Choreographed 4D visuals: experiencing Sylvia Rijmer's Body Logic Method in a VR Dance installation

Unveiling choreographic thinking in an art & science laboratory

Hybridity can emerge from the interstices of interdisciplinary work. Hybrid creative approaches and research methods evolve in uncommon forms of collaboration. BlackBox is a hybrid art and science laboratory, more specifically involving Arts & Cognition: we are a team of researchers that includes academic scholars from cognitive science and linguistics, computer scientists, performance theorists, media artists and technology developers. Our main goal is to understand the compositional processes and 'choreographic thinking' of contemporary choreographers while working closely with them and following a practice-based approach. In other words, we try to unveil, via different digitised visualization techniques, what is normally hidden behind the curtains of the choreographic pieces we analyse. While using animated infographics, video annotation, motion tracking, 360º footage, 3D renderings, stereoscopic photography and virtual reality, we try to apply these technologies in accordance with the artistic work flow and the artist's aim. For our most recent collaboration we invited Sylvia Rijmer and worked with her during two art and science residencies. While the BlackBox researchers gained unique insight regarding her artistic process and underlying patterns of creative decision-making, Rijmer employed the scientists' analytical tools to reflect upon and further define her choreographic thinking approach called Body Logic Method (BLM). A strong will to collaborate was the trigger for this hybrid experimental study, both artistic and laboratorial. Important to this particular project has been the curiosity to reveal Rijmer's analytical choreographic process and the recognition of the value of sharing, which has multiplied the positive effects of a truly interdisciplinary and transmodal research within a collaborative study where brain, body and movement were the focus.

Working with hybrid bodies in VR

Sylvia Rijmer's BLM system enables the dancer to become aware of their individual 'body logics' and provides techniques to qualitatively improve their dance propositions in a creation environment where improvisation is employed. Specifically, she has generated tools for compositional (Dodging) and typological (Scanning) movement possibilities, which can be explored one by one and eventually combined. During the second residency, three dancers applied BLM techniques to explore graphic elements extracted from Cornelius Cardew's 'Treatise Score'. Written between 1963 and 1967, Treatise is a musical composition employing abstract and geometric symbols and shapes, which gives the musicians great freedom in how to perform the score. The BlackBox team has worked together with Rijmer to 'translate' these graphics into what we call '4D visuals' – i.e. scalable animated graphics in a 3D environment. We equipped the dancers with high-end HTC Vive VR headsets with cables (secured by an assistant), and enabled them to explore the 4D visuals in movement through the use of the BLM improvisational and

compositional tools. At a later stage in the residency, Rijmer and the dancers developed solos, duets and trios from these 'VR improvisations'. The results of this experiment is what a user can experience in our VR gallery-installation created in Unity 3D. We allow the users to interact with the same 4D visuals that the dancers had initially explored, and subsequently to navigate different virtual spaces, in which the VR-motivated compositions can be discovered. To this end, we have employed stereoscopic photography, point cloud recording, high speed burst photography and slow motion video recording as different mediums to create user experiences of the choreographic process. The layout of the VR gallery creates an interactive VR storytelling experience, where elements are gradually being revealed to the user by navigating through the environment.

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The architecture of the VR installation comprises of four buildings inspired by the Cardew graphic score. Each dancer's process can be visited on four different levels in their respective buildings. Additionally, a pyramidal structure lets the user explore the collaborative work in duets and trios on three levels. Navigation works both horizontally and vertically.

On Level 1 the visitor is invited to discover the identical 4D visuals that each dancer has explored and improvised with. Elements from Cardew's 'Treatise Score' appear in animated form, hence the fourth dimension (time) in the 3D environment. The visualizations can take the form of coloured graphic shapes, combined geometric solids and particle systems that suggest spatial and temporal properties inherent in the score.

