Sonic Interaction Design in Immersive Theatre

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Abstract

Immersive theatre has two vital features: immersion and interactivity. Immersion has two types: one is physical immersion, and the other one is mental immersion. Interactivity happens between audiences and immersive theatre production, such as props, installations and actors. Audiences have chances to interact with sets, installations and actors. Besides, immersion and interactivity are not two distinct features. Interactivity can help lower the barriers to the immersive experience, but it cannot guarantee immersion in the audience.

This thesis shows the result of three professional sound designers' interviews and a case study of immersive theatre – *Sleep No More* in Shanghai to analyse sound design methods. From interviews and the case study, we can learn that sound is an important component in immersive theatre, as in other theatre performances. Sound design approaches have some similarities and differences when compared to traditional theatre. Looping sound is a main technique for the sound designer. Besides, they will also create a different audio system for immersive theatre, which happens in different spaces.

In this thesis, a sonic interactive system flowchart was provided. It compares two types of gesture recognition technology, analyses the possible ways users can manipulate this system by using software design methods and uses the audio engine to design the system flowchart. Considering the concept of the sound zone in *Sleep No More*, we can combine scopes of camera-based gesture recognition devices with the sound zone in immersive theatre.

Key Words: immersive theatre; sound design; sonic interaction; gesture control

Author's Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for a degree or other qualification at this University or elsewhere. All sources are acknowledged as references.

Content

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1 Introduction

1.1 Background

Immersive theatre refers to a form of performance which breaks the fourth wall, which is an imaginary "wall" separating the story world (the stage) and the real world. Sometimes, traditional theatre will allow actors to directly speak to audiences in order to break the fourth wall (Risko, Richardson and Kingstone, 2016). However, immersive theatre uses various methods to disintegrate this barrier between audiences and performance. Methods include the use of specific spaces, one-on-one performance (Cartelli, 2012; Machon, 2013; Punchdrunk), and even the use of binaural audio to create an immersive auditory environment (Machon, 2013). All these methods aim to achieve an identical goal – creating an immersive experience.

In immersive theatre, "immersive" not only means "a state of being immersed", but also "providing information or stimulation for a number of senses" (Machon, 2013, p.21). There are many types of sensory stimulation, including visual, aural, and tactile. Therefore, creating a well-decorated set for immersive theatre is not the only way to create immersion, interactions, including physical communication, dialogues and narratives could also evoke audiences' interests which may finally lead to mental immersion. Therefore, "interactivity" becomes a feature of immersive theatre. The process of interaction provides sensory stimulation in multiple ways. As Biggin (2017, p.2) reflects, immersive theatre has incorporated non-linear storytelling, interactive elements or characters, and innovative design in the performance environment, including set design. Non-linear storytelling with varieties of installations and surroundings increase interactivity in immersive theatre. Machon (2013) also mentions that "interactivity" is a significant part of immersive theatre. For example, *Punchdrunk*'s *Sleep No More* is an immersive theatre production in which audiences may wear a mask, stand beside the performance area and have opportunities to choose the room or stage they want to step into and the character they want to follow (Machamer, 2017, p.63). The interaction between audiences and story is a key feature of *Sleep No More*.

Sound is a vital component that affects both audiences' physical and psychological sensation, and can be used "to move the audience, to create a world, suggest an environment, evoke an emotion, reveal truth" (Finelli, 2002, p.13). It aids in the creation of the atmosphere of the piece as well as being used to represent objects. It can also convey emotions and construct an auditory environment that may seek to reflect the real world or create an imaginary one.

In modern performances, many theatre companies and artists have tried to apply advanced technology, including electronic sensors and gesture recognition devices to their productions. Artists have combined electronic sensors with set design to make stage performance more interactive (Hahn and Bahn, 2002; Honauer et al., 2017; Qin et al., 2015).This technology has been applied both on visual and aural elements, with the latter including both sound effects and music. It is worth noting that set design processes that use computer science and electronic techniques in theatre are similar to those in art installations and interfaces for musical expression, which also use electronic sensors and technologies. These art installations and interfaces have not only been used for exhibitions, but have also been used in multiple performances. For instance, art installations and electronic music devices named *Audio Shake,* using accelerometer chips (Mark, 2004), a physics-based sonic dining table *Gamelunch* using contact microphones (Delle et al., 2007), an instrument called *The Hands* using metal electrodes (Murphy, McKinnon and Zareei, 2016; STEIM Amsterdam, 1973), a device named *Myo Armband* using myoelectric sensors (Getmyo, 2013; Di Donato et al., 2017) and a music interface called *Mi.Mu Gloves* which used flex sensors (MIMU, 2010). With the development of computer vision, gesture interaction without a wearable device is becoming more commonplace in performances. Some interactive performances are using Microsoft Kinect to create interactive experiences, which will be introduced in section 2.3.3 (Bargsten, 2013; Honauer et al., 2017; Qin et al., 2015).

Most performances mentioned in the introduction provide interaction focused on the set, light and sound design for performers and actors. Few of them have considered audiences' interaction through technology, and its resulting immersion, during performances. To provide a higher level of immersion for audiences in immersive theatre through sound, this research focuses on sonic interaction and sound design in immersive theatre.

1.2 Research Questions

Transducers, motion tracking and multimedia systems are used in a variety of artistic performances, such as music performances, dance performances, and immersive theatre. The present project focuses on investigating the application of interactive media and audio technology for sound design in immersive theatre. The project explores three research questions:

(1) Is it possible to apply sonic interaction design principles to immersive theatre?
(2) In the context of sonic interaction design for immersive theatre, what type of adaptable interactive techniques are both suitable for actors and audiences?
(3) How can they be applied to immersive theatre productions?

These questions are aimed at exploring sonic interaction design and immersive theatre, and looking at the possibility of applying sonic technologies that are rarely used in theatre sound design, to promote the development of theatre sound design in future theatre productions and create higher levels of immersion for audiences.

1.3 Thesis Structure

The thesis is divided into four parts:

Firstly, a literature review on immersive theatre, sound design, sonic interaction and gesture recognition. This step is crucial to establishing overlaps across these four research areas. It contributes to the first research question, exploring the features of immersive theatre and sonic interaction design in different types of performance and art installations.

Secondly, I explore the outcome of three interviews with professional sound designers in order to supplement the literature review findings. Interviewees shared their sound design experience in traditional and immersive theatre, describing the similarities and differences between these two types of theatre and explaining the challenges and opportunities of each type of performance. The purpose of the interviews was to learn from professional sound designers and discuss their practice as well as the potential of the incorporation of sonic interaction design to theatre production.

The third part of the thesis focuses on a case study, the performance of *Sleep No More* in Shanghai. It analyses the sound design in *Sleep No More* which could help proposes a reasonable sonic interactive system in the following chapters.

Based on the literature review, interviews with sound designers, and the case study of *Sleep No More*, the fourth part of the thesis discusses the most appropriate type of sonic interaction for immersive theatre, focusing on two different types of gesture recognition technology. Besides discussing the hardware for sonic interaction design, this part of the thesis also discusses the software for implementing an interactive sonic system and provides a prototype of a sonic interactive system that might work in a small-scale immersive theatre piece. Then, an expert of game audio technique was invited to criticized this system and gave out his suggestions for the future research.

2 Literature Review on Immersive Theatre, Sonic Interaction Design and Gesture Recognition

This chapter compares and contrast the idea of different authors in immersive theatre, sonic interaction design and gesture recognition. By learning the knowledge about immersion and interactivity, sound design in theatre, sonic interaction design, and different technology of gesture recognition, this chapter shows the relationship between the thesis and previous studies, and highlights the gaps in sonic interaction design and immersive theatre sound design.

2.1 Features of Immersive Theatre

The aim of this research is to explore a methodology to enhance immersion and interaction in immersive theatre through sonic interaction design. However, "immersion" has different definitions, and it is important to define "immersion" and "interaction" in the context of current developments in immersive theatre. In this section, the focus is on the history of immersive theatre, as well as the features of immersive theatre and sound design in theatre performances.

2.1.1 Immersion

"Immersive theatre" is a term that is commonly used in the UK (White, 2012) and it refers to a kind of performance in which audiences are beside the actors in expansive environments, which means the room or spaces for performances are not restricted to traditional theatre stages and audiences can interact with installations, such as set pieces, lights and sound (Biggin, 2017; Nield, 2008; White, 2012). Some immersive theatre productions also feature interactions between actors and audiences. Immersive theatre companies in the UK include *CoLab*, *Coney*, *Curious*, *Dreamthinkspeak* , *Punchdrunk* and *Shunt* (Machamer, 2017, p.93,94). Some new US companies, such as *Bricolag*e, *Dog and Pony*, and *Third Rail*, started creating immersive theatre when immersive performance went into the US (2017, p.94), as these productions sparked the interest of the theatre community in the US and generated new companies.

Immersive theatre might date back to the political participatory art practice and pedagogical drama practice in the mid-twentieth century (Machamer, 2017, p.95). Marvin Carlson indicated that before the term "immersive theatre" started being utilised, many immersive performances were called "site-specific", "environmental" and "promenade theatre"(Carlson, 2012). In the 20th century, a site-specific drama could be held in spaces such as a living room, a hotel or any other spaces, as required (Carlson, 2012).

Many researchers (Biggin, 2017; Carlson, 2012; Machamer, 2017; Machon, 2013; White, 2012) have agreed that applying gaming theories and technologies to the analysis of immersive theatre can be helpful for scholars. For example, Sara Thiel (2017) uses the five conceptual planes of three-dimensional video game space to analyse the immersive theatre production *Sleep No More*:

> (1) *Play Space:* the physical stage of the immersive theatre production. Physical stage means the room and space used in the production. For example, the rooms used in *Sleep No More*.
> (2) *Rule-based Space:* the tutorial before audiences join the production. For example, in *Sleep No More*, before audiences go into the room where actors are, they will be gathered around staff or actors to learn the rules.
> (3) *Mediate Space:* the installations and set design in the space of immersive theatre, such as the lights, loudspeakers, projectors and LED screens.
> (4) *Fictional Space:* the audiences' imagined space according to the material world of the immersive theatre production. It can be considered as a conceptual world that audiences create when they start experiencing theatre.
> (5) *Social Space:* The interaction and communication between audiences within the space of the immersive theatre production. It means audiences can socialise with each other within the theatre space.
> (Thiel, 2017)

These five "spaces" help theatre artists create a thriving immersive production from not only material structures but also the experience of audiences. The narrative and performance design of immersive theatre are used to facilitate a physically and emotionally immersive experience (2017, p.14). These conceptual planes also support the theory suggested by Machon that immersive theatre is a type of "audience-plus" performance (2013). It means that creating and completing this type of performance is not just the role of producers and actors, but that audience participation is also key. That is the reason why sonic interaction design for immersive theatre should not only focus on the performers but also consider audience interaction. Essentially, immersive theatre is an art form focused on audiences' individual experiences, as suggested by Michael Billington (Billington, 2007; Machamer, 2017, p.62).

2.1.2 Interaction

Interaction between humans and computers in video games is critical. Game players interact with the characters in the game through a keyboard, mouse, gamepad and microphone. Once game players send information through the user interface, game characters will provide feedback (actions, or sound, or both) for players. In immersive theatre, audiences have a similar role as game players, especially story-based video games, such as interactive fiction (IF). In this type of

video game, players choose different available paths within the game, leading to different outcomes. In immersive theatre, audiences walking through rooms and spaces, choosing various scenes to watch, and interacting with multiple installations and surroundings, may also lead to a different outcome of individual experiences. The interaction between audiences, in-character actors, and stage installations differs from those interactions between players and games. However, the results and feedback that audiences receive are similar in that they could increase mental immersion for participants.

The in-character actors may have "semi-improvised" dialogue (the actors' lines may be fixed but the audiences' response is uncertain) with audiences in an interactive performance (Biggin, 2017, p.64). Interactivity in an immersive show is not only from person to person but also from person to stage/scenery installations. Interactivity in scenography design helps audiences experience physical immersion by going into an environment (2017, p.60). Dixon (2007) reflects on four types of interactivity in performances, which may occur simultaneously. The level of the interactivity is in ascending order (with higher numbers indicating higher levels of interactivity):

> (1) *Navigation* is the simplest interaction in the four categories of interactivity. It is a simple action following an instruction, such as pressing a button or clicking a mouse to choose "Yes" or "No" (2007, p.566).
> (2) *Participation* is a higher level of interactivity than Navigation. Besides the simple action, participation provides multiple-choice questions and gives a response back to audiences. In theatre, participation means that the audiences may be invited to interact with performers or installations (2007, p.581), but they will not change the narrative.
> (3) *Conversation* is a continuous interaction. For example, the audiences have a dialogue with performers in-character in the theatre. The interaction may happen between human to human, between audiences and software or between audiences and hardware (Dixon, 2007, p.585; Biggin, 2017).
> (4) *Collaboration* is the highest level of interactivity in these four categories. Audiences do not only participate in, or have a conversation with the performance or artwork, but also contribute themselves to a part of the performance/artwork (2007, p.595). Participatory art involves this level of interactivity. Participants join the art performance and they are not only an audience member but also a part of the participatory performance.

