9. THIRD LIFE PROJECT

Photo: eSeL - Joanna Pianka 2015

Project title: Third Life Project

Makers/collaboration by: Territorium KV - Milan Loviška and Otto Krause, University of Duisburg-Essen, Simula Research Laboratory, Stellenbosch University

Text by: Milan Loviška, Otto Krause, Carsten Griwodz, Herman Engelbrecht, Gregor Schiele

Country: Austria, Norway, South Africa, Germany

Website/link: http://www.thirdlifeserver.org/

Lessons learned:

- Staging a real-time video game in a theatrical performance brings up for question and re-examination what is tangible and actual and what is immaterial and abstract.
- Interactions in virtual environments that are grounded also in physical world enhance intuition of both performers and spectators.
- Regular online video conferencing meetings afford numerous opportunities to establish the trust and reciprocal understanding, and the respect for different goals, practices, expertise and rhythms of work that are all together necessary for a rewarding interdisciplinary collaboration.

09.

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Introduction

Working at the cutting edge of live performance, the artists Otto Krause and Milan Loviška have joined with their Third Life Project the 'emerging generation of artists that is turning to digital technologies to fundamentally transform theatre'[1].

This networked international arts-based research collaboration with a team of computer scientists and engineers explores the potential of virtual actions to perform real actions causing extravirtual physical effects on physical objects (output devices) and effects on the bodily and mental states and behaviours of persons (emotions, sensory impressions, beliefs, desires, bodily states, etc.)[2].

Its hybrid nature lies not only in the juxtaposition of real and virtual environments in live performance for a physically present audience, but even more in the work of inventing and implementing strategies and technology for direct engagement with elements of real environments through elements of virtual ones. The artists initiated the project in April 2014. Prof Carsten Griwodz, Dr Herman Engelbrecht and Prof Gregor Schiele joined them to form the core of the team. In October 2015, the team of eleven[3] presented the results of their work in three performance lectures at WUK in Vienna. The artistic idea behind the project emerged from the question of how to stage a real-time video game in a theatrical performance. The performance was not built on a narrative other than the loose narrative of the game Minecraft[4], and focused more on extravirtual avatar interactions with performers, and objects in the real world. The goal of the project both artistic and technological was to devise a distributed, hybrid and distinctive performance, while creating a platform for sharing knowledge between groups that might not have an opportunity to come together otherwise. Each performance was therefore directly followed by a discussion with the spectators to give an insight into how the artists and the experts work, and to exchange ideas about performing with mixed reality and ubiquitous technologies.

Figure 1: Walking through a part of the first world. Photo: eSeL - Joanna Pianka 2015

Designing Third Life

The technological interface of the project combined Minecraft environments, novel tracking technologies and connected objects of the Internet of Things (IoT). A computer server developed as part of the FiPS project was present on stage to host the Minecraft game. We chose Minecraft because of our previous experience with it, but applications in other types of virtual world would be possible as well. The blocky aesthetics of the game defined the overall aesthetics of the set design, costumes and ubiquitous objects embedded in the physical world. The artists developed two Minecraft worlds that contained two different virtual representations of the WUK performance venue. The exploration of the virtual environment started from and ended in the virtual WUK theatre, which served as an entry and exit point from the real world to the virtual one and back. To break the logic of the real world, the first world around WUK was an open space that featured a mash-up of greenery with a desert environment, and contained a village, a huge eyeball hanging in the sky above and programming code flying loosely in the air. In the desert, one could meet a giant server representing Kubrick's Space Odyssey 2001 monolith with a floating foetus inside. It contained a herd of non-player characters (NPCs), virtual pigs, which could be released and guided back to the WUK in the course of the presentation (Fig. 1).

The second world was darker and fantasy-like with mushroom forests, cobwebs, water and lava beams that one could observe while travelling in a mine cart. The long railroad passed along a virtual upside-down version of the Museum of Modern Art in New York City[5] and led to a discotheque, where the avatars could dance and afterwards be teleported back to WUK[6] (Fig. 2).

