TOWARDS A DYNAMIC, INCLUSIVE AND EQUALITARIAN AUGMENTED ACTIVITY SPACE

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ABSTRACT

The design of a dynamic, inclusive and equalitarian augmented activity space/mixed media piece – named Guitar Hero! – that leverages the theatricality of rock guitarists and its embedded cultural symbols to articulate a coherent environment that amplifies and emphasizes interaction – and the psychology of mis-interactions –, embracing free will, intention and glitch, is described.

The technological and compositional strategies used to develop the Guitar Hero! environment, an analysis of its organisms (agents, actuators and sensors) and the relationships between them are outlined. Last, the multiple roles brought about by the expansion of the relationships between the environment’s organisms and the psychology of interactions brought by this expansion are addressed, specially free will, intention and glitch - human and technological.

1. INTRODUCTION

The 1960’s gave birth to an artistic desire for art forms that would “directly embody the counter-cultural longing for spontaneity, open systems, and the dissolution of borders between artistic experimentation and quotidian life.” (Salter, 2010). While John Cage was responsible for spontaneity, open systems, and the dissolution of the work of art during a performance, other key components were added. The 1960’s gave birth to an artistic desire for art forms that would also provide the opportunity to collaborate to the audience members and the performer through the use of technology.

2. THE ENVIRONMENT

The structure and narrative of Guitar Hero! reappropriate the theatricality of rock guitarists, its embedded cultural symbols and prescriptive models of action. These are used to compose a set of predetermined interactive scenarios inspired in particular moments of a rock concert, and whose design and notation provide enough space for improvisation and interaction. Preparatory scenes are introduced to accommodate the interactive environment proposed by Guitar Hero! by loosening the concert hall interaction constraints.

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rock show moments reappropriated in the piece
guitar and drum solos

guitar sacrifice

guitar duels

air punch

objects thrown at the audience

onstage running

singing

head banging

Table 1. Rock show moments used to create the structure and narrative of Guitar Hero!

The main strategies used to compose the scenes in Guitar Hero! include: a semiotic approach to the interactions in rock concerts and the various stages that lead to the concert itself; the creation of a set of situations that constantly reconfigure the activity space; the design of an extended architecture in which activity constraints are proposed by Guitar Hero! by loosening the concert hall interaction constraints.

The mixture of human, computer, and human-computer interaction are used as the point of departure to define and develop the characteristics of the organisms of the activity space and to define the technological strategies that best serve the compositional structure of the piece. The computer based strategies use audio, video, accelerometer, and gyroscope data provided by machine and human agents. This data is fed into the design of an extended architecture in which activity constraints are proposed by Guitar Hero! by loosening the concert hall interaction constraints.

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Guitar Hero! system, built in Max MSP Jitter, to augment and reconfigure the activity space, and generate audio and video output.

2.1. AUGMENTED ACTIVITY SPACE
The term augmented spaces refers to the domain of adding layers of data to the environment (Manovich 2006). The different data layers in Guitar Hero! serve the structure and narrative of the piece by generating a cotermiously expansion – resorting or not to technology and sensor fusion – of the agency possibilities within the space of its five main augmented agents (real and virtual).

2.2. The Augmented Performance Space
Spatial mapping and optical flow are used to estimate activity in certain regions and the velocity of one or more agents in the entire space. While the later is used to sonically spatialize moments in which body gestures similar to projectile motion are used to “throw” sounds into the concert hall, the former allows the audience and the performer to use the space on stage as a sound or behavior map, providing a simulated agency to the space itself. Further, the augmented stage is equipped with a video projector and a projection screen with the goal of extending the participation of the virtual performer to the visual domain, creating new possibilities of dialogue between the performer and the virtual performer.

2.3. The Augmented Virtual Performer
It is designed by developing and placing a traditional computer-based improvisation system in a different context, in which the focus is not put on the musical content of the computer’s improvisation, but on its ability to somehow interact with the environment, be it freely speak and move – by means of synthesis and sound spatialization. The visual appearances of the virtual performer simulate a visual dialogue with the performer by designing scenes in which loosely choreographed movements of the performer are video recorded, processed and played back.

