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New Technologies - a Source of Inspiration and a Tool for Interactive and Immersive Experiences

Vlad Benescu[1]

Abstract: New technologies are influencing the sphere of performing arts with new possibilities for storytelling and the possibility of building a different kind of bridge between artistic creation and spectators. The objective of this article is to demonstrate how a context involving new technologies can facilitate an interactive and immersive environment in which the spectator can easily venture without feeling that his involvement in the artistic product implies an uncomfortable activity. In this article I will use as a case study a performing arts research project conducted in the summer of 2022 entitled Transsystemic Signals 2.0. This project brought together theatre artists and digital arts artists and aimed to explore the innovative-creative potential of the tools offered by new media. To analyse this research project I will first define what constitutes the interactive and immersive nature of an artistic product. During the course of my scientific research I have participated in several projects that integrated new technologies and I have fulfilled several functions: actor, dancer, director, choreographer, technician, cameraman, lighting technician, digital artist, which helped me to have an objective vision of the phenomenon.

Keywords: new technologies; interactive; immersive; creative process; performing arts

1. Introduction

The presence and use of new technologies is changing the dynamics of the performing arts. New technologies are changing the aesthetics, structure and mode of production of artistic projects. The tendency to migrate towards performances that integrate new technologies is driven by a variety of factors. Audiences are beginning to prefer interactive and immersive experiences. At the same time, artists are attracted to new ways of telling stories and new possibilities for creating social conventions that facilitate memorable experiences. Another factor is cultural

[1] PhD in progress, National University of Theater and Cinematography I.L. Caragiale, Bucharest, Str. Matei Voivode no. 75-77, 021 252 7457, Corresponding author: vlad.benescu@unatc.ro.

reflection. Art has always mirrored society, and in an interconnected and increasingly digitalised world it is natural that this reality should generate new themes for artists to explore. There is a possibility that forms of human-computer interaction can be used as inspiration for projects that do not use new technologies and their possibilities to facilitate communication, but more often than not artists choose to integrate these new opportunities brought by new technologies. Their integration opens up new ways of working with the perception and sensoriality of viewers. New technologies lead artists to have a predilection for designing and producing experiences that integrate the viewer and stimulate their senses.

2. Interactivity. Types of Interactivity

Steve Dixon in his book Digital performance defines four types of interaction: navigation, participation, conversation and collaboration. The four types of interaction are ordered in ascending order according to the degree of viewer involvement that each artistic project entails. Steve Dixon says that "the four types of interaction that we distinguish are ranked in ascending order according to the degree of openness of the system and the level and depth of interaction with the user" (Dixon, 2007: 563).

Browsing has the lowest degree of engagement Browsing may take place in physical space or it may take place in a virtual space. Any kind of computer or mobile phone use involves browsing. Even using the TV and using a remote control to change channels is navigation. Through the internet we navigate dynamic hypertext.

The next type of interaction that Steve Dixon defines as participation involves, in addition to navigation, a greater degree of involvement of the viewer or user. Technology opens up possibilities that would have been difficult or impossible without it. An example would be a simultaneous viewer vote to decide or influence how the experience will continue.

Conversation is a type of interaction that involves an exchange and a degree of complexity. "In works that operate on a 'conversational' interactive paradigm, there is often a complex relationship or negotiation established between the user/audience and the work, which is based on aspects such as trust, cooperation and openness" (Dixon, 2007, p. 585).

Collaboration implies that the artistic project is strongly influenced and modified by the audience's intervention. In an interactive performance in which collaboration is

present, the audience become authors or co-authors of the artistic project in which they participate. Collaboration is a type of interaction that can be enhanced by the use of new technologies. Steve Dixon reinforces this by stating that "collaboration can occur between a single user and a computer/virtual environment, but it usually occurs mostly when users work together with others to create new work using computer technologies or in a virtual environment" (Dixon, 2007, p. 595).

Art projects that are interactive in nature encourage play and enjoyment to enable cause and effect to exist. Steve Dixon says that interactivity in arts and performances using digital media revives feelings of childhood, when the world is a vast, inexplicable and beautiful environment. (Dixon, 2007: 598) In addition younger generations, who have grown up playing a lot through computers, phones, or other digital media, have all the more cultivated a desire to be part of what is happening in front of them. Every game on a phone or computer is interactive at its core. Hans-Thies Lehmann says that "these environments that they work and interact with on a daily basis lead viewer to wish that even theatrical performances had this characteristic, even to have an even more alert dynamic to distinguish them from what they see in the rest of their personal experiences" (Lehmann, 2009, p. 265).