1 S. Benford, G. Giannachi, 'Performing Mixed Reality', Cambridge, MIT Press, 2011

2 P. Brey, The Physical and Social Reality of Virtual Worlds, in M. Grimshaw (Ed.), 'The Oxford Handbook of Virtuality' (Chapter 2, 42-54), New York, Oxford University Press, 2014

3 In addition to those already mentioned are Lilian Calvet, Jason B. Nel, Alwyn Burger, Stephan Schmeißer, Christopher Cichiwskyj and René Griessl.

4 Minecraft is a playground with no explicit objectives or story. Within its environment and events, it creates emotive situations in which players write their own personal stories.

5 Minecraft was added to the video games collection of the MoMA in 2013

6 M. Loviška, O. Krause, H. A. Engelbrecht, J. B. Nel, G. Schiele, A. Burger, S. Schmeißer, C. Cichiwskyj, L. Calvet, C. Griwodz, P. Halvorsen, Immersed Gaming in Minecraft, in 'Proceedings of the ACM Multimedia Systems 2016 Conference (MMSys '16)', Klagenfurt, Austria, May 10-13, 2016. DOI: 10.1145/2910017.2910632

Moving through different parts these worlds (desert, village, tunnels, rooms, travelling in a mine cart, etc.), visiting the virtual landmarks (giant server, MoMa, discotheque, etc.), and executing specific tasks at these various points of the journey were the implicit objectives that formed the experience for the performers as players of the game and for the observing audience. In practice, this intense sense of achievement and the emotional response as a consequence was what created the internalized narrative. Alongside the action, the team on stage was engaged in constant conversation throughout the performance about the progress and performers' experiences in the gameplay, while commenting on the artistic and engineering choices that had been made in the project development. The presence of the engineers onstage allowed us to expose the technology and the interactions of the performers to the observing audience, to reflect on performing with the technology in the course of doing so, as well as creating an opportunity to address and solve any potential technical or performance complications live onstage (see trailer at this link, and see Fig. 3).

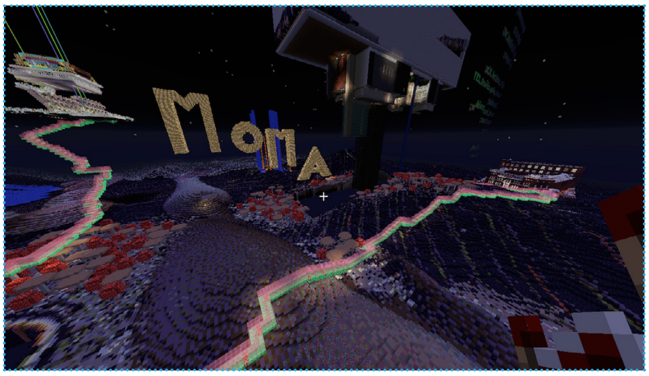

Figure 2: Aerial view of the second Minecraft world. Photo: Territorium KV 2017

Figure 3: Engineers in live onstage action. Photo: eSeL - Joanna Pianka 2015

In the remainder of this paper, we describe the dramaturgical consequences of some of the most compelling technologically driven interactions through the actual technological interface of the project and from the different perspectives of the two performers, engineers and audience. After that, we discuss the challenges and dynamics of our interdisciplinary collaboration and conclude with a few notes on the design process itself.

The head-mounted display Oculus Rift DK2 was used to enable one of the performers to view the virtual environment in a natural manner. Another motivation for using the Oculus was the existence of an open-source project[1] that had already modified the Minecraft client to support the Oculus. To interact with virtual objects, the off-the-shelf motion controller Leap Motion was mounted on the front of the Oculus and integrated into the Minecraft client. The engineers from MIH Media Lab in Stellenbosch developed the hand gestures database specifically for the project. The performer's hand gestures were then recognized and mapped in a way that allowed him to select, place, break or otherwise manipulate virtual objects. This, on one side, effectively turned the performer into an input device in the technological interface, and on the other side, transformed his arm movements and hand gestures into an odd choreographic output for the viewing audience (see Fig. 4).