As Brown and Cairns (2004) explain, an immersive experience does not mean audiences feel immersed or do not feel immersed; there can be different states of immersion: "engagement, engrossment and total immersion" which show the gradient in immersive experiences. Interactivity and immersion do not guarantee each other, but interactivity can help immersive

performances achieve immersion (2017, p.63). In many immersive performances, digital technology creates effects that aim to facilitate immersion, rather than exploring the relationship between audience and technology (2017, p.63). Therefore, the research on applying sonic interaction design to immersive theatre essentially aims to explore the methods for engaging audiences with immersive experiences by extending the interactivity to the auditory environment.

There have been a number of immersive theatre performances in the last decade which have used different technologies to create a new age in immersive experiences. For example, *Flatland* by *Extant* (Spiers et al., 2015) is a immersive theatre performance uses different technology at the same time. It focuses on creating opportunities for visually impaired participants, while also advocating for a shared experience with sighted audiences. Therefore, *Flatland* performance concentrates on the sense of hearing and touching. As the designers aim to remove the visual element from the performance altogether, the design of the senses such as sound and touch become particularly important (Extant, 2015). In the dark room of *Flatland* Sound provides orientation and scale for the audience in the flatland, while the haptic device guides and assists the audience in exploring the room. To allow the audience to experience the performance using their sense of hearing and touch, the designers had them wear spacelander suits and bone conduction headphones (Kendrick, 2017, p.82). The sound has been specially designed. Several speakers are placed in the room to fill the space with sound, becoming an acoustic blanket to mask any extraneous noise. The audience wears bone conduction headphones that provide a guide voice which helps them to orientate themselves and direct them to the areas they can explore (Kendrick, 2017, p.83). Besides, *Punchdrunk*, an internationally renown immersive theatre company, has received a lot of feedback from audiences since the launch of Sleep No More, comparing the experience to gaming. They are currently working with game company *Niantic* to create and develop new productions using gaming technology (Punchdrunk).

Virtual Reality and Augmented Reality have also become a choice for creating immersive performances. *Dill Pickle* created by Pietroszek (Pietroszek, Rebol and Lake, 2022) is an interactive immersive theatre which combines character capture and virtual reality technology, allowing real actors to perform and interact in a virtual space. *Sutton House Stories* (Dima and Maples, 2021), is a four minute story introducing the heritage – Sutton House, a Tudor house located in London, UK. It was designed and created in 2019 and used AR technology to allow visitors to interact with historical characters, learning about historical events during their visit.

Sound effects and music are essential elements in theatre, the same as they are in immersive theatre. The next section focuses on sound design in theatre and investigating sonic interaction.

2.2 Sound Design and Sonic Interaction

Sound and music have been important elements in theatre throughout history, even before scenery and props became significant. In ancient Greek drama, due to the very large audience areas, such as in Epidaurus, which can accommodate up to 14,000 audience members at the same time, many audiences members were too far away to see actors clearly, so theatre sound became a significant element for them to understand the content of the plays (Bennett, 2019, p.16). Before the advent of recording devices, sound effects such as animal sounds and birdcalls were recreated live by talented voice imitators, and other sound effects were all created by using different tools. For example, a ceramic bird whistle was found in Shakespeare's Curtain Theatre, which was used to mimic birdsong (Bennett, 2019, p.40; MOLA (Museum of London Archaeology) Team). "Thunder runs" were built above theatre stage ceilings and consisted of wood and metal, including wooden tracks and iron balls as Figure 2.1 shows. When the scene needed thunder sounds, theatre workers would step on the "thunder run" and allow iron balls to roll down from wooden tracks (BBC Radio 4; Bennett, 2019, p.39). From the 1930s, pre-recorded sound effects were gradually used in theatre performances (Kaye, 2009).

（a）Balls and Wooden tracks

(b)A Part of "Thunder Run"

(c) Wooden Track

(d)A Panoramic View

Figure 2.1 "Thunder Run" in Bristol Old Vic (Bristololdvic.org.uk)

2.2.1 Sound Design in Theatre

The purposes of sound design are multiple. Music and sound effects in theatre are crucial for the creation of atmospheres and transitions (Kaye, 2009). Reflecting a character's characteristics and situation are common important considerations for a sound designer (Kaye, 2009). The term "soundscape", which was first coined in the 1970s by R.M. Schafer (1977), delivers a similar meaning to what Kaye suggested.

Voice (including speaking, chant and singing), music, song, soundtracks and intended and unintended noise (including clapping, laughing, coughing and chatting) form part of theatre sound (Bennett, 2019). In theatre practice, sound does not only have physical attributes such as frequency and amplitude, it also has mental and spiritual attributes, which are similar to visual effects. Audiences can perceive sound as "warm or cool, soft or harsh and busy or simple (pattern)"(Kaye, 2009), which help them understand current situations and characteristics in a production. Intended and unintended noises – clapping, laughing, coughing and chatting- show interaction of theatre sound. As Susan Bennett (2019) suggested, audiences create these noises which are also a part of theatre productions. Actors on stage and technical staff rely on these noises created by audiences to receive audiences' feedback. Interaction is not only between actors, technical staff and audiences, it also happens between actors and music, voice and other sound sources (Kendrick, 2011, p.xxx). Modern technology's development brings more opportunities and methods of interaction between different people (audiences, performers, technical staff). This is one of the reasons why conducting this research project is crucial.

The role of sound designer has changed with the development of technology. Stage managers used to be responsible for finding sound effects and music according to the requirements of directors and producers, and manipulate the tapes of sound effects during performances as well (Kaye, 2009, p.7). After multiple modern creative tools were developed, such as "digital audio workstations, CDS, synthesizers, samplers, computer-assisted playback system and high-quality loudspeakers", the role of sound designer gradually separated from stage managers (Kaye, 2009, p.7).

Due to the development of technology, sound designers should keep updating their knowledge. So far, Musical Instrument Digital Interface, known as MIDI, has changed and improved the designing progress in sound design and music production. In interactive performances, actors can already trigger sounds with gestures by using wireless MIDI devices (Kaye, 2009, p.9). In theatre production, the way that stage managers or sound designers trigger sound has changed. A

commonly used technique is the use of a piece of software called QLab. QLab is used for designing and controlling sound, lights and videos (qlab.app). Stage managers play the sounds according to scripts and performance, instead of creating sounds using theatre installations, for example, *Thunder Runs*. Besides the theatre industry, the performance of sounds is also a key part of the sound work of film, television, games, animation and web series (Ament, 2014, pp.24–32), and it is known as Foley. Foley is a method which includes performing footsteps, as well as working with the sounds of props, and clothes. These sounds aim to help actors and directors convey their intentions (Ament, 2014, pp.33–40).

Besides, some sound designers have tried technology and techniques from non-theatre industries to create sound for theatre performance and achieved unexpected effects in the theatre productions. For example, sound designer Pierre-Marie Blind worked on a theatre play called *Le Léthé* by using Wwise (Blind, 2017). Wwise is a game audio engine for game sound design (Audiokinetic). It helps game programmers to trigger sound, to modify sound properties and to mix sound effects and music in video games. However, he used Wwise to create an adaptive soundscape for the performance. The sound and music were adaptive to the actors' performance, so there was no need to worry about the synchronisation.

To some extent, sonic interactive systems transfer part of the sound manipulations from sound designers to actors and audiences by using gesture recognition technology. The link between sound design and interactive technology could be sonic interactive design, which is explored in section 2.2.2.

2.2.2 Sonic Interaction

Considering the methodology to create an interactive auditory environment is crucial to this research project. Sonic interaction design (SID) is a research area combining sound, human-computer-interaction and interactive arts (Rocchesso *et al*., 2008). Due to its focus on interactivity, sonic interaction design might be a useful method to design interactive auditory environments for immersive theatre.

At the beginning of the 20th century, with the computer algorithm development, sound production, especially music production, started to apply electronic devices to the production process. The music production process was reduced to "simple movements of buttons, sliders and knobs" by using mixing desks and electronic plugins (Franinović and Salter, 2013), changing from acoustic instruments to digital devices. Sensing and triggering techniques became a new research topic

from the late 1960s (2013). These techniques in the sound production area helped musicians and sound artists develop electronic musical interfaces by using electronic transducers and sensors. *The Hands* is such a device, created by Michel Waisvisz in the 1980s (Carlson, 2012; STEIM Amsterdam; Torre, Andersen and Baldé, 2016), and whose sensors tracked the movements of fingers, with the electronic data sent to the back-end system for controlling MIDI (STEIM Amsterdam).

Franinovic and Serafin (2013, p.vii) suggest that sonic interaction design is an interdisciplinary subject which requires knowledge and techniques from electronic engineering, interactive media, music, acoustics, cognitive sciences and communication sciences. They also define sonic interaction design as "a creative activity of shaping relationships between artefacts, services, or environments and their users by means of interactive sounds." They also point out that the properties of sound, which are instability, vibration and malleability (2013), make the sonic interaction different from visual interactions. With the development of recording techniques, physical media, such as tapes, turns sound into a physically malleable material. Therefore, sound artists exploited the speed, phase, and other parameters of physical media to create new sound effects (Franinović and Salter, 2013). For example, in 1963, Paik (2002) designed and created a sonic interactive installation by cutting radio tapes and pasting them on the wall, named *Random Access*. In this project, Paik designed a creative way to play the tape's sound. According to the properties of the normal tape playing approach, speed and direction, he used a handheld playback head, which was connected to the speakers, to play the sound recorded on the tapes. Figure 2.2 shows *Random Access*.

Figure 2.2 Random Access in 1963 (Paik, 2002)

Sonic interaction includes expanding functions by modifying acoustic instruments, creating new digital musical instruments, and designing interactive installations for the public to interact with the sound environment, among others (Dahl, Bevilacqua and Bresin, 2010). Sometimes, each

interactive action can have unexpected sound feedback which makes "unrealistic" links between gesture and sound (2010), or modify, exaggerate and contradict the sound feedback (Delle Monache, 2012). Actually, the unrealistic feature in sonic interaction was already described in the term "schizophonia" by Schafer (1994, chap.6), which means "the split between an original and its electro-acoustical transmission or reproduction". In other words, the acoustical properties of sound feedback from sonic interaction could be different from the original sound source. *The Gamelunch*, created by Stefano Delle, is an example of the separation between tableware collision and sound feedback. The work aims to explore the relationship between "interaction, sound and emotion" (Delle *et al*., 2007). In *The Gamelunch*, Physically-based Sound Synthesis Algorithms (2007) were the method used to create a "schizophonic" art installation. These algorithms help the designers of *The Gamelunch* reproduce the main identity of sound with the data collected from transducers by using reasonable physical/mathematic models. However, the synthesised sound feedback from the system contradicted human's daily auditory experience, which misled human's behaviour while they were manipulating the tableware (2007). In other words, participants would hear sounds different from what they might expect in the regular domestic context. Figure 2.3 shows the mapped areas of the table in *The Gamelunch*.

Figure 2.3 Details and mapped areas of *The Gamelunch* (Delle *et al*., 2007)

The outdoor sound art installation *Lost Oscillations* (Murphy, McKinnon and Zareei, 2016) aimed to reproduce the soundscape of a city which was destroyed by an earthquake and reconstructed after the disaster (Murphy, McKinnon and Zareei, 2016). The structure of *Lost Oscillations* is similar to *The Gamelunch*. The interface is built with wood, plastic decorations and metal electrodes. The whole installation includes the interface and eight loudspeakers as shown in Figure 2.4. When participants touch the mental sensors, the system triggers multiple playback events for participants to experience the city soundscape from different directions (Murphy, McKinnon and Zareei, 2016).

