon".

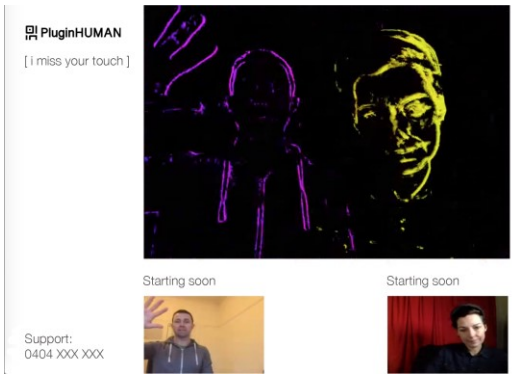

Figure 3: The [i miss your touch] web platform displays three video windows.

[i miss your touch] ran every week from mid-March to July 2020. Bookings and access to the artwork is free. The initial interface was a prototype web platform. This prototype displayed three video windows, but no technical support number or on-screen text communication. The platform was refined progressively. The current version was released in late June 2020. [i miss your touch] has to-date been accessed by over 50 people over 5-months.

Figure 4: [i miss your touch] was streamed live and projected onto the exterior of our PluginHUMAN studios.

3.1 The Presentation of the Artwork

During local COVID-19 lockdown times, weekly interactions with the artwork were streamed live and projected onto the exterior of our PluginHUMAN studios (figures 4 & 5). There was no audience for this weekly presentation, as people were not allowed to gather in public or private locations due to local COVID-19 restrictions. This presentation of the artwork operates as a haunting reflection of 2020 isolation conditions.

The combined affected footage of participant interactions has been edited into a 5-minute video artwork. This rendered video artwork will be displayed on public screens during future events. It is a record of people's experiences of COVID-19 social and physical distancing conditions.

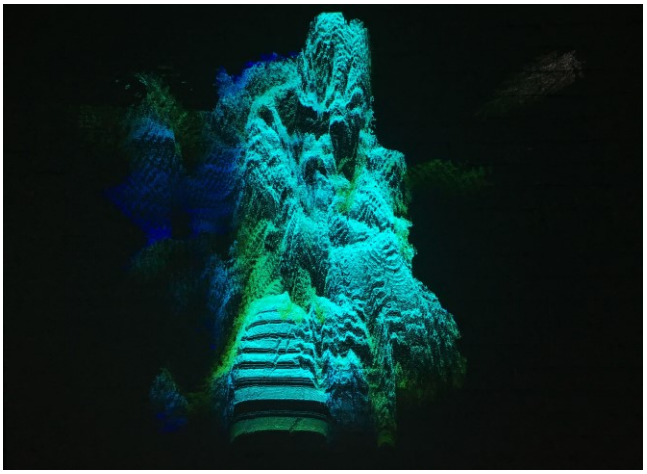

Figure 5: People are not visually identifiable within the artwork.

4. The Technical Design

[i miss your touch] is ephemeral; it operates in real-time. There is no permanent interface or web imprint that exists or is accessible. This artwork is not a website. Participants are provided with access to a web platform. The platform is a custom-coded, cloud hosted Node.js. We created an "app spot" that is hosted freely on Google Cloud. The app spot hosts the basic interface design. This interface consists of a white background, the PluginHUMAN logo, the artwork name, the music, and three empty video stream windows. The app spot also allows our software platform "TouchDesigner" to access each of the participants' webcam streams [7].

We compile the video streams in TouchDesigner and stream this live footage back to the app spot. The TouchDesigner system is custom coded using Python. The video streams are manually effected in real-time by one of the PluginHUMAN artists. This involves applying effects to participants' videos. These effects distort the imagery, provide extreme colour and create abstract shapes that visually augment participants' movements. The outcome is a live collaboration between the participants and us, the artists.

The backend system runs on one computer with four monitors. Monitor 1 displays participant 1's unaffected video stream. Monitor 2 displays participant 2's unaffected video stream. Monitor 3 displays the [i miss your touch] web interface. Monitor 4 displays the TouchDesigner interface, including a

button that allows us to start the music. These four monitors allow us to see the most important technical aspects of the artwork operating in real-time.

5. Lessons Learned

Due to high-level usage of local internet services during COVID-19 lockdown, participants' internet connection is not always consistent. We can overcome this by "refreshing" their connection. If a participant's image "freezes" they will see a "Connect Now" button appear. They select this button and, in most cases, this solves the issue.

If participants experience difficulties connecting to the platform, they can speak to us by calling the technical support number. All technical issues have resolved during the 5-minute allocated setup time. About 20% of participants call the technical support line, the other participants have no difficulties connecting to the artwork. Technical issues mostly relate to: people using tablet devices rather than desktop or laptop computers; people using a browser other than Chrome; or people using the incorrect URL. All of these issues are solved by participants changing their device, browser or URL. On one occasion a participant was unable to share their video stream due to virus software blocking access. We were unable to overcome this issue in their allocated time. These participants were able to select a different time and connect using a different computer.

People are not visually identifiable within the artwork (figure 5). The music, combined with the abstract visuals, seems to make participants feel a lack of self-consciousness. Participants dance freely and some explore a wide range of physical movement. Many people find ways to virtually hold hands with the other participant (figure 1), and some people engage in virtual "partner dancing" (where they have their arms around each other). Many participants spend a lot of time and care experiencing what appears to be virtual touch.

6. Limitations

We acknowledge limitations to our approach. As this is a work-in-progress we acknowledge that future research could involve a participant study. This study could examine people's responses to this web platform and the specific ways in which people interact within the [i miss your touch] system. Future studies could also examine a comparison between how people interact with [i miss your touch] and how people interact with other participatory play experiences [e.g. 6]. This comparative study may help us further understand the ways in which art installations inform game and play-based design.

[i miss your touch] is designed to operate on Chrome internet browsers. This artwork was a rapid response to a global health crisis. We therefore prioritized producing the work in a short timeframe and were looking for a swift stable solution that may provide access for the widest number of participants. We also had no initial budget. Our focus was to help people maintain connections with each other during this challenging time. It would be ideal to provide wider participation by enabling wider browser access and by enabling mobile and tablet access. This would require further design and testing, and these changes may be implemented in the future.

The text instructions are currently only available in English. This may limit participation to those who are not able to read English. We tested the system without the use of text instructions and observed many participants activating and interacting with the artwork by intuitively navigating the design. Therefore, it may not be necessary for the text instructions to be present within future iterations. It is also possible that future designs may have the instructions available in multiple languages. This part of the design requires further investigation.

7. Conclusion

[i miss your touch] is a novel design that offers a unique opportunity for open-ended virtual play. Our contribution includes an interactive online platform that:

- Allows people who are in separate locations to appear in a shared virtual environment,
- Allows people to co-create a real-time artwork,
- May allow people to experience virtual touch.

[i miss your touch] may also extend knowledge on how to design accessible systems that provide experiences of virtual touch without the need for specialist equipment. This design may benefit game designers and researchers who want to use web platforms to provide players with experiences of virtual touch; those who want to provide players with real-time co-creation experiences; and those interested in the relationship between technology, art and play.

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