3. Immersiveness. Types of Immersive Experiences

Immersiveness is given by the way the experience is created. Most often the immersive nature of an experience is given by the quality of the sound or image and the way in which they are rendered. Immersiveness can be of many kinds. There is narrative immersiveness, which is generated by the way the structure of the story or experience is designed, thus giving the viewer the opportunity to get lost. There is also a difference between literary and dramatic immersiveness. "Dramatic immersion differs from literary immersion in the tangibility of the world in which the individual is immersed, as opposed to the literary world in which the reader is absorbed" (Buoko, 2014, p. 260). However, an immersive experience can be created through the use of performance sound, which can transport the viewer to another reality and/or through performance imagery rendered in ways that facilitate a visual immersive experience. Often image and sound work together to enhance the immersive effect. Elena Gorfinke expounds that immersivity "is not a feature, but rather an effect that a work can produce on the participant" (Bouko, 2014, p. 260). Viewer immersion in contexts that use technology can also be achieved by the fact

that sound and image produce a form of sensory overload that exhausts the subjective perspective on the object or event.

There are many contexts where there is a confusion between immersive and interactive. "Immersive and interactive are not mutually exclusive nor do they guarantee each other. The purpose of immersion (when defined as sensory overload or exhaustion) is to place an audience member/participant in the world or aesthetic of the work. Achieving this effect may not necessarily require them to physically engage with the work." (Biggin, 2017, p. 61) Emily Brown and Paul Cairns, in a study of video games, define three degrees by which an immersive experience can be characterised: involvement, absorption and total immersion. In this case the degree of immersion is given by how much users of a game are connected with it and the production of emotional reactions based on the events in that game.

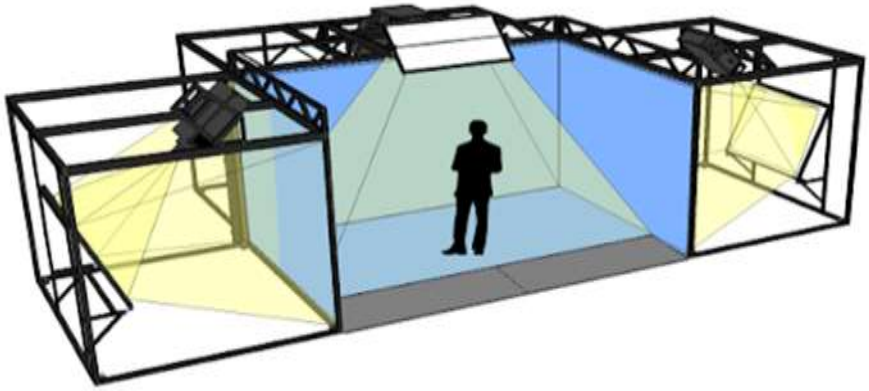
For an experience to be immersive it needs to be uninterrupted by a moment of objectification. Cinema reached a new level of immersiveness when it started using the curved screen, which covered a visual angle of 146 degrees. This represents the opening up of the human field of vision, which includes peripheral vision. With the advent of virtual reality headsets the ability to create immersive experiences with video content has increased. They fully shield peripheral vision, but in addition to this ability to deprive the viewer of external stimuli that could disrupt the experience, virtual reality headsets have motion sensors that allow the user to influence the perspective and orientation of the visual content being viewed. This interactive nature enhances the quality of the experience. There are cases where the experience is enhanced by multiple possibilities to interact. The user may interact with real objects that are also found in the virtual environment. This can be achieved through location auto-detection methods placed or integrated in the virtual reality headset in conjunction with certain ways of constructing the video content being viewed. Through this artifice the tactile sense is also involved in the experience, which enhances sensory stimulation.