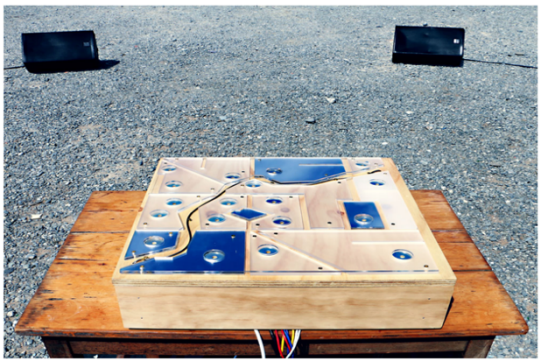


Figure 2.4 The purpose-built *Lost Oscillations*' user interface, shown with two of eight loud speakers (Murphy, McKinnon and Zareei, 2016)

In addition to the examples mentioned above, there are many other sensor-based audio interfaces created by different researchers, such as *Jam-O-Drum* (Blaine and Perkis, 2000), *The Squeezables* (Weinberg and Gan, 2001), *The Beatbug Network* (Weinberg, Aimi and Jennings, 2002), and *Audio Shaker* (Mark, 2004). *Jam-O-Drum* was a collaborative audio interface, created using a table, a video projector and six drum pats. As the drum pats are hit, by up to six simultaneous users, the system creates rhythmical music and projects different visual effects on the table (Blaine and Perkis, 2000). *The Squeezables* was also a digital musical interface which was made of pressure sensors and soft gel balls. Users pulled or squeezed soft gel balls and pressure sensors sent data to the system, creating music (Weinberg and Gan, 2001). *The Beatbug Network* had a special shape design, which was similar to a bug with two antennas. The whole interface had eight "bugs" and users created music by hitting the antenna on the "bugs" (Weinberg, Aimi and Jennings, 2002). *Audio Shaker* was a sonic interactive device that looked like a water bottle. Users could open the bottle cap and make any sound for the device to record, then they shook the bottle and the audio would be remixed according to the data from the accelerometer chip in the device (Mark, 2004).

To conclude, sonic interaction design is an interdisciplinary subject. Before the definition of sonic interaction design was given, there were already a number of interactive devices and installation in the academic research. As Pauletto (2014) suggests: "sonic interaction design studies how digital sound can be used in interactive contexts to convey information, meaning, aesthetic and emotional qualities." Exploring the applications of sound and interactive systems, creating new relationships between sound, objects and human in digital ways is the main aim of sonic interaction design.

2.2.3 Summary of Sound Design and Sonic Interaction Design

Sound Design focus on sound creation. It creates an auditory world for performances in theatre, assists in conveying new information that is not conveyed visually on the stage, and sets off the emotional atmosphere of the story. As a strategy for performance, sound design creates sound and music, choose sound and music which can set the tone of performances. In the progress of creation, sound design may use technology to achieve goals.

Sonic Interaction Design focus on technological innovation. It uses a variety of interactive technologies to manipulate the properties of sound, such as volume, frequency, pitch and position, so as to achieve the designer's purpose, including creating new forms of sound performance, restoring historical soundscapes, and researching psychological and philosophical thoughts. In these productions, designer will usually choose suitable sound and music, or create sound and music by MIDI, or record sound from user's manipulation.

The relationship between sound design and sonic interaction design is intersection. Sound design and sonic interaction design focus on two different key point as the previous paragraphs said. With the development of technology, tools of sound design have changed from mechanical devices to electronic devices. In the performance, sound designer also uses varieties of approaches to create sound and music. Some of them are sonic interaction design. Designers has begun learning and using new technology, which was not used in sound production before, to their creation. Meanwhile, sonic interaction design has a part of work which could be considered as sound design (for example, choose a suitable timbre for creating NIME). To conclude, both sound design and sonic interaction design works on sound, and they all convey thoughts of designers, but they have different key points on implementation.

2.3 Gesture Recognition in Art Installations and Performances

Sonic interaction is not limited to art installations, it also applies to performances. Combined with gesture recognition, sonic interaction design has been used in music and dance performances. Researchers and designers have been creating wearable devices to manipulate acoustic properties of music during live performance. For example, *Pikapika* (Hahn and Bahn, 2002) is a solo performance using a bespoke wearable sonic interaction device fitted in the costume of the dancer to play different sound effects and to control the music, through the choreography.

Sonic interaction design has also been used in multimedia theatre performances. For instance, *Schwelle* (Baalman, Moody-Grigsby and Salter, 2007) is a large-scale interactive theatre

performance which used a wireless sensor-augmented device for creating adaptive audio scenography. The dancer/performer in *Schwelle* wears two accelerometers on the wrists, and one on the chest. On the stage, the set designer uses eight photoelectric sensors to receive data of lighting changes and the data is then used to control the acoustic properties of sound effects (2007).

In those previous studies, the sonic interaction design section focused on describing the implementation of the interactive systems, with a less thorough reflection on how and why to map acoustic properties to performers' gestures. The present project explores interaction between human and system, that is not limited to well-trained and experienced actors, but also includes audiences. Therefore, researching gestures in performance is a necessary step.

2.3.1 Body Gestures in Performance

Both Camurri (2010) and Sofia Dahl *et al.* (2010) suggest that human gestures are able to express information in the emotional domain. Camurri *et al*. (2010) interpret the term "gesture" in their article as including "(1) body gestures, where the entire human body is involved, (2) arm gestures, performed by either the fingers or the hand(s)." Dahl *et al.* provide a narrower definition of gestures than Camurri, by focusing more on musical gestures, which are the movements of joints and muscles when the performers are playing musical instruments during performance. With the similarity between musical gestures and communicative gestures in daily life, Dahl *et al.* (2010) point out that it is hard to distinguish the functions of communicative gestures when various gestures become an entirety.

Rosenbaum *et al*. (1991) pointed out that large-range movements will manipulate larger joints and muscles, for example, arms, whereas small-range movements will be more related to muscles and joints on fingers. According to their article, this physical movement pattern is called optimal movement selection, which means choosing the lowest energy cost of movement patterns. What is more, when the performance tempo becomes faster, the gesture elements will be combined and produce integrated movements (Dahl, Bevilacqua and Bresin 2010). According to the movement patterns mentioned in Rosenbaum's article, designers could foresee the movement patterns of the actor and the audience's joints in the performance, which can be used to design the corresponding sound interaction. However, this is also a challenge in sonic interaction design if designers choose gestures as a key interactive function because the ambiguities are in the different combination of gestures.

2.3.2 Sensor-based Gesture Recognition

Sonic interaction design in New Instruments for Musical Expression (NIME) is not a new application. Researchers exploit the physical signals from sensors, transforming them into electronic signals and mapping signals to a variety of audio. There are different types of sensors for creating NIME, but the intuitive interactive approach is using fingers to play and control music instruments because hand manipulates tools more finely than any other part of the body. Therefore, the examples in this section are about hands.

For example, *The Hands* (third version) was a gestural controller-instrument made by the musician Michel Waisvisz. It was a hand-based controller device that sonic interaction researchers cited in their articles as a typical example, like in Winkler's (1995), Franinović's (2013) and Torre's (2016) chapters. The third version of *The Hands* was a hand-wearing device. It is a further developed prototype of the first version in 1984 to 1989 (STEIM Amsterdam). In order to observe the details of this instrument, the picture from the article of Torre, Andersen and Baldé (2016) is shown in this section (see Figure 2.5). In this instrument, sensors were mainly functional components which were built in the small keyboards on the instrument interface as shown in Figure 2.5. The instrument's user, controls the MIDI by using fingers to press the keys on the keyboards. The sensors catch not only the movement of fingers, but also the gestures of the whole hands and arms (Torre, Andersen and Baldé, 2016). However, keys and arm gestures require performers to be experts such as Waisvisz himself, and well-trained. Otherwise, it is hard to create an entire music piece and express emotion (Franinović *et al.*, 2013). While sensors-based technology brought innovation to sound and music, it did not reduce the difficulty of learning and using.

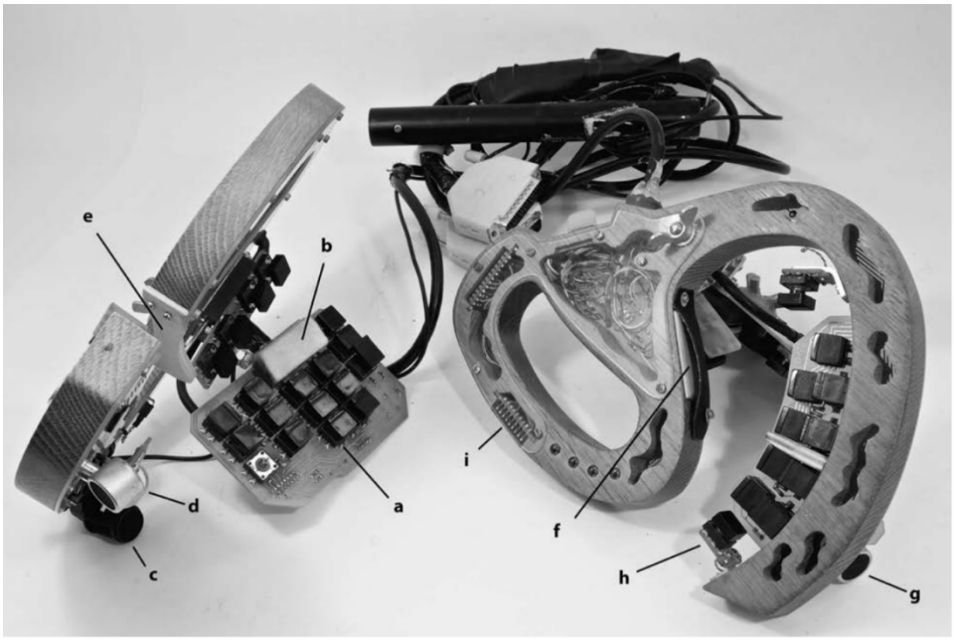


Figure 2.5 The left hand device of *The Hands* (3rd Version) (Torre, Andersen and Baldé, 2016)

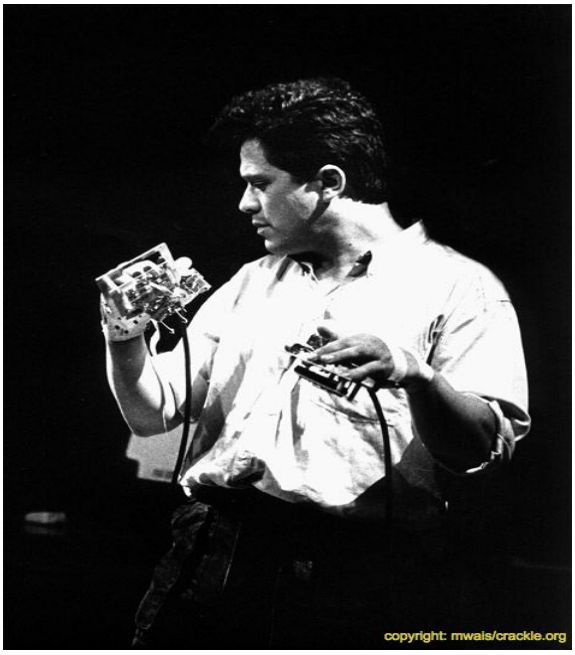


Figure 2.6 *The Hands* (First Version) (STEIM Amsterdam)

To some extent, *MI.MU Gloves* achieves the goal of a simplified interface. It is a commercial wearable musical instrument. Instead of keyboard and keys, *MI.MU Gloves* consists of ten flex sensors on the back of the gloves, which track the movement of fingers and knuckles. An inertial measurement unit (IMU) sensor is attached to the wrist of the gloves, which can track the orientation of arms and hands, sending direction data to the software. To have accurate feedback when users are using the gloves and mapping sound to gestures, the designer in the MI. MU Team designed haptic motors and a combined button with an LED light on both hands. The LED lights

provide visual feedback and haptic motors provide the tactile feedback to users (MIMU, 2010; Freire).

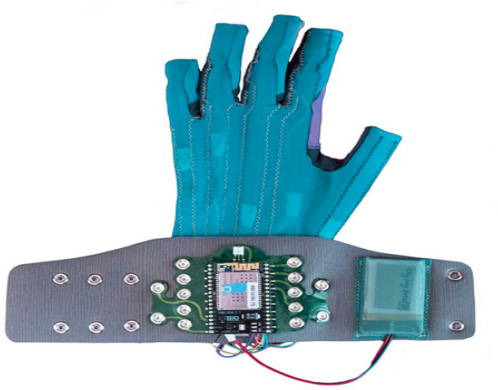


Figure 2.7 *MI.MU Gloves* (From website (Shu, 2014))

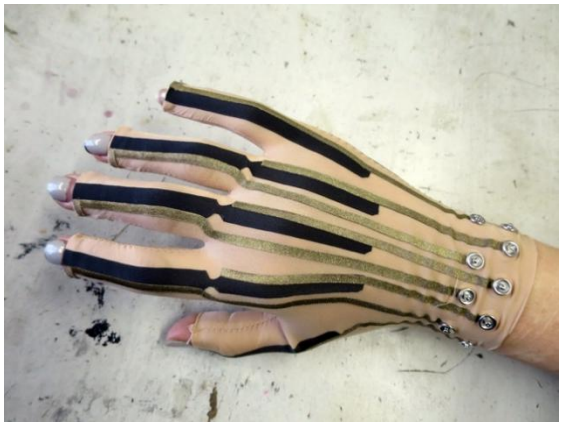


Figure 2.8 Prototypes of *MI.MU Gloves* (From website(Freire))

Considering the interaction between audiences and theatre pieces, wearable gesture recognition devices are not suitable for multiple audience members in immersive theatre. In the cases mentioned in this section, wearable gesture recognition devices usually need long-term practice to master the skills. Audiences in immersive theatre have no time to spend on practising. Moreover, they may be expensive due to the need of several specially designed devices. Therefore, vision-based gesture recognition, which will be explored in next section, may provide opportunities for multi-user interaction.