Level 2 presents examples of 'embodied photography' of selected VR improvisation moments. Two kinds of photographic techniques are employed: high-speed or burst photography and stereoscopic photography. The sequences of high speed photographs show all the phases of a movement simultaneously. One can walk around the image sculptures and experience the spatial feats of the dancers' movement. Stereoscopic images can be experienced at very different scales.

Next level up the visitor can interact with a video recording of the solos that were choreographed based on the VR improvisations. We annotated the video recordings in collaboration with Rijmer and identified at which moment a dancer was working with a particular 4D visual. The user can grab the graphic that is presently displayed and place it next to the dancer in the video.

Finally, on Level 4 the visitor is invited to participate. To this end there are two possibilities resembling the work in a studio. Point cloud visualizations of the solo (without the graphics) enable a user to 'learn' the solo from a virtual teacher. Alternatively, the visitor can learn the solo from a video recording, or choose to freely improvise with the displayed graphic elements.

Upon entering the pyramidal structure above, the visitor encounters a familiar scenario. A rehearsal video shows the three dancers performing the trio choreography. In front of the video, the user has the choice to follow a particular dancer more closely through the choreography. To do so, the graphic symbols corresponding to the chosen dancer can be placed anywhere in the user's field of view.

Level 6 displays a slow-motion video. Here the visitor can see how the dancers adapted their solo material to the trio choreography. The user can explore what each dancer does by grabbing the annotations from the pillar. A first infographic relates to speed, a second infographic informs about differences in the quality of performing and variations between solo material and trio version.

On the final Level 7 of the VR installation, the visitor is presented with a creative challenge. A point cloud recording of each dancer's solo material is prepared on three respective pillars. The user can pick up each dancer using the controllers and place them on a stage in different constellations. This way the user can experiment with different compositions and create their own solos, duets and trios.

Three concluding thoughts on hybridity in our design work

(1) We have termed our visualization approach 'embodied photography and filmmaking'. In this case, the choreographic thinking of Sylvia Rijmer (based on her BLM system) presented a complex challenge, as the dancers were working in a mixed reality environment with the 4D visuals in VR. Our images were captured with 'embodied' technology (stereoscopic photos, high speed photography, slow motion videos and point cloud recordings) and with a vision for the installation, which revolved around the question 'How can the visitor physically experience the different stages of the choreographic process?' Hence we designed situations like the image sculptures on Level 2 with the 'dodging' technique in mind and invited the user to explore the surrounding space just like the dancers initially explored the 4D visuals. One could say that our design thinking was 'choreographic'.

(2) Scientific data visualization is commonly associated with static 2D graphics, interactive infographics, or animated infographic films. Infographics involve a storytelling dimension. Habitually, a journalist collaborates with the design team to present scientific findings in a comprehensive way. In our case, infographic approaches were employed when quantitative data was helpful for the understanding of the choreographic thinking or the performance of the dancers. At other times, our interactive scientific storytelling borrowed techniques from the field of dance. For example, on Levels 1,2,4 and 7 the visitor can physically explore the VR environment and contents in an improvisational setting. We believe that such embodied design approaches allow the users to better understand performance techniques and cognitive challenges experienced by the dancers in the creative process. We invite the visitors to experience scientific findings from the 'inside', from a first-person view.

(3) Comments made by visitors of our VR installation at the digital media festival *In Shadows* confirmed our hybrid art and science approach. One user said that her perception of the space augmented significantly, that she loved being so close to the dancer. Another user was fascinated by the possibilities that the miniature point cloud stage offered for choreographic experimentation. For us, the take-home message from this feedback is that this kind of hybrid 'choreographic object' allows for the exploration of scientific data sets from various epistemological perspectives. Professionals from the fields of performance theory, computer science and media art can explore the VR installation from academic perspectives; students and teachers in art education from a practical and theoretical viewpoint; and festival and art gallery visitors yet from another standpoint. For

us, all these user groups share a keen interest in making use of hybrid media art tools to explore what has not been accessible for them before: choreographic thinking in a mixed-reality setting.