Moving in the virtual world by moving onstage had a similar function for the spectators. The Oculus enabled the performer to change his view of the world by simply moving his head. To translate his whole body movement in the real world into movement in the virtual world, we used a single camera worn by the performer, which observed a set of pre-installed markers. These markers are CCTags[2], developed by the engineers from Simula Research Lab in Oslo. The markers enable the camera to track the position and orientation of the performer's torso, and translate this into movement in the virtual world. However, the real-world movement is naturally limited by the demo space. We explored various approaches for moving longer virtual distances. In the end, the outer edge of the demo area was turned into what we named a *scrolling area*. When the performer entered this region, his avatar started to move continuously in the direction that he was facing. The performer could change the movement direction by turning his body and, to stop the continuous movement, he had to step back into the inner demo area.

1 https://github.com/mabrowning/minecrift

2 L. Calvet, P. Gurdjos, V. Charvillat, 'Camera tracking using concentric circle markers: Paradigms and algorithms', 19th IEEE International Conference on Image Processing (pp. 1361 – 1364), Sept. 30 – Oct. 3, 2012

We defined the inner area by a soft carpet, distinct from the hard, flat surface of the scrolling area. Walking barefoot on the carpet provided the performer with haptic feedback for the transition from movement area to scrolling area and constantly reminded him of the borders of his physical area[1].

The carpet helped the fully immersed performer with his orientation and location in the physical space. Consequently, it became a principal scenographic feature that demarcated the physical space, objects and actions from the virtual ones by placing them seemingly next to each other. This way the audience could simultaneously watch both the real and the virtual world, or look back and forth from one into the other. Another scenographic element in our technological interaction design was the control of stage lights through the changes in daylight during the gameplay of Minecraft. When it was daytime in the virtual world, the virtual world area on the smart stage was lit, while the real world area remained in darkness. When the performer's avatar went to sleep at night, the lights in the virtual world area dimmed while the real world area lit up, allowing the other performer to perform (see Fig. 5).

Figure 4: Performing a hand gesture. Photo: eSeL 2015


Figure 5: The mixed reality stage from the audience perspective (right corner front) in the course of the light change (left side is dimming – a night in Minecraft, right side is lighting up – a day in the real world). Photo: eSeL - Joanna Pianka 2015

Expanding on the aforementioned interaction techniques, we also experimented with shared avatar control by both performers at the same time, which allowed them to perform more complex avatar behaviours. While the first performer was fully immersed in the virtual world, the second one was present in the real world and experienced the virtual world using a traditional 2D screen. This gave him the freedom to move around quickly in the real world and perform activities that would be difficult or potentially dangerous for the one immersed in the virtual world. We chose the second performer to control avatar jumping and teleportation. To create a natural interaction, the avatar's behaviours were initiated by performing analogue activities in the real world. For example, to make the avatar jump, the second performer jumped on a real trampoline with embedded sensors. We also used this trampoline to make the avatar dance. To teleport the avatar to different virtual world locations, the second performer carried a physical block to different locations with embedded sensors on stage, similar to carrying the avatar to different target locations on a miniature map[2]. The engineers from Embedded Systems at the University of Duisburg – Essen developed the collection of these sensing devices. Inside of each is either a tiny Raspberry Pi computer or an Arduino platform allowing the IoT devices to send and receive messages and perform actions via a computer network (see Fig. 6).

Overall, these applications opened up space for an interesting power dynamic between the two performers. Executing specific actions in the Minecraft worlds, the first one had the power to virtually activate all the connected physical objects on stage, which would stay otherwise unresponsive. The second one could act as a kind of guardian angel for the first one and help him to progress in the gameplay and as such in the actual performance. If the avatar got stuck in a hole in the virtual world, the performers could combine their actions to jump the avatar out of the hole. If the avatar could not get free or needed to get away quickly from a dangerous situation, the second performer could initiate a teleport. Clearly, we only conducted initial experiments, but

1 M. Loviška, O. Krause et al., cit.

2 M. Loviška, O. Krause et al., cit.

both the technological and dramaturgical potential for novel interactions in the virtual world as well as between performers is high and should be examined in more detail.

The performer's avatar also interacted with NPCs, which are the beings in video games usually controlled by the computer. In our case it was a herd of pigs and randomly generated hostile monsters. Their own behaviour and simple agency introduced a basic level of unpredictability and randomness into the performance. For example, in one of the performances an exploding hostile monster unexpectedly killed all the pigs except one[1]. Such a surprising event not only required a different and prompt response from the performers, but also changed the emotional experience of the observing audience.