4. Tools that Belong to the New Technologies that Allow the Creation of Interactive and Immersive Experiences

4.1. Technologies Used to Generate Immersive Experiences

In the context of the use of new technologies in artistic projects, a number of devices and methods that can facilitate immersive experiences stand out. Immersive experiences require the use of advanced methods of rendering video and audio content. Typically, to enhance the immersive effect, 3D film is used when using video content. This involves special methods of recording video content followed by special viewing methods designed to produce the three-dimensional effect. In order to create the 3D image or film effect it is necessary to use methods that render a slightly different image for each individual eye. Virtual reality headsets can be used to play video content, and depending on the quality of the internal screens, the immersive effect can be enhanced or other methods of playing video content on screens or video projection panels can be used. However, even in methods that use images on screens or video projection panels, it is necessary to use 3D glasses using different technologies so that viewers can enjoy the three-dimensional image. There are not yet optimal methods that can allow 3D images to be viewed without the use of glasses. Holograms are starting to make this possible, but this technology is still very expensive and not widespread. But at the speed at which technology is evolving, it is likely that in a short time this new potential will become readily available.

Configurations that facilitate immersive experiences can be found in cinemas. Since the 1950s, several ways of playing 3D movies have emerged. In 1952, Cinerama was born. Then in 1970 came IMAX, which also uses the curved screen. Another way to create immersive experiences is with CAVE installations. A CAVE installation involves using multiple video projections to cover four surfaces surrounding the viewer, namely three walls and the floor.



Source: http://www.visbox.com/products/cave/

In the Transsystemic Signals 2.0. research project, a configuration was created that offered the capabilities of a CAVE installation. In a proper CAVE installation, as shown in the image above, video content is played back via rear projection using mirrors. This method improves video quality by not distorting the rectangularity of the image at all, and this prevents the need to intervene in the video settings of the projectors, which would partly affect the experience. In the research project, direct projection was used to simplify the set-up, but also because it was desired to use the whole space without reducing the experience to a small perimeter.

4.2. Technologies Used to Facilitate Interactivity

There are multiple options that can be used in the performing arts to facilitate interaction. According to the Directing Cybertheatre study there are "three forms of interactivity in digital performance: interactivity between the performer and the digital set design (i.e. all digital material projected or rendered from the computer during the performance); interactivity between the spectator and the digital performance material; and interactivity between the performer and the spectator" (Salihbegović, 2013, p. 86). Interaction can be achieved mainly with the help of the following technologies: motion capture systems, smartphone, with the help of the internet, with the help of communication protocols such as MIDI (Musical Instrument Digital Interface), OSC (Open Sound Control), Bluetooth, biofeedback technologies or with the help of various devices such as development boards: Arduino, Raspberry Pi, Orange Pi, etc. In the case of the Transsystemic Signals 2.0. project, several motion capture sensors were used to generate interaction between the performers and the virtual set design.

In the Transsystemic Signals 2.0. research project, three Kinect Azure sensors were used to facilitate interaction. Kinect Azure is the third generation Kinect sensor and has a new feature that allows multiple sensors to be interconnected for volumetric capture. Volumetric capture is a method of creating a three-dimensional representation of an object, person or space in the real world. For this to be possible it is necessary to produce a series of operations supported by a computer. On the video projection, digital scenery and a three-dimensional representation of one or more people in the space for interaction will appear.

5. Transsystemic Signals 2.0.

Transsystemic Signals 2.0. is a performative installation presented at WASP-Working Art Space and Production in the summer of 2022, resulting from a research process. During the research digital artists collaborated with theatre and performance artists to discover how they could make a project that blends the two fields and generates an experience where viewers feel comfortable and easy to engage with the installation.

Four video projectors, three Kinect Azure sensors, a high-powered computer, a Matrox external video card, a high-performance sound system, a series of modular synthesizers, with sound created in real time, and many other connecting elements to facilitate the functionality of all the devices were used to create the final setup. On the software side, Unity game design software was used to process the motion sensor data and then integrate it into a virtual world created specifically for the project. It also processed how the images would be distributed to the four video playback sources.

The interaction facilitated by the Kinect Azure sensors was also processed and realised through the game design software. Within this, several rules were established by which virtual objects or the entire virtual space would react according to various triggers. Changing the position of the person or persons in the action perimeter caused the whole virtual space to move. This gives an immersive character to the installations because it simulates how in real life each change of position changes our perspective on the surrounding world. A calibration period is needed until the reaction of the virtual space is in line with the change in perspective we are used to. Of course one can choose to have this dynamic be different, faster or slower, but it is likely to keep interrupting our immersion in the installation or even create discomfort, especially when the visual content moves too fast.