2.3.3 Vision-Based Gesture Recognition

Body gesture and hand gesture recognition technology are broadly used in many areas, such as the game industry, the film industry, and virtual reality. Researchers in human-computer interaction and computer vision have conducted in depth research in the field of recognition of human gestures. As Wu and Huang (1999) describe, vision based gesture recognition technology

includes motion modelling, motion analysis, pattern recognition, machine learning and psycholinguistic studies. Figure 2.9 shows the process required for visual gesture recognition.

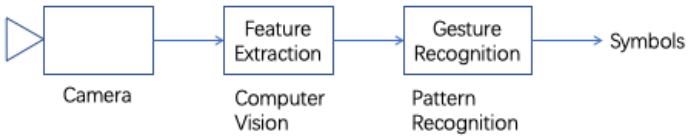


Figure 2.9 The different processes required for visual gesture recognition (adapted from Camurri *et al*., 2010)

As Figure 2.9 indicates, the camera in the recognition system is the "eye" of the computer to capture body gestures and movements. Each frame of video captured by the camera will be sent to the system as the data source. Camurri *et al.* introduce three types of approaches for three kinds of features for gesture recognition systems, referred to as *silhouette-based*, *appearance-based*, and *motion-based* features (Camurri *et al*., 2010).

The *silhouette-based features* method extracts the target object's silhouette from the static background by providing a reference background image. The noise in the silhouette figure is because of the camera sensor, fluctuations in the lighting and the target objects' colour to which the background colour is similar. To reduce noise, some image processing filter and binary large object processes are applied to the results (Camurri *et al*., 2010).

The *appearance-based features* approach is to detect the colour of the pixel from current figures that can separate foreground and background; the colour may be skin-tone or another pure one. The colour detection can be used both in RGB (Red, Green, Blue) colour space and HIS (Hue, Saturation, Intensity) colour space. Due to limitations of colour detection, appearance-based systems often use markers which are special coloured objects to help the system recognise human gestures (Camurri *et al*., 2010). Said special colour in the environment often means the colour which is different from all clothes, foreground and background. When the camera is trying to catch human's gestures, the camera catches these coloured objects, which show the joints and body and tracks body movements. It considers the clothes and coloured objects on a human body rather than the human body itself. In order to grasp accurate data from coloured objects, the environment for gesture tracking should be simple enough without decorations.

The *motion-based features* approach is similar to the *silhouette-based features* one, whose extraction and detection are based on a static background. The difference between these two

recognition methods is that the *motion-based method* subtracts the silhouette of the previous frame from that one in the current frame. Because of this principle, the motion-based features method can be only applied to a moving scenario (Camurri *et al*., 2010).

The difficulties of gesture recognition in computational systems are not only the challenges mentioned above. As Camurri *et al*.(2010) indicate, sight sometimes will be blocked by other objects, and a part of the body movement will not be perceived. In this situation, the human being will consider it as the movement is continuing, but the recognition system will have problems finding the continuity of body movements. The recognition system will not receive data of movements, or will not correctly match the gestures when body movements are hidden behind obstacles.

However, the difficulties of recognising body movements have not been an obstacle to research in the field. Applying gesture recognition technology to performing art has already appeared in previous studies, and have included technologies and devices such as Microsoft Kinect, OpenCV, and Webcam with Openpose. Bargsten's (2013) research on gesture and performance with Kinect is relevant to this project. In this research, Bargsten used Microsoft Kinect, PureData and middleware called Synapse to create an audio and visual performance (Bargsten, 2013). Figure 2.10 shows data of the skeleton grasp from Kinect.

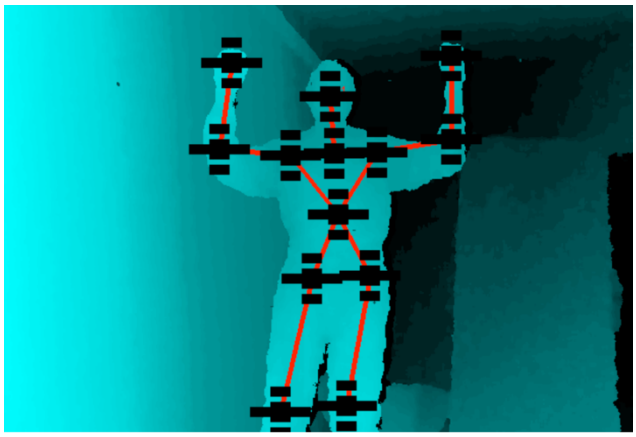


Figure 2.10 Skeleton data from Kinect and Synapse (Bargsten, 2013)

In the picture (Figure 2.10), the human body and joints consist of black points and red lines. The position of points and the movements of red lines will transfer data by Synapse. Open Sound Control (OSC) is the data language that Synapse uses and most contemporary programming languages can receive its data to control MIDI (Bargsten, 2013).

Figure 2.11 Mirror Mind Still (Qin *et al*., 2015)

In 2015, Yi Qin designed a "New Music-Media Theatre"(Qin et al., 2015) piece called *Mirror Mind* which was adapted from Chinese traditional musical theatre, *Kunqu*. This performance combined sensor-based sonic interaction and camera-based gesture recognition techniques. Microsoft Kinect was used as depth camera for gesture capturing in the performance (Qin *et al.*, 2015). They did not only use Max/MSP for processing data from the wearable sensor-based devices on performers on the computer used for audio, but also processed motion data by Max/MSP on the other computer for video. Although they were using two types of system in the performance, they tried to make a connection by constructing a local Ethernet network (Qin *et al*., 2015). *Mirror Mind* showed the possibility of using camera-based gesture recognition in performance, while it was still applied only on visual effects.

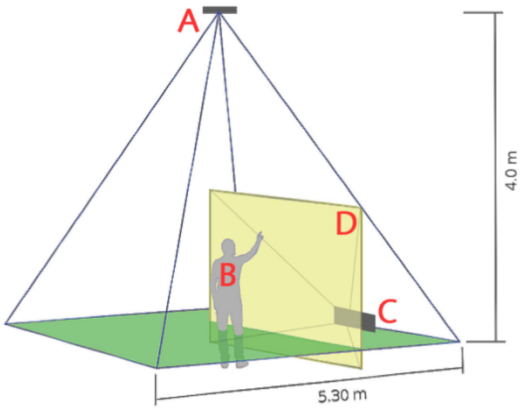


Figure 2.12 The structure of interaction system in the *Dusk*: Setup – A) ceiling- mounted Kinect sensor, B) actor in front of screen, C) short throw projector, D) projection screen. (Honauer et al., 2017)

Mirror Mind is not the only production to have used Microsoft Kinect. In 2017, an interactive theatre piece named *Dusk* also used this device, but in a different way. Shown in Figure 2.12, a Kinect was hanging on the ceiling. The designer of this performance used the depth camera of the Kinect device to detect the position of the actor in front of the projection screen. The data of the actor's position controlled the visual effect on the screen. While the actor walked along the screen, the lights in the building on the screen would be switched on, as shown in Figure 2.13.

Figure 2.13 The visual effect in Dusk (Honauer *et al*., 2017)

These two performances showcase how vision-based gesture recognition technology does not only track body joints but also data on the entire person. According to the application programming interface (API) of Microsoft Kinect, the data from the colour camera and depth camera can be of multiple people. Therefore, vision-based or camera-based gesture recognition technology can facilitate interaction between an uncertain number of audience members and sound, when compared to sensor-based technology.

2.4 Summary of Literature Review on Immersive Theatre, Sonic Interaction and Gesture Recognition

In sections 2.1, 2.2.2 and 2.3, I identified immersive theatre as having two essential characteristics – immersion and interactivity. Immersion has two types – physical immersion, provided by the set design and installation, and mental immersion, created by the physical environment and the story's narrative. Sara Thiel (Thiel, 2017) analysed the immersive theatre production *Sleep No More* by using video game theory, which indicates the similarities between immersive theatre and video games. Moreover, theatre researchers used four categories of interactivity and three levels of immersion as theories in immersive theatre research. Interactivity and immersion are not separate features. Although they do not guarantee each other, interactivity can help lower the barriers to the immersive experience.

As a vital component, sound contributes to creating immersion in theatre productions. It includes voice, music, sound effects and noise. The auditory environment in the theatre consists of these sounds that immerse audiences in the story. In the past, facilities like "Thunder Runs" for making sounds were built in the theatre, and stage managers used to be responsible for creating sound effects in real-time during the play. With the passage of time and the development of technology, sound designers' work has changed from manipulating facilities in the theatre to editing sound recordings, from analog techniques to digital techniques. The role of the sound designer has also changed due to the development of sound-producing technology.

Sonic interaction design has been applied to performances and art installations. In music performances, performers have worn sonic interactive devices, creating music by varieties of hand gestures and body gestures. People using them in sonic interactive installations, have manipulated installations and experienced the sound feedback. Some installations also created music; other installations created soundscapes or created unique soundtracks by using data from systems and transducers. Due to interactive systems, the sound people hear can be completely different from what people expect. Therefore, sonic interaction design brings more possibilities for sound production in performance, providing new opportunities and strategies for theatre sound design.

Human gestures play an important role in triggering sound in sonic interaction design. Therefore, how an interactive system recognises gestures becomes a key point of sonic interaction design. Commonly used recognition technology includes sensor-based work, including switches, flex sensors, capacitive sensors, which are touchable, and computer vision and cameras technology, which are not touchable. Some researchers have used camera-based gesture recognition

technology in theatre and dance performances. However, they have been focused on manipulating visual effects rather than audio. Whether camera-based recognition technology is suitable for sound design was discussed with sound designers during bespoke interviews, as reflected in section 3.

3 Perspectives of Professional Sound Designers on Immersive Theatre and Sound Design

3.1 Introduction of Interview

The literature review conducted in section 2.1 shows the characteristics of immersive theatre, reflects on sound design and production techniques, and the applications of sonic interaction design in art installations and performances. However, the definitions of "immersive theatre" from the perspective of sound designers and sound designers' working procedures within immersive theatre productions and their opinions of applying gesture recognition technology to sound design needed further exploration through data collection in the form of interviews. Questions for sound designers were about immersive theatre, sound design, theatre rehearsal, sound technology and game sound. In addition to understanding the definition of immersive theatre by sound designers, these interview questions also help researchers understand the sound design process for theatre.

Three professional sound designers were interviewed about immersive theatre and sonic interaction and shared their working experiences in theatre. These three sound designers were invited because they all had experiences on sound design for traditional theatre and immersive performance:

Miquelon Rodriguez is a theatre artist, sound designer, composer, sound editor and broadcast designer in Toronto, Canada. He majored in theatre subjects, including directing, scripting, acting and design. He has been working on sound design for theatre since university. In his interview, he introduced site-specific, Promenade theatre and immersive theatre. He also introduced his workflow of sound design and rehearsal. Loops were the main technique he used for immersive performance.

Nick John Williams was a pop drummer. When he was at university, he was introduced to interdisciplinary performance. Then Williams became a PhD student studying sonic art, working with dance performers and sound installation practice. After finishing his PhD, he started working as a professional sound designer in theatre and worked for musicals and site-specific performances. In his interview, he pointed out that immersion happens on audiences, and immersion happens emotionally. He often used sensors and single board computers for sound design in site-specific performance.

Yaiza Varona is a composer and sound designer. She has experience working with theatre productions and other performances. In her interview, she argued that immersive theatre does not require the use of technology and can immerse the audience in the story. Varona thought that while audiences are guided to do something or find something in the performance, they will regard themselves as a part of the performance. She thought that the more they interact with things in the performance, the more immersed they are. Besides, she also mentioned her difficulties in theatre rehearsal.