Another way to increase the space for improvisation and unexpected situations would be to allow remote users to log into the Minecraft environments. Streaming the performances in the physical world online in real-time could then allow them to see how their virtual actions impact the overall performance. There were several reasons why the team decided not to do so in the performances in Vienna. Making streaming an essential part would have meant a high demand on the Internet connection bandwidth, and the team had no way of knowing whether the video streaming would be reliably available throughout the performance. Besides this, with the IP address of the Minecraft server being public, there was a risk of attacks that could shut down the server completely during the performance. Also, the dramaturgy of the performance was not built for potential manipulation of the virtual environment by remote users, intentional or not. A development like this would therefore not have been possible by simply adapting the performance, but would have required a whole new design starting from scratch.

One of the most important lessons learned in discussions with our audiences was that ruling out the presence and random activity of remote users might have contributed

1 Originally, the herd of pigs was supposed to follow the performer's avatar from the giant server into the virtual WUK theatre.

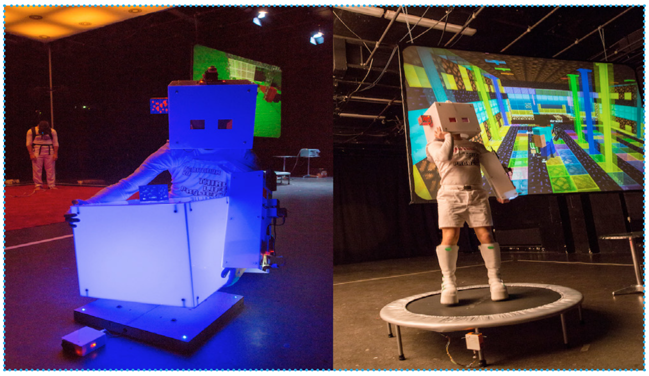

Figure 6: Performing teleportation (left) and jumping on the trampoline (right). Photo: eSeL 2015

to an uncertainty among a few of our spectators as to whether the gameplay was taking place in real-time or not. Some of the spectators also doubted the nature of the interactions between the virtual and real objects. Because the engineers sat behind the computers onstage, some spectators assumed that the engineers or theatre technicians were controlling the interactions. To support this assumption, one spectator even argued that everything in theatre is expected to be fake anyway. This was surprising and rather disappointing feedback, especially bearing in mind that we repeatedly stressed during the project development to the engineers that faking any interactions onstage was not an option, and doing so in technology-driven performances is even more problematic than in any other types of performance productions.

What could help to disperse such doubts is the incorporation of more direct interactions between the audience and the technology and virtual world during the show. In our case, the interactivity was reserved almost exclusively for the two performers, and the audience simply viewed these interactions, just as they might view any other type of theatre performance. The only exception were the two situations in which one of the performers read, with an embedded camera, some QR codes given to the audience when buying their theatre tickets, that allowed them to virtually appear as NPCs in the Minecraft worlds (Fig. 7).

The perks and perils of interdisciplinary networked collaboration

Naturally, there were financial, organizational, geographical and other limitations that influenced the project development and the decision making. In our case, most of the development was conducted via weekly video conferencing meetings, where we could share different perspectives on all the aspects of the process ranging from research topics, through organizational and financial constraints, questions of aesthetics up to the artistic choices and the engineering tasks behind the design of technologies, interactions and scenography. It is important to state at this point, that the artists discovered the scientists by searching online and sending over the concept proposal. One of the scientists approached, Carsten Griwodz from Simula Research Lab in Oslo, liked the idea and brought the rest of the computer specialists from the universities in Stellenbosch and Duisburg-Essen into the team. The whole team had never met before, and the artists and the scientists did not know the other party prior to the collaboration being initiated. Therefore, beside all the other challenges, we had to establish the trust and reciprocal understanding, respect for different goals, practices, expertise and rhythms of work in the process of the actual project development. As it is rare and rather a luxury in many collaborative practices to meet often and discuss everything in detail, this is where the online meetings did us a great service. They afforded us numerous opportunities to get to know each other, to recognize both the possibilities and the boundaries of what we all actually can and want to achieve in the project, and encouraged us to undertake the risks associated with such a mode of production. This way, we had an appropriately shifting balance of control between the artists and the researchers in place. Despite the fact that it might be the artists who take ultimate control of the form and content of the work, the above stated shows that the engagement of the computer scientists in our project represented a significant measure. Both parties shared the responsibility, and treated each other equally, and that was reflected not only in the development, but even more in the act of actually performing together onstage in the final production.