2.4. The Augmented Performer
In the Guitar Hero! environment, the performer’s actions go beyond performing a piece whose success relies on playing an instrument whose reaction depends almost solely on the performer. Instead, the Guitar Hero! performer has to sonify his own body and handle the free will, intention and glitch from other agents. The former is used to support scenes in which, mediated by an accelerometer attached to his hand, the performer uses gestures to interact with a virtual band and the audience, as well as to throw sound projectiles. Arm gestures such as cueing the hand by raising the hands or strumming the guitar control the activation playback speed of samples played, while arm and hand gestures control the spatialization of sound by feeding accelerometer data from an IPod into a projectile motion in 3D space system and applying it to IRCAM’s Spat. The performer’s interactions with the performance space, virtual performer, computer musician, audience, and electric guitar, who all become agents in certain scenes of the piece, will be later explained in detail.

Figure 1. The augmented performer and its augmented instrument live coding and interacting with the computer musician during the XXVI Panorama da Música Brasileira Atual in Brazil.

2.5. The Augmented Instrument
It is developed to mutate the guitar into a non musical instrument whose behavior changes according to the current scene. Those in which the performer shakes the guitar are used to simulate a reaction of the guitar against the performer, thus highlighting and perverting the relation between the performed – instrument – and the performer. In these scenes, the speed of the guitar, collected from a Wii controller attached to its headstock, is used to produce sonic glitches unexpected by the performer.

2.6. The Augmented Audience
It is conceived as a strategy to immerse the audience in the activity space, granting them the opportunity to directly interact with the environment and play an active role in its evolution (Bourriaud 1998), without having to behave in any way different from how they would in a rock concert. Scenes were created in which interactive moments of rock concerts were simulated to augment the interactivity of the audience, vanishing the ubiquitous technology into the background (Weiser 1991) and using sound – making noises, clapping and singing with – as the main medium of interaction. Audience members can also interact by coming on stage or by throwing real objects at the performer.

As a consequence of these manifold augmentations, the organisms in Guitar Hero! are given the opportunity to play active and passive roles. This aspect is used as a compositional strategy to highlight the arisen relations between the organisms and their niche in each of these environments.

3. MULTIPLE ECOCOLOGIES
In this context, the term multiple ecologies refers to the multiple roles that are given to the organisms (Lippe 2002) and their interaction within the Guitar Hero! activity space.

3.1. Performer and Performer’s Body
The relation between the performer and its body are highlighted by compositionally exploring – leveraging from the theatricality of rock concerts – new functionalities given to certain parts of the performer’s body. These functionalities allow the performer to freely throw sonic objects into the activity space and create spatial trajectories of sound in real-time.

3.2. Performer and Instrument
The relation between the performer and the guitar is expanded by empowering the performer to use the guitar in non conventional ways. This does not mean using extended techniques to produce unconventional guitar sounds, but using the guitar as a non musical instrument that produces sounds or behaviors particular to a situation in the piece and in agreement to the context of the piece. During the piece, the performers moves and shakes the guitar, similar to rock guitar players, to use the guitar as a sound activator and spatialization tool.

Further, a dialogue between the performer and the guitar is created in scenes in which – borrowing from moments of guitar massacre in rock concerts – theatrical offensive movements towards the guitar, such as shaking it or threatening to throw it on the ground, simulate an offensive response from the guitar, which generates changes in the playback speed of active sound samples, start random sequences of samples and create jitters in the amplitude of what the performer is playing.

3.3. Performer and Performance Space
The relation between performer and space is expanded by requiring the performer, within the theatricality of the piece, to explore the space in different ways, including walking through the space, cueing certain reactions from the environment according to the performer’s position and throwing sounds into the space. Scenes are created to explore these three different interactions between the performer and the environment. The first interaction is mediated by the virtual performer and its position on space: during a sound dialogue with the virtual performer, the performer walks around the stage trying to go after the virtual performer, whose sonic position in space is randomly generated. The second divides the stage in a certain number of regions, each one with its own sonic peculiarities, that can be navigated by the performer, virtual performer, audio technician or audience members by using their bodies. The third extends hand and arm gestures of the performer to the entire space by using the trajectories described by these gestures to produce sound spatialization.