The full set of questions asked during interviews can be found in *Appendix A: Interview Questions*, the data extracted from interviews can be found in *Appendix E: Table 1 Data extract from sound designers' interviews*, together with full transcripts in *Appendices G, H, J.* In addition to the set questions, interviewees were encouraged to talk about their own experiences beyond the questions. In other words, this is a semi-structured interview. Hence, the interviews were not strictly limited to the questions listed. The responses of each sound designer supplemented gaps not covered in the literature review. Ethics approval was granted by the Department of Theatre, Film, Television and Interactive Media for conducting these interviews as non-anonymous to recognise the contribution of these professionals to the thesis. Blank information sheets and consent forms can be found in *Appendices B*, *C* and *D*.

3.2 Methodology of Analysing Interviews

By interviewing these three professional sound designers, I captured specific knowledge that was missing from the literature review. This section provides an analysis of the interviews. It proposes ways forward in interaction and sound design for immersive theatre based on those findings and the literature review.

To analyse the interviews, I utilised Themes Analysis (TA). TA is an analytic approach to organise and describe qualitive datasets by defining themes (patterns) (Braun and Clarke, 2006; Braun et al., 2019). There were three main steps in the analysis of the interviews:

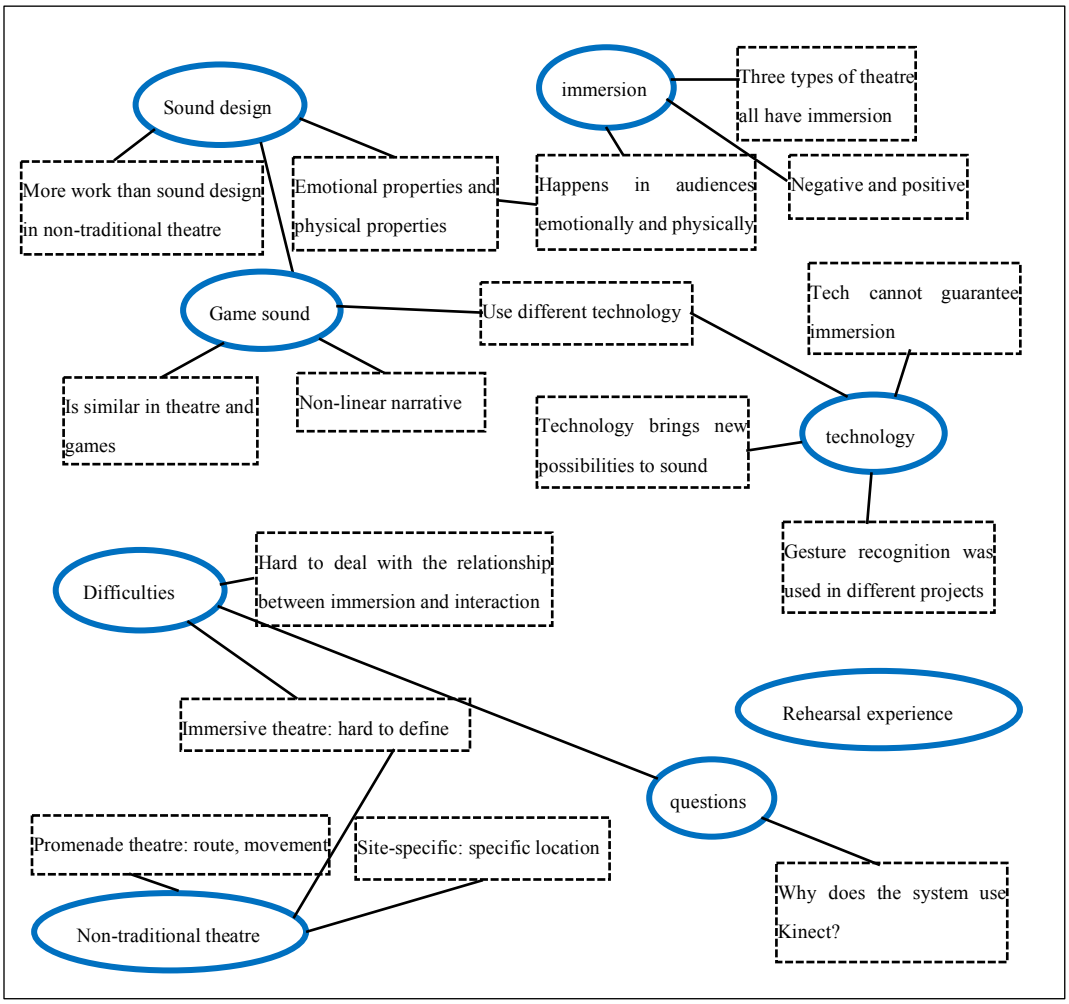
1. Data extracting: familiarising myself with the interview content and extracting the data from it.
2. Themes searching and reviewing: finding features and key ideas from the dataset; organising them as several themes; reviewing themes to create a thematic map.
3. Themes defining and naming: making a clear definition for each theme in the thematic map.

In the next section, the initial thematic map shows the main topic of sound designers mentioned in the interview. Then, after reviewing and summarising the initial themes, I created final thematic map to conclude the key point of what sound designers described, which is a way that help this research find out the important things that sound design and sonic interaction design should pay attention to in the theatre production.

3.3 Analysis of Interviews

The data was extracted from the descriptions when sound designers were answering the questions on the list, including topics they mention beyond the questions, which are shown in Table 1 (see *Apendix E*).

Similar descriptions from sound designers' answers were classified as the same topic in the dataset. The codes in the table were coded from each topic, while each topic has one or more statements from interviewees. By searching for themes from codes, there is an initial thematic map showing in the Figure 3.1.



The themes in the initial thematic map are similar to the interview questions. It shows eight themes: sound design, game sound, immersion, technology, difficulties, non-traditional theatre, rehearsal experience and questions that interviewee pointed out.

By reviewing the initial thematic map, it can be seen that there is no determined definition for immersive theatre. Immersive theatre can have different formats of performance, can be in different places, it may or may not have interactive elements. However, their views all have one thing in common: immersion. Immersion happens in audiences. Interaction and technology could help a performance immerse audiences, but they (refer to interaction and technology) do not guarantee audiences will be immersed.

The opinions of sound designers reveal the procedure undertaken to immerse audiences. Firstly, creating an environment for audiences to engage in the performance physically. Physical immersion includes visual effects and sound effects. Audiences looking around the space, listening to the sound and music, and touching objects in the venue are the first steps to an immersive theatre story's world. Sound and music deliver the emotion of the performance. Audiences receive the visual and aural information, following their curiosity to explore the story then getting immersed emotionally. Because the immersion might happen in audiences, immersive theatre could not exist without audiences watching it live. It may not deliver the immersion to an audience watching online or through pre-recorded performances. To some extent, audiences might be considered part of the performance. This performance is complete when there is an audience.

Like all theatre productions, sound design in immersive theatre starts by working on the script and discussing ideas with the director. The designers work with sound and music to create an environment that helps tell the story. Immersive theatre venues tend to be bigger than traditional theatre stages so that sound designers will prepare multiple sets of sound and music cues for different scenes. The techniques used include loops and triggers. They create loops for the whole performance and keep it going till the end while also enhancing the sound design by adding specific sound cues using event triggers. The trigger can be to manually play a sound effect at a set point in time or to use a sensor at a specific location to detect a specific event and then play a specific sound effect.

When it comes to the topic of technology in sound design, Miquelon Rodriguez and Yaiza Varona thought that it is possible to use technology – gesture recognition - in general theatre performances because there were already some cases in which gesture recognition is used to control the lights

and visual effects. However, Nick John Williams had some different opinions, which might explain why gesture recognition is not frequently used. Computer vision-based gesture recognition requires more advanced interactive systems and programming skills than sensor-based triggers. He explored camera-based gesture recognition devices like Microsoft Kinect but did not have a good experience implementing the system. Meanwhile, Microsoft Kinect has been discontinued since 2017. That is the reason he asks why the sound interactive system, which was mentioned in the interview by me, uses Kinect.

The answer for this question is that, in my opinion, sensor-based recognition is more efficient for triggering sounds than controlling the properties of sound and music. Because controlling the properties usually needs varieties of data from trajectory. Sensor-based recognition usually collect other data to represent the trajectory rather than trajectory itself, such as pressure, voltage, speed and so on. Currently, most performances that use sonic control create a system with wearable devices for actors. Alternatively, they put the sensors in the room as a trigger for audiences and actors to play the sound.

Although camera-based gesture recognition may not be as sensitive as sensors to detect body position, it can capture the details of body gestures, such as hands up, hands down, waving hands, and other joint movements. Using camera-based gesture recognition could provide more gesture data with fewer devices than sensors, especially to create a sound installation for performances. For this project, Kinect is the most accessible gesture-recognition device, and it is used as proof of concept, but this doesn’t mean that the proposal is limited to this specific device, the findings are more widely applicable.

According to interviewees' experiences in designing sound for immersive theatre, the sound design in this theatre performance is becoming more similar to the sound in video games. In video games, game states show the different game situations that players will come across. In order to deliver information of state to players, sound designers will design different sound effects to inform game players of the situation they are in, as Collins suggests, these could include "time-ins, time-outs, player's health, enemy's health" (Collins, 2008, p.4). Therefore, the sound feedback is different according to the different game states. Game sound helps immerse players emotionally.

Three professional practitioners provided information of sound design both in theatre performance and technology in the interview. Initial thematic map shows the relationship between each theme. After selected and simplified, the final themes show the information in the list:

1. Sound design: Sound design sometimes does not only need creating sound and music, but also need to apply different technologies for performance.

2. Technology: Technology could provide more possibility of creativity for performance. Different production may use different technology in the design.

3. Immersion: Immersion happens in audiences emotionally and physically. Interactivity could bring immersion to audiences, but it does not guarantee the immersion.

4. Difficulties: Although technology brings creativity to sound design for immersed audiences, it could also distract audiences from the story. It contradicts the original purpose of using technology.

To convey the information of themes clearer, I tried to name and define each theme and created the final thematic map as the Figure 3.2 shows.

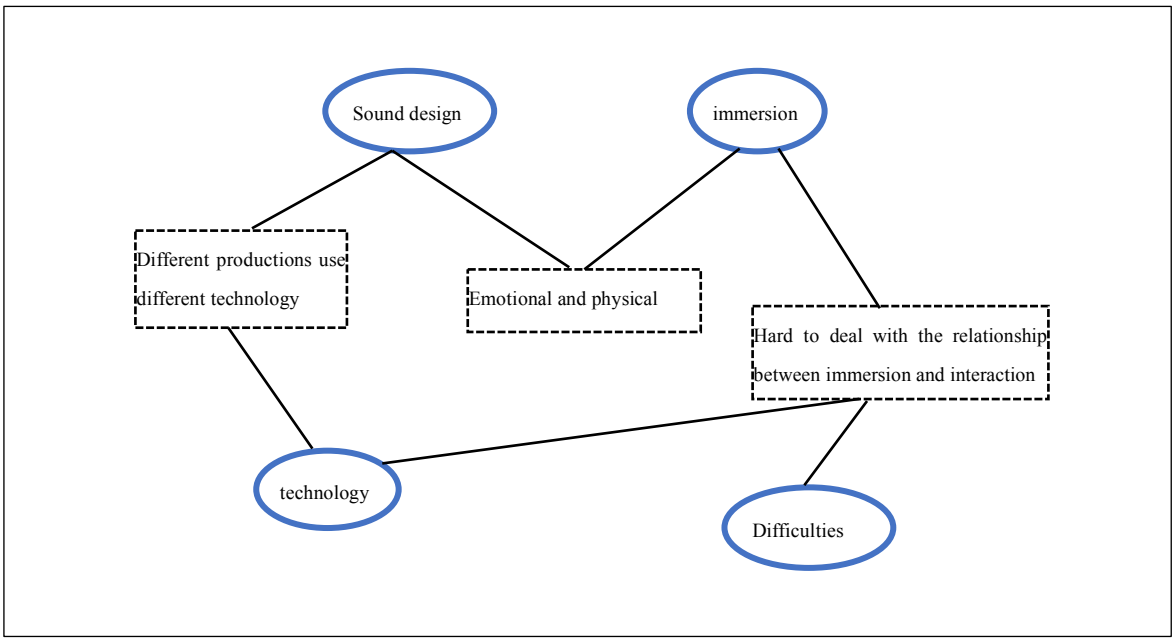


Figure 3.2 Final thematic map

To sum up, four main themes remain in the final thematic map. It shows the relationship between each topic from the interview: sound has emotional and physical properties, which provide audiences with emotional and physical immersion. Sound design plays an important role on the immersive experience of audiences. Technology facilitates the process of sound design fitting different types of production, while the main approach to create the sound world is the same. It is difficult to find a balance between immersion and interaction. In immersive theatre, the stories are not linear, and the number of audience members might be different in each performance, so the narratives of stories may also be different. A similar sound design approach to digital games might generate emotional immersion.