Despite this, we found that each group working separately and only meeting online to be the most problematic part of the project, in the sense that we could not integrate and test the technology together. The team met twice in the real world, during the final months of project development. The first time was in August 2015 at Simula Research Lab in Oslo, where a furious week was dedicated to integration and testing. Seeing things from this perspective then enabled us to undertake some of the artistic decisions. This meeting shaped, to a great extent, the sequencing of all interactions in the dramaturgy of the performance, as well as the design of the Minecraft virtual environments. These could then more meaningfully support the technology that had already been developed. The second and equally productive meeting was in the few days before the premiere at WUK Vienna, to set up and rehearse the actual performance. Naturally, as this was the first and only time when everything needed was available, many workarounds and adaptations were still introduced during the rehearsals. Even so, thanks to the numerous online meetings and the physical meeting in Oslo, we were quite well prepared and went through these last days without any serious problems.

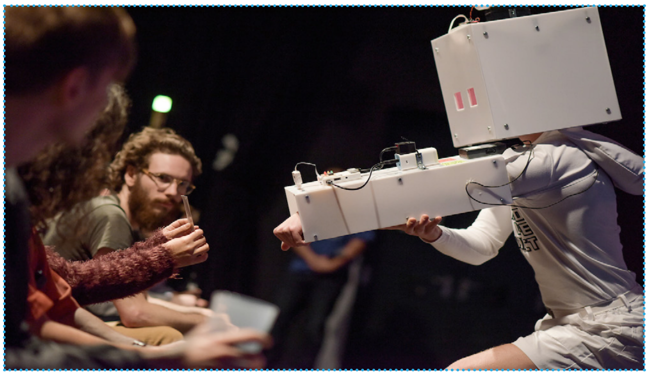

Figure 7: Audience interaction - scanning a QR code. Photo: eSeL - Joanna Pianka 2015

Conclusion

The design iterations went loosely through the following steps: concept and fundraising (2014), development, user - testing and evaluation (2015), with the last two being repeated several times, especially towards the end of the project. The project was not really pressured by any deadlines other than the two mentioned above; having the technology ready for the integration in Oslo and the rest finalized for the premiere in Vienna. The artistic ideas and the technology used were completely intertwined. One of the main design principles was that we only include the technology that actually enables us to build artistically relevant interactions, and at the same time that we exclude all those artistic decisions that we cannot support with the technology. This was related to another important design principle, that we design for spectating and as such we treat all the considered spaces, actions, roles, objects, events and interfaces as [potentially] performative. The collaboration has been very fruitful and enjoyable, and the team continues to work together on the next instalment of Third Life Project. This time the idea is to undertake a two-year long research with special focus on multiuser cooperation and audience participation in mixed reality interfaces.

Acknowledgments

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Project team

Milan Loviška - Territorium-Kunstverein, Austria, milan@loviska.com

Otto Krause, Territorium-Kunstverein, Austria, info@ottookrause.com

Herman A. Engelbrecht, University of Stellenbosch, South Africa, hebrecht@ml.sun.ac.za

Jason B. Nel, University of Stellenbosch, South Africa, jason@ml.sun.ac.za

Gregor Schiele, University of Duisburg-Essen, Germany, gregor.schiele@uni-due.de

Alwyn Burger, University of Duisburg-Essen, Germany, alwyn.burger@uni-due.de

Stephan Schmeißer, University of Duisburg-Essen, Germany, stephan.schmeisser@uni-due.de

Christopher Cichiwskyj, University of Duisburg-Essen, Germany, christopher.cichiwskyj@uni-due.de

Lilian Calvet, Simula Research Laboratory, Norway, lilian.calvet@gmail.com

Carsten Griwodz, Simula Research Laboratory & University of Oslo, Norway, griff@simula.no

Pål Halvorsen, Simula Research Laboratory & University of Oslo, Norway, paalh@simula.no