3.4. Performer and Virtual Performer’s
The relation between performer and virtual performer is applied to the auditory and the visual domains. This is achieved by composing scenes that use a sonic and visual computer improvisation system to create interactions between the performer and the virtual performer. There are two main scenes in the piece. During the first, the one the performer and the virtual performer dialogue with one another through their position on space. The performer walks through the space as if trying to make contact – physical and sonic – with the virtual performer, who suddenly sonically appears and disappears. This juxtaposes the spatial characteristics of the performer and virtual performer: while the former has a fixed size and moves according to body constraints, the latter has a malleable size and moves in space according to the limitations of the PA.

The second creates, during the rather common musical improvisation guitar duels, an illusion of visual interaction and teasing. Choreographed moves from the performer are audio and video recorded, processed and played back and orchestrated to suggest a provocation against the performer.

Figure 2. Virtual Performer provokes the performer during a performance at the ZKM in Karlsruhe.

3.5. Performer and Audio Technician
Prescribed technical glitches are embedded early on the score to make it unclear to the audience whether or not later glitches in the piece are intentional. This does not mean, however, that unplanned glitches are not
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The relationship between performer and audio technician is composed to strongly oscillate between intention and glitch and give the later enough freedom to directly influence the piece. This is done by asking the audio technician to confuse the performer by using the max patch – or live coding – to modify in real-time certain aspects of the environment, such as the sensor threshold, or throwing random sounds. This approach aims at frustrating the performers expectations, creating a more dynamic – or nerve wrecking – environment. The audio technician is also expected to incorporate into the piece any real or false glitches – including abusive audience interaction – that may surge during the performance.

3.6. Performer and Audience

Specific situations are designed to stimulate a change of roles and a two-way interaction between the audience and the performer. They make use of musical culture and memory, psychoacoustics and well established rock concert interactions. The scenes were carefully designed to create an immersive environment in which audience interaction is not prescribed and does not require interfaces external to the audience, thus allowing the audience to behave as themselves, be it a rock concert crowd. Motifs and guitar licks with clear harmonic structures and high ease of apprehension are used in Guitar Hero! to facilitate audience participation. In a recent performance in a music university, unfinished snippets of Beethoven’s 5th motif were combined with rock licks to generate expectations on the audience members and empower them with the ability of finishing the performer’s melodic phrases – which happened often. In other scenes the audience contributes to the piece by sonifying a drum loop, over which the performer will improvise. Typical of rock concerts, there is a scene in Guitar Hero! in which the audience is given guitar picks. However, the audience is invited to throw them at the performer, who replies by using the guitar as a baseball bat that produces all types of sound when the performer swings. Although many situations are orchestrated, the piece is open to any types of interaction that might arise from audience members. Guitar Hero! implies a structure with a flexible time and space that is able to handle free will, intention and glitch – one of the most important aspects of the piece. This approach is used to grant to all things in the activity space the right to coterminously act as themselves in a pliable time and space that oscillates between free will, intention and glitch – technological and human.

5. FURTHER DEVELOPMENTS

The efforts for further developments are focused on the implementation of 3D projection mapping to increase the spatial placement possibilities of the virtual performer, as well as visually creating a virtual space, on the expansion of audience interactivity by creating mechanisms of interaction mediated by audio and video data collected from the entire space, and on the use of rock guitarists and its embedded cultural symbols to articulate an augmented activity space that expands and emphasizes the interaction – and the psychology of mis-interactions – between agents, and between agents and actuators. These multi ecologies in Guitar Hero! produce an interaction timing particular to inclusive and egalitarian environments, empowering agents to contribute in real-time to the evolution of the piece and granting all things the right to coterminously act as themselves in a pliable time and space that oscillates between free will, intention and glitch – technological and human.

6. REFERENCES