3.4 Summary of Interviews

This section introduced three sound designers' experiences and opinions on sound design in immersive theatre. The interview transcripts were analysed following Theme Analysis method. During interviews, they explained the differences between site-specific, promenade theatre and immersive theatre. From their descriptions, all of them immerse audiences physically in the stories, but the scales of the performances are different.

In immersive theatre, preparation is important due to the improvisation and the technical testing in the specific venue. Sound design in immersive theatre is similar to traditional practices, but many different technologies could be used to adapt the design to the specific location being used, which might be beyond the limits of a stage. There are a lot of possible avenues of exploration regarding future use of advanced technologies for sound design. For example, Williams' site-sensitive performance used sensors and single board computer as triggers to control sound in certain place. Sound effects will be triggered when audiences walk past the sensor location.

Interviewees believed that technology could help performances achieve greater levels of interaction and immersion, but the careful act of balancing technical applications, with storytelling needs, requires further reflection. Therefore, the next section, through the careful study of the production *Sleep No More*, provides a perspective on how current immersive theatre practices create an immersive world for audiences.

4 Case Study: *Sleep No More* in Shanghai

Drawing from the literature review and the opinions of sound designers, it is clear that "immersion" happens in audiences. Therefore, taking into account audiences' perception of immersive theatre becomes a key point in this research. In order to start considering the audience experience within immersive theatre, this section presents *Sleep No More* as a case study, from the experience of an audience member, myself.

4.1 Background

Punchdrunk is a British theatre company based in London, UK, formed in 2000 (Punchdrunk). It has produced several immersive theatre projects, such as *Sleep No More* (SNM) (from 2003, currently on show), *The Drowned Man* (July 2013 - July 2014), *The Borough* (2013), and the immersive opera *The Duchess of Malfi* (2010) (Punchdrunk). *Punchdrunk* has expanded its audiences to the world. The original version of *Sleep No More* was staged in London in 2003. In 2009, a reinvention of *Sleep No More* (*SNM*) was on show in Boston for a year, and then since 2011, the reinvention is on show in New York regularly. In 2016, *SNM* was introduced to Shanghai, China, and is currently on show (Punchdrunk).

SNM is an immersive theatre performance adaptation of Shakespeare's *Macbeth* in film noir style (Punchdrunk). The performance lasts three hours and each one hour is a loop which means the story restarts from the beginning again. *SNM* is considered a typical example of immersive theatre, which theatre scholars often refer to. Scholars have analysed and discussed *SNM* in relation to its narrative structure, audience experience, and cultural aspects, among others. For instance, Thomas Cartelli critiqued "one-on-one" experiences between audience and actors in *SNM*, suspecting that the interaction through wearing a mask was negatively impacting the behaviour of audiences in the performance (Cartelli, 2012). Jennifer Flaherty summarised audiences' blogs and her own experiences of visiting *SNM* in New York, and concluded that *SNM* incorporated ideas from immersive video games but it couldn't be treated like a game (Flaherty, 2014). Sara Thiel applies computer video game theory, five conceptual planes from physical concept to mental concept, to analyse the narrative structure of *SNM* as explored in section 2.1.1 (Thiel, 2017).

Flaherty (2014) explains that "the line between immersion and interaction is blurred throughout the production." *Sleep No More* allows audiences to follow different actors and watch different scenes. Depending on the audiences' choice, the story outcome will be an individual experience.

However, audiences cannot control everything in the performance, so every time they visit the building of *SNM*, they will have different experiences even if they try to make the same choices as the last time. In conclusion, both games and immersive theatre apply similar narrative structures; gamers and audiences can choose what to do, and this behaviour will influence the result of the game and the experience of the performance.

4.2 The *Sleep No More* Experience

Sleep No More (*SNM*) in Shanghai is performed in a six-floor building named Shangyan Valley, located in Shanghai's centre. The whole building has three wings, and *SNM* is performed in the Central and North Wings. The performance in Shanghai was three hours long and had three loops as well. Audiences start their journey by going into a long dark narrow corridor that allows one or two persons to walk together. The only thing they can see is the light in the corner of the corridor. In this corridor, audiences are not allowed to use mobile phones or mobile phone flashlights. The corridor should be kept dark as indicated by *SNM* staff.

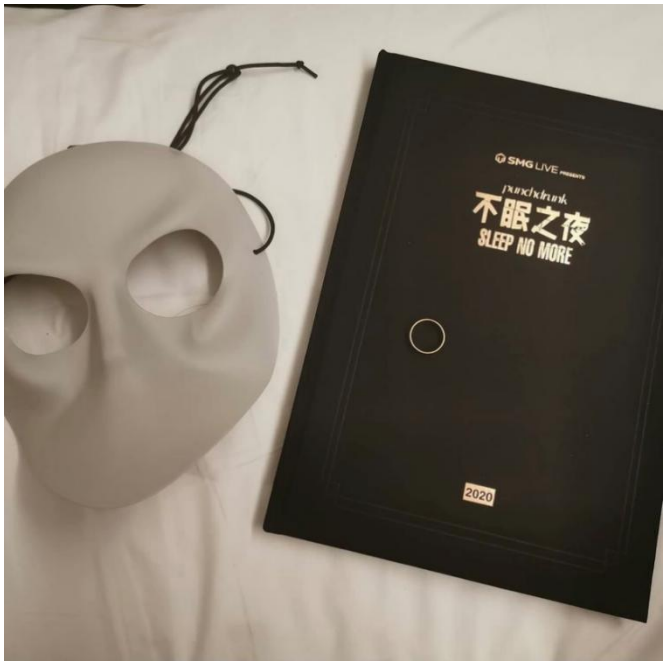


Figure 4.1 The mask and souvenir book from *Sleep No More* in Shanghai. The ring on the book means that audience was invited to a one-on-one performance in the show.

This is the first step in "immersing" audiences. A narrow corridor physically separates the performance space from the outside world, isolating the light and sound. When audiences step into the corridor, they enter a dark environment, and leave behind the brightness of the foyer. Walking down the corridor is like passing through a "space-time" tunnel. When audiences emerge, they are in a "new world". At the end of the corridor, an "immersive bar", an official name from

SNM's souvenir book (see Figure 4.1), is decorated in retro style. It is a waiting room where audiences can sit and order a cocktail, waiting for the show to start. As an audience member who attended and watched the performance once, I marvelled at the exquisite retro decoration of the bar in the McKinnon Hotel, which is the fictional name in the performance. Jazz music played by a pianist increased the retro atmosphere of the bar. Audiences are transported back to the beginning of the last century, through the style of the decoration and the sets. Furthermore, audiences are separated from the outside world as the space for the performance in the building has no windows.

Figure 4.2 The "Immersive Bar" in the McKinnon Hotel of *Sleep No More* in Shanghai, December, 2020

The performance starts by setting the rules for the production. Said rules are introduced by the "owner" of the McKinnon Hotel, an actor with slick hair, moustache and wearing a white suit and black shoes, who stands in the same space, about one meter away from audiences. Compared to traditional theatre, *SNM* has more health and safety rules, such as keeping an eye on the distance between audiences and actors when they are dancing and performing. The rules aim to make sure audiences will not disturb the acting process. Audiences, therefore, become "ghosts" in this story. They stand, watching them, listening to them, and most importantly they keep silent. Sometimes only a few viewers are fortunate enough to be invited to interact with actors, as listeners who are invited to stand or sit opposite them, and feel the emotions of the characters at close range. Staff wearing black shirts are also present maintaining order in the crowd during the performance. They are silent, standing at the side of each room and waiting for actors coming in and out. It is hard to tell the difference between staff and audiences because they hide in the crowd and only appear

when the performance requires it. They are like gamemasters in online computer games. If audiences have problems, staff in the building will offer help. Gamemaster (GM) is a term that is often used in Computer Role Playing Games (CRPGs), Pen and Paper-based Role Playing Games (PnP RPGs) and Live Action Role Playing Games (LARPs) and other game platforms (Tychsen *et al*., 2005). Gamemasters within a game platform include human and storytelling engines and their functions can be divided into five categories:

> (1) Narrative flow: The GM is responsible for keeping the narrative and providing feedback in real-time according to the players' actions.
> (2) Rules: The GM is responsible for ensuring players understand game rules and maintaining order.
> (3) Engagement: The GM must provide game events for players in order to support players' engagement in PnP RPGs.
> (4) Environment: The GM must create a fictional environment for players to play that can be perceived, physical or virtual in different types of RPGs, such as defining a game space in the LARPs.
> (5) Virtual world: Specially in CRPGs, the GM is responsible for finding out the bugs in the game world and helping players solve their problems of in-game sources.
> (Tychsen *et al*., 2005)

The "Gamemaster" in *SNM* had similar responsibilities. There were some actors introducing rules, some actors interacting with audiences to help them engage in the performance, and some actors working as a clue that the story would happen at that place.

SNM has worked hard on engaging audiences in the performance. However, it still has obstacles in creating a deep engagement and immersion for audiences. In the bar, music, dim lights, and the effects of cocktails increased my expectations of the performance. After learning the rules, I followed other audiences into a darker scene. At that moment, the excitement reached its highest level then gradually decreased. At first, I had a great passion for chasing actors and crowds, running through different floors, finding the best place to see what was happening. The most impressive place was the ground floor in the building because it was the start of each performance loop, all the actors and audiences would go back to the ground floor to restart our journey. The space had two environments, when the lights were dim, it was a "forest" with a long desk on a high platform in front of the room, where the "trees" in the room could be moved by actors. When the lights were on, all the "trees" were moved to the side and in the middle of the room was Macbeth's living room.

However, as time went by, watching this performance became an exhausting experience, which made me lose passion and engagement. It was hard to tell which space was in which floor because when we followed actors running through different rooms, we continuously climbed up and down among the floors. At points I could not tell which floor I was in. That was one reason why it was easy to get lost in the dark. Moreover, I was not always able to catch up with actors and crowds. This was exacerbated by the fact that when no actors were in the space, there was no theatre staff to help. I was left to wander around the rooms to find the whereabouts of actors and audiences in the building.

The use of sound effects such as thunder and melancholic music, increased the sense of anxiety. These sounds were continued all the time. It might be a part of the experience in *SNM*, but it could potentially have a negative impact on audiences' engagement. From my point of view, the anxiety of feeling lost could distract audiences from the performance, paying more attention on finding their way to catch up with people rather than understanding the story or observing the environment.

To address my feeling of being lost, I chose to stay in one place, observing the set design and waiting for actors to come in, rather than trying to 'follow' the performance. It was then that I noticed another difficulty. While rules encouraged us to explore the building and didn't prohibit audiences from touching things, I still had no courage to move or manipulate props. The distance to be kept between audiences and actors was clearer than between audiences and props. For example, in one of the scenes the Maid was serving a beverage for the pregnant Madam, Lady Macduff, in the canteen. In the meantime, the phone rang in the phone booth outside the restaurant. I hesitated. Should I answer the phone or is it just ringing for the characters? As I was considering what to do, another audience member answered the phone. The opportunity had been and gone. Unfortunately, when I returned to the phone booth after a while, no further interaction was possible. Something similar occurred as a waiter was dancing at the front desk in the next scene, holding a small teddy bear. He threw the bear on the floor, and no one picked the bear up. After the waiter went away, I hesitated again when I looked at the bear lying on the floor. What would happen if we left it there? Can I move it to another place? These concerns made me feel limited during the production.

Although I was unable to interact with the set and installations, I was fortunate to be invited by an actor to join his one-on-one performance in a small room. From my perspective, he played a waiter who wanted to be a female. The information of his role I knew was from this one-on-one performance. He invited me to a small room, took off my mask from my head, let me sit down on

a chair near the desk. He walked to a case beside the desk, fetching a long-haired wig and wearing it. He looked sad and depressed. After sitting down on a chair on my right side, he took out a lipstick from the desk and put on the lipstick, then he shook his head, wiped off the lipstick, and took off his wig. Then he stood up, opened his arms and begged me for a hug. In these ten minutes around individual performance, I tried my best to find opportunities to interact with him. For example, I tried to hold his hand while he sat in front of the mirror on the desk, clenched his hands and looked miserable. However, I still had some questions in my mind, which were the same as what I thought during the performance outside the small room. Can I touch him? Can I talk to him? Can I leave him alone?

In *SNM*, visual effects, including lighting and set design, are the primary methods to make audiences feel that they are going back to the 1930s and 1940s. The rules in *SNM* provide much freedom for audiences exploring, but freedom also brings uncertainty on what is included under those rules. Sound also plays a vital role in conveying emotions in *SNM*, from physical to psychological, as will be explored in section 4.3.