In addition to the displacement caused by the changing position of people within sensor range there was also a displacement of virtual content that occurred independently of this possible influence. In order to make the installation immersive even in the absence of interaction with it, dynamics were implemented. The virtual room from which the virtual content was perceived had a linear forward displacement. This gave the impression that the elements and virtual space were coming towards the viewers, but the displacement was similar to the way we perceive the environment during a car or train journey.

Several interaction rules have been put in place. Several objects or virtual set structures reacted in different ways when the three-dimensional representation approached or overlapped them. Through this kind of interaction, which was not accurately shown from the beginning, the need was triggered to explore the virtual space and observe what reacts and what kind of reaction will occur.

In this project, viewers were going through all four types of interaction defined by Steve Dixon. In the first part of the performative installation they were in the navigation stage. Two performers, myself and Georgiana Ghergu were in the interaction space and interacting via Kinect Azure sensors with the virtual content. During this time the viewers could move to different places in the space as there were no chairs. During this initial period of the installation the interaction did not require a higher degree of involvement from the viewers, they could move around the space or stay in the place they had originally occupied.

Afterwards we left the interaction space and the video content resumed from the original point. These actions were a clear signal to the viewers and gradually they started to approach the interaction space. By moving towards the range of the motion sensors, the interaction became more immersive. Thus, at this stage we are dealing with participatory or even conversational interaction if there is more than one person in the space influencing each other. At the same time people who do not enter the interaction space are still at the navigation stage. Also, even collaborative interaction is present in the space. Through viewer participation, a form of narrative is independently produced in relation to predefined virtual content, but which is perpetually changing due to viewer input. Both the viewers who interact with the installation and those who merely observe the result perceive this created narrative. Those who interact have a dual experience in which they are both spectators and performers, but still, at least on a more diluted level, perceive the narrative being created in that moment.

The installation has an immersive character due to the CAVE-like configuration and the quality sound that is used for Transsystemic Signals 2.0. But viewers can't have an experience where they are totally immersed due to the fact that there are often other people around and the installation is more focused on interaction. Immersivity can increase if there is only one or a very small number of people in the installation. This context can cause the viewer to get lost in the content of the installation especially because of its reactivity, which can be reminiscent of video games, but in this case you are the character in the virtual environment and the avatar, which is your three-dimensional representation, can be controlled through your own body.

6. Conclusions

In the research project Transsystemic Signals 2.0. it could be observed that through new technologies it is possible to create a context in which viewers can easily engage. Spectators can engage in all kinds of interaction without prior training. The simple set-up of the installation makes viewers curious to play. There have even been instances where the installation has been presented without opening with a performative moment in which the two performers interact with it first. Viewers began to approach the video projections to vary perspective and be surrounded by the video content, and as they entered the sensor range and their three-dimensional representation appeared on one of the walls they began to play and check out the possibilities.

Contexts in which new technologies are used have greater potential for people to interact without constraint. There is also the possibility that in contexts without the intervention and presence of technology, there may be projects that loosen up the atmosphere and make it easier for spectators to participate, but through human-to-human interaction, unmediated by technology, and it is possible that the interaction and the degree of freedom that the person gives him/herself is also influenced by the compatibility with the facilitator. In cases where there is mediated interaction this constraint is non-existent and the possibilities are much more varied. Artistic projects that create interactivity through digital media not only activate the playful spirit, but also provide an increased degree of intimacy and allow the audience to act freely.

The possibilities of creating interactive and immersive experiences through new technologies is an area of potential not yet sufficiently explored. Although there is a long history of many achievements in this field, the frequent emergence of new tools continually opens up space for exploration and experimentation. It is only through

projects that explore and seek to integrate the potential of technology as creatively as possible to provide novel experiences that we can discover what we can really do with the opportunities around us.

At the same time, there are still no clear studies that define how interactivity can enable and enhance immersiveness within an experience. Rose Biggin says that "the relationship between interactivity and immersion should be considered separately from the means of engagement with the technology used to create the experience. Feelings of immersion do not come directly from the use of technology in the way that virtual reality or multimedia performance seeks to create an immersive experience." (Biggin, 2017: 65) With research such as this, a path can be paved towards projects that generate more immersive or meaningful experiences.

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