Hummingbird: A Collaborative Live Theater and Virtual Reality Adventure

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ABSTRACT

Hummingbird: is a modern, innovative performance merging live theater and interactive virtual reality by bringing a group of active participants into a shared space for a live performance. The performance premiered as part of Chicago's Tony Award-winning Goodman Theatre New Stages Festival showcasing innovative and ground-breaking theater works in December 2021. This project bridges art, science and live theater through a collaborative research effort between computer science and design faculty and students at the University of Illinois Chicago (UIC) Electronic Visualization Laboratory (EVL) and Chicago theater directors, actors, videographers and producers. *Hummingbird*'s story celebrates courage and coming of age through the eyes of a gutsy teen who must outsmart her mother's narcissistic boss and survive dangerous new technology in a live, immersive adventure. Hummingbird extends traditional live theater and makes virtual reality art accessible to a broader audience, demonstrating how virtual reality can transform theatrical storytelling.

CCS CONCEPTS

• **Applied computing** → Arts and humanities; Performing arts; • **Human-centered computing** → Collaborative and social computing; Collaborative and social computing theory, concepts and paradigms; Computer supported cooperative work.

KEYWORDS

Virtual reality, Storytelling, Theater, Multi-user, Performance

1 INTRODUCTION

Shared virtual environments support real-time interaction among participants involved in a collaborative activity, unlike single user virtual reality (VR) where the participants are isolated from each other. In immersive and interactive theater, unique opportunities are provided for audiences to interact with each other, the actors, and narrative. Hummingbird builds on these concepts by bridging VR with live performance, merging the theatrical space with the digital space, connecting participants together and encouraging collective multi-user interaction with the story. Ten public performances were held between December 3rd and 6th in the Electronic Visualization Laboratory. Each performance included 5 VR participants wearing a virtual reality headset that actively participated in the outcome of the story and 16 audience members (observers) passively watching the performance play out in person and through a large video wall co-located with the VR participants. The performance merges the physical and virtual world with the goal of encouraging stronger theater engagement among tech-savvy audiences and Chicago's diverse teenage and youth demographic while still engaging general adults.

In *Hummingbird*, participants do not simply observe the performance on a physical stage but also meet on the virtual stage inside the play itself, directly interacting with the actors, each other, and the story. Specific attention was brought to design collaborative tasks to encourage multi-user interaction (e.g. all avatars should simultaneously use pickaxes to break a stone wall to get the secret key). The script and interactivity were developed iteratively and in parallel to tightly connect the collaboration required for the story and avoid ludonarrative dissonance.

More than 100 people attended the performances including 50 active participants. Most of the audience responding to a survey reported that they enjoyed watching/participating in *Hummingbird* (100% of VR participants and 88% of observers). The majority felt they were part of the story (69%), notably VR participants felt increased engagement over observers (96% vs 50%). The majority

Figure 1: Participants interact in the Orchard during the performance. (©2022 HummingbirdVR; Photo: Lance Long, 2021)

of respondents indicated that they are interested in attending similar productions in the future (83%), including live theater shows (without VR) after trying *Hummingbird* (85%).

2 CONCEPT, STORY AND PRODUCTION

Hummingbird is a live theatrical adventure that questions identity, humanity's relationship with technology and coming of age in a digital society. The aesthetics of *Hummingbird* are inspired by Japanese Ukiyo-e paintings from the 19th century, known as "pictures of the floating world," which prioritized outlined forms and gradient colors. The audience enters the theatrical space invited by Aya; however, as they get deeper into the narrative, they transfer into the digital space, becoming avatars in the shared virtual environment. Gerard, a cyber ghost obsessed with immortality, has captured Aya's mother, Deni. In order to save Deni, active participants must collaborate to successfully overcome the challenges in three virtual scenes – Underworld, Orchard and Giant Statue. In Underworld's dark magical cave, participants can reveal hidden drawers and use illuminating stalactites to enter the next world. Underwater, in Orchard, they collaborate to release the flood water. In Giant Statue, they transform into hummingbirds and can fly. When all of the participants work together, they are all able to escape Gerard, the world and save Deni. Active participants used an Oculus Quest VR headset with embedded hand tracking enabling the use of natural hand gestures for grabbing and touching, often prompting comments such as "How do you track my hand, I am very amazed by it." A centralized server synchronizes the location and actions of all VR headsets in real-time to prevent collisions between participants and allowing untethered social interaction and collaborative exploration of the plot using virtual avatars. Stage managers and even the lead actor in their VR headset can trigger extra dialog or events to dynamically respond to the audience. We used novel separation and playing of spatialized room and headset audio simultaneously i.e. local effects verses larger environmental sounds. *Hummingbird* explores new ways of extending virtual reality as a medium for artistic expression, connecting art and technology on new levels that were not possible before through other formats.

3 DEMONSTRATION AT THE SIGGRAPH

Our SIGGRAPH presentation will include 10 performances, in each we will invite 5 active and depending on the allocated space 15+ passive participants. Each performance time is approximately 45 minutes depending on audience engagement. An overview of the virtual space and avatars of the active participants will be shown on the large screen/projection from a bird's-eye view for passive engagement. Our installation will feature custom designed graphic identities, such as lab coats, origami characters and performance posters, to further immerse participants in the *Hummingbird* world. Additionally, the performance could be live streamed and recorded for remote audiences. The future plans include testing a tele-immersive version of the performance enabling active participants in remote sites to engage with live actors in Chicago.

4 CONCLUSION

As theaters grapple with attracting younger crowds, there is a growing interest to utilize resource intensive technologies with live performances. Hummingbird integrates emerging technology with traditional theatrical storytelling. While previous VR theater performances allow an actor to interact with few participants in the same space or a larger audience remotely, this performance pushes the boundaries by immersing a larger co-located audience in the performance, giving them agency and control over the action. This production provides a model for immersive, interactive theater that has the potential to transform storytelling, broadening the reach of live performance and theater.