4.3 Sound Design in *Sleep No More*

The sound design in *SNM* contributes to creating a different atmosphere throughout the different scenes. Because of its film noir style, the emotion conveyed through sound and music in this theatre piece is melancholic, dark and mysterious.

Music in *SNM* runs through the entire three hours of the performance. Although *SNM* in Shanghai is performed in a building with six floors, each floor has different set designs. It requires the sound designer to create different soundscapes according to different scenes. For example, some scenes have been localised, that is, they have been modified to emulate a Chinese environment. The set designer created a space called “Garden of Eden”, which is a ballroom. The music in this space is separate from other rooms and floors, and plays classical Chinese ballroom music from the 1930s to 1940s. According to Ricci (2012), in other versions of *SNM*, the music used includes mainly popular songs from the early 1940s in the US and the UK. Neither the article or the introduction in the *SNM* souvenir books explain why the production team chose music from this era. However, it is possible to note that music from the 1930s to 1940s fits the decoration in the McKinnon hotel, guaranteeing consistency. Music helps shift the performance to fit the geographical location, which also shows the importance of appropriateness (Kaye, 2009) in sound design, which creates an immersive experience.

The sound designer uses different styles of music and non-rhythmic environmental sound to divide the rooms into several indoor and outdoor scenes, including Lady Macbeth's bedroom, a ballroom in Shanghai, a specimen shop, a hospital, a forest, garden, cemetery, and train. Those non-rhythmic sounds tend to be electronic and synthetic. There is a non-rhythmic low-frequency sound present in most of the rooms, and it plays loudly. It plays an essential role in creating a melancholic feeling for audiences. When discussing sound for theatre, Kaye mentions "at low power [low frequency], this acoustic weapon could induce nausea, vomiting and abdominal pains (Kaye, 2009)". Kaye described an extreme case of using low frequency sound, but low-frequency sound has also been used in pop concerts and films, making audiences feel the vibrations physically (Broner, 1978). In Broner's article, he concluded that the body would have vibrations like mechanical vibrations when the acoustic frequency went down to 0-100Hz. According to the research, low frequency noise could cause annoyance (Broner, 1978). In *SNM*, low-frequency synthetic sound induces physical resonance on audiences' bodies, immersing audiences in a depressed and uncomfortable environment physically.

Acting in *SNM* is different from traditional theatre. Actors have no dialogue but only facial expressions and body language, including dances to deliver the script and emotion. Although it lacks traditional dialogue, the sound design still uses the actors' voices, such as laughing, crying, screaming and groaning, to express their emotions and suffering. Furthermore, sound effects emanate from loudspeakers in the room which are hanging on the walls in the dark where audiences cannot see them easily. Moreover, actors are generating sounds by interacting with props and set installations. For example, they use a spoon to stir drinks in glasses and tapping the glass with the spoon, they also pat the window to make a loud noise. All these sounds contribute to the audience's experience, which is different from traditional theatre because audiences stand close to the actors and watch the performance at a short distance, and audiences can perceive information from actors. In the example of the noise from the actress patting the window, it has the potential to thrill audiences, as sounds are more 'real' than if they were emanating from loudspeakers.

Although interactivity is a feature of immersive theatre, interaction with sound in this theatre piece is relatively weak. These interactions for audiences are limited, only a few audience members have opportunities to interact with props and actors, which will result in different levels of engagement for each audience member. As Biggin suggests, audiences' sensory immersion is related to the engagement of each participant (2017). Although immersion and interactivity do

not guarantee each other, adding more interaction to theatre sound may bring audiences to a more immersive environment.

Currently, in *SNM*, the sound design has few variations throughout the three hours. It is understandable as a way of guaranteeing audiences, who watch the performance later, can watch the same thing when the loop restarts in the three-hour performance. However, no audience can finish watching all the content. Exhausted audiences running from room to room and floor to floor could easily get bored as the auditory input does not change, and sound design is focused on mostly unchanging music. Sound and music are different from props and sets, and adding sonic interaction may lead to less hesitation in exploring the performance. A solution forward could be to apply a game sound theoretical approach in order to increase interactivity in immersive theatre.

4.4 Summary of Case Study

Punchdrunk is a pioneering company in the field of immersive theatre, having created four immersive performances. *Sleep No More* has no dialogue, so the sound designer uses sampling and sound zones to create aural immersion for audiences. In my point of view, although a highly-regarded production, *SNM* still has difficulties engaging audiences in the performance and making audiences immersed both physically and mentally. Audiences' immersion could go a step further to a higher level by increasing interactivity on sound design if we can provide more opportunities for audiences to contribute themselves to the performance. Learning from game sound design, immersive theatre sound can use the same approach to create dynamic audio for actors and audiences to interact in real-time. Interactivity could bring cognitive immersion to audiences, making them experience a higher level of engagement during this performance.

5 A Design of Sonic Interaction for Theatre

Section 2.3 explored two types of gesture recognition that sonic interactive design can use: sensors and computer vision (cameras). Although, cameras can also be regarded as a type of sensor. The reason why sensor-based and camera-based gesture are categorised as two types is that sensor-based technologies require them to be in contact with the human body, but camera-based technologies do not require manipulating and touching.

5.1 Comparison between Two Types of Gesture Recognition

Sensor-based gesture recognition and camera-based gesture recognition present different opportunities and challenges for sound design in performances. This section chooses some devices to discuss the advantages and disadvantages of the two types of recognition technologies.

Some of the advantages of sensor-based gesture recognition include:

1. Intuitive: Designers usually create a device using sensors to capture the data of movements and then send the data to the interactive system. Sensors in the devices work as sound triggers. The way that users (or actors) manipulate objects to create sound is intuitive. Each gesture is mapped to one type of sound or music. For example, *Mi.Mu Gloves* (MIMU, 2010) have flex sensors and accelerators in the gloves. It is easy for users to wear a glove on their hand and bend their fingers, turn their wrist or raise up and down their arms. The actions and the devices tend to be ordinary and common, so it is intuitive.
2. Accurate: Sensors are attached to the wearable device which users directly wear on their bodies. Therefore, the sensors can precisely capture the minor movements of joints and muscles. In the *Pikapika* (Hahn and Bahn, 2002) project, the dancer wore the device and danced with music. The sound effects were accurately mapped to different movements of the actor's body.
3. Stable: Relatively, the devices created with the sensors are less affected by the environment. Sensors can work correctly in different locations unless there are some damages to the devices. Because of this feature, singers and musicians have commercialised interactive music devices such as *Mi.Mu Gloves*.

At the same time, there are also drawbacks:

1. Requiring training: Sensor-based devices usually require users to be highly trained. They are not suitable for a person who uses the devices temporarily. The devices mentioned in the literature review: *The Hands* (STEIM Amsterdam) and *Mi.Mu Gloves* (MIMU, 2010) were both designed for musicians. Furthermore, musicians also spend plenty of time learning and practising.

2. Limited number: These devices send individual movements and gestures data to the sonic interactive system. Therefore, each person is required to have one device. In this case, it is not suitable for a large-scale performance that might demand many devices simultaneously.
3. Risk for users: All wearable devices might have risks for users because of contact with the human body. Most sensors are made of metal, and they could hurt people while fast movements happen in the performances. So, the designers should pay more attention to them when they design the components of devices.

Camera-based recognition technology also has some advantages:

1. No contact: Camera-based gesture recognition does not have to come into contact with human bodies. After setting up different cameras in the space, people who will be detected only need to go into the area within the scope of the cameras. This technology used to be applied to video games. The device, Microsoft Kinect, used to be a common device for game players.
2. Multi-user: According to different camera-based devices, there could be more than one person using the recognition technology simultaneously. For instance, the Microsoft Kinect supported the recognition of 6 persons simultaneously (Filkov, 2015).
3. Multi-data: Computer vision for gesture recognition could catch the movement from body and joints, including head, neck, torso, arms, legs, wrists, hands and fingers. The system would receive all the data at the same time. The designer could use part or all of them to interact with sound properties.
4. Easy to use: Users can easily manipulate the device without training. With computer vision and artificial intelligence technology, movements and gestures detection are fault-tolerant. It does not require a standard gesture for recognition when users play with it for the first time.

It has these disadvantages when it is used in performances:

1. Unstable: The camera-based detection requires a plain environment. It means that there should be fewer other objects in the space of the camera scope that could block the camera except for human bodies. According to the theory of how camera-based recognition works in the literature review, the system captures data by using colour, silhouette and motions (Camurri et al., 2010), which means that when the performance happens in a different place, the environment might change. It would probably affect the accuracy of detection of computer vision.
2. Difficult to debug: The system is complicated for mapping gestures to sound. It requires designers to have higher programming skills to solve the merging of different data from different joints and gestures.
3. Limited environment: As the first disadvantage described, camera-based recognition needs a specific environment, such as good lighting, open and clear space. Therefore, narrow

and dark rooms, forests, and other complex environments are unsuitable for this technology. This feature limits the performance space.

By comparing these two technologies, we know that both are suitable for performance. Sensor-based gesture recognition has been used in music performances and dance performances. Due to the sensors being more intuitive and accurate in collecting data than cameras, there are more sound-related performances and sonic art installations using sensors. However, camera-based gesture recognition has also been applied in theatre performances and dance performances. For example, Richard Hoadley used Microsoft Kinect to create a dance performance. In his performance *Choreograms,* the Kinect detected gesture's data and the system-generated data to music notation. In the meantime, a musician played the music notation live(Hoadley, 2016).

Sound and music play an essential role in assisting performances having an immersive environment. Currently, sensor-based devices do not offer a discreet solution, and it is important in many productions to hide the devices in the environment. Camera-based devices might fit this requirement if the performance space is suitable for camera detection. The camera could be set on the wall, hidden in the installations, as long as there is no obstacle in the camera scope. Audiences would find it hard to see the camera hiding in the space while they are all attracted by the story. Hiding the technology is not necessary but it is sometimes needed. For example, this might be due to the different eras productions are set in and the different themes, the technology sometimes needs to be hidden in the environment to main the coherence of the environment being rendered.

5.2 Interactive System: Game Audio Engine

Besides considering the hardware for sonic interaction design, implementing the interactive system is also vital. In this thesis, as a result of the analysis of technology presented in section 5.1, I have chosen to discuss creating a sonic interaction system for camera-based gesture recognition. Some software tools are suitable for the system design by thinking about the hardware supported.

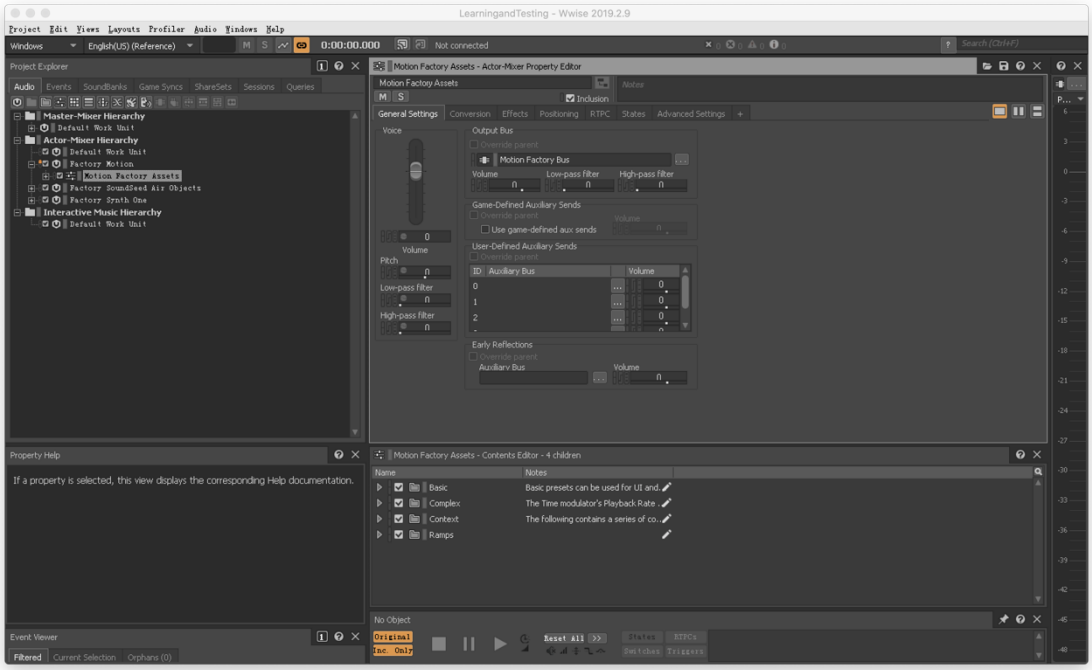


Figure 5.1 the interface of Wwise

In sonic interaction, the sound is the feedback of each movement or gesture. It is similar to sound in video games. So, we can apply the strategy of game audio design to theatre, using similar platforms. For example, game audio engines like Fmod and Wwise are often used in game development. Due to the similarities between these audio engines, here I choose to introduce Wwise. Wwise is an interactive audio solution for the game industry. It has integrated spatial sound and multiple plug-ins and supports customers' plug-ins. It also interacts with game implementing platforms, such as Unity. In these game implementing platforms, game object is a function in the game implementing platforms. Game object in platforms can match to users and receive their gesture data separately. In this way, game objects can have various sound feedback while playing games.

Figure 5.2 *Le Léthé* used Wwise for sound design (Blind, 2017)

Applying a game audio engine to theatre performance is not a brand-new idea. Mentioned in the literature review section, *Le Léthé* was a theatre performance using game audio engine – Wwise (Blind, 2017) instead of QLab, which is usually used in the theatre. As the designer described, the game audio engine helped him systematise the repeated audio events when he should pay more attention to controlling the specific sound events. For instance, playing a specific sound cue, such as a phone ringing for the actors. The audio engine allowed him to focus on fewer events. This technique is fundamental in game audio design but relatively new in theatre sound design.

5.3 Proposed Solution on Sound Interaction for Sleep No More

Interactivity is a pivotal attribute in game sound. Game players actively trigger the game audio, including dialogue, surrounding sound and musical events (Collins, 2008, p.5). In contrast, audiences in theatre performances tend to be a passive receiver of theatre sound. However, in *SNM*, audiences moving around and interacting with set installations freely brings about many opportunities for them to trigger sounds, just as game players do. Therefore, it is possible to utilise a game sound design approach in immersive theatre.

In game sound, dynamic audio is a term to describe its "reactive" and "adaptive" features, which include interactive audio and adaptive audio. Interactive audio responds to the players' active input and adaptive audio reacts to the game states ("time-ins, time-outs, player's health, enemy's health and so on" from Collins) (Collins, 2008, p.4). Learning from the field of game sound design, dynamic audio has a lot to offer the production of *SNM*.

As Stephen Dobbie, who was the sound designer of *SNM* has highlighted, sampling was key to the sound design of *Punchdrunk* (Lighthouse Arts 2014). Sampling is an approach that uses samples of a sound recording to create another recording. It is convenient for sound designers to construct soundscapes with different sound materials. The soundscapes in different spaces of *Sleep No More*'s building are called "Sound Zones" by Stephen Dobbie and the production team (Lighthouse Arts 2014). Because of sampling and the existence of sound zones, increasing interactivity with sound in immersive theatre becomes possible.

Sampling is also an approach that game sound designers use in game implementation. Game audio programmers use Digital Signal Processing (DSP) in real time to make sound effects in games sound more realistic by using physical graphics engines. If theatre performances were to use real-time DSP, the achievement may be more than reproducing realistic-sounding effects. It may also become more creative. Mimicking digital games, the sound system in immersive theatre could receive body gestures as inputs to control real-time DSP effects of sound and music which is similar to the response of sound effects in games in both computers and consoles.

Currently, body gesture recognition is restricted to a certain space because of technological limitations. In *Sleep No More*, the stage is an entire six-storey building which is too big to be covered by recognition technology. But different sound zones in *Sleep No More* can solve this problem. According to different sound zones, sound designers can design different real-time DSP effects to increase interactivity in specific sound zones. The interaction with sound in sound zones may include interaction between actors and installations, as well as between audiences and installations.

5.4 A System Flowchart for Sonic Interaction

According to the research undertaken as part of this project, it is possible to propose the system flow chart in Figure 5.4 for sound design in immersive theatre. The design of this sonic interactive system allows for actors' and audiences' body movements to be detected by camera-based gesture recognition; the data is then transmitted to the game engine. The corresponding data that meets the pre-set actions is selected and transmitted to the game audio engine. The pre-set actions mean that sound designers and programmers set the specific gestures and movements in advance in the interactive system. In the game audio engine, the sound events respond to the command from the game engine, changing the sound properties, such as volume, pan, pitch and harmony. Figure 5.3 shows the interaction of the user with the system.

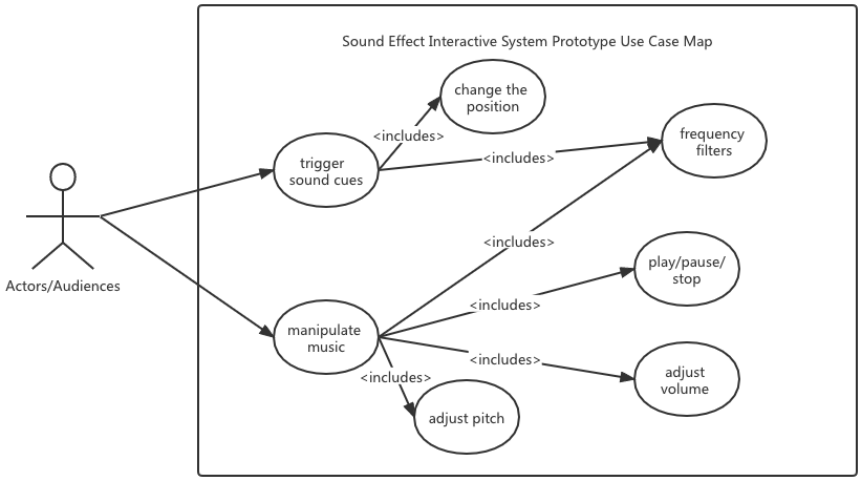


Figure 5.3 User case map of sonic interactive system

Sound effects and music in the performance, users might trigger the sound cues, change the sound position and frequency, play, pause or stop the music, adjust the volume and pitch of the music. These properties of sound and music can be matched to the gestures while the actors are performing or inviting audiences to join the performance and instructing them to act with them. However, how gestures map with sound properties is the topic of future research.

There are many devices of camera-based gesture recognition technology. In this thesis, the system flow is designed based on the depth camera. Currently, this is a plan for implementing the prototype, and the thesis is presenting my ideas. Therefore, the system flowchart here only shows the workflow of the system. The platforms and SDK (Software Development Kit) used in the system flow are a brief example, and the specific system implementation needs to be adapted to the devices used. For example, the use of Kinect requires the use of Kinect supporting SDK; the use of optical capture camera needs to be paired with the use of supporting development software.

The system flowchart with an example is shown in Figure 5.4:

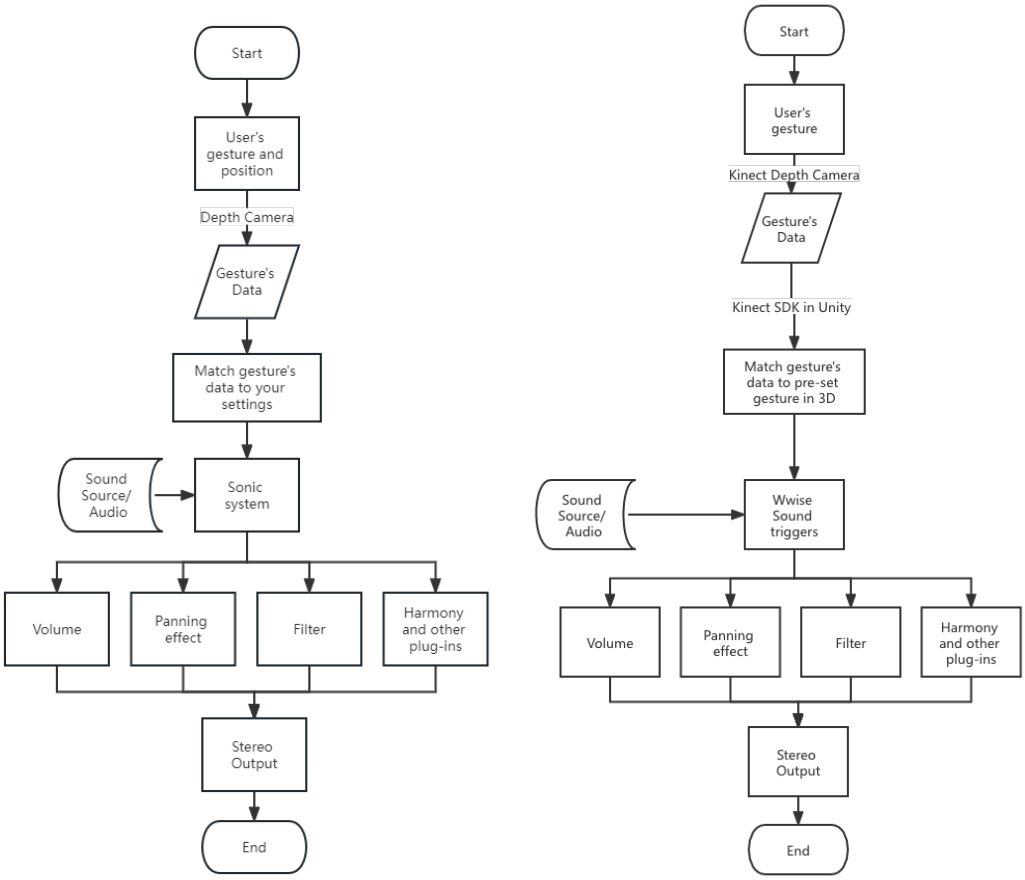


Figure 5.4 Sonic interactive system flowchart (left); an example of using Kinect, Unity and Wwise (right)

In this system, users are actors and audiences. The depth camera captures the user's gesture data and position data and transmits it to the platform for data processing through its auxiliary tools (software), for example, the data collected by Kinect (camera) is transmitted to Unity (platform) for processing through the interface of Kinect SDK. In the data processing platform, the system matches the body data and position data with the pre-set values, and then triggers the corresponding sound effects and sets the corresponding sound properties, such as modifying the panning, volume, frequency, and control filters parameters.

5.5 System Design Proposal for *Sleep No More*

Sleep No More is a large-scale immersive theatre production. As section 4 introduced, it has six floors in the building for performance. The narrative in *Sleep No More* has linearity and non-linearity as well. The linearity is represented by the story being told, in this case an adaption of Macbeth; non-linearity is represented by each audience member's individual exploration of the performance and the space.

Therefore, the sonic interactive system could be applied on *Sleep No More* in two ways. The system could be used for sound and music of the whole building because the sound and music show the theme of each floor in the building. Besides, each sound zone (see section 4.3) also has a different sub theme. Once audiences go into a "Sound Zone", they would not receive information from another sound zone.

In this thesis, sections 5.2 and 5.4 mentioned Unity and Wwise as examples for system design to make the system flowchart clearer. So here I explain how Unity could be applied in the immersive theatre performance. "Game object" in Unity and "3D positioning" in Wwise can play specific sounds in specified areas. For instance, in *Sleep No More*, there are several rooms in the first floor which have different themes: canteen and bedroom, corridor, shop, bar, and so on. The proposed implementation would involve using Unity to simulate the structure of the building, and create "game objects" for each room. I would then connect "sound event" in the programming script to each "game object" in Unity. "Sound event" means trigger of sound and music in the performance will be regarded as game event in Unity. In game, "event" is a trigger of programme that make things happen according to player's manipulation or game state. Finally, I would use the positioning function in Wwise to locate each sound source on the designated position.

To exemplify further, in the interaction between actors and audiences, the system could create adaptive sound and music for performing. For example, the ground floor is a large hall for characters to waltz. Characters enter and dance one by one, and the plot gradually reaches its climax with the music. After the climax, most characters leave the hall but the remaining characters start fighting and killing. Some audience members will follow characters to other places in the building, and other audience members will remain here to watch what happens later in the hall. The implementation of this part could be:

1. Install depth cameras on the ceiling. Use it to detect the position of an actor who is dancing. Besides, by using the function of counting the amount of users with other cameras, the system could modify the pitch and speed with the number of actors. The system uses several depth cameras to receive different types of data from actors and audiences. Audiences would be allowed to dance in the same space, in order to push the music forward. The more people dance, the happier the music is.
2. In *SNM*, actors danced in the hall sometimes in pairs, sometime alone. Therefore, the designer could use more depth cameras to capture the main character's body movement when they are solo and match the gesture with the sound effect. The system could modify the panning and volume of sound with 3D positioning in an audio engine like Wwise when they

are waving their arms to the music. Sounds, like windbells, could be panned according to the trajectory of the arms.

3. While actors leave the ground floor, audiences remaining in the hall could still interact with sound with the system. They can imitate actors dancing or move in the hall to interact with music properties. Depth cameras here in the space will detect the position and gestures of the maximum number of users.

The above design allows the music and sound effects to change according to the state of the actors when their performance changes from dancing to fighting, allowing the atmosphere to shift more naturally. As the audience decreases as the characters leave, the style of the music can change as well. For example, when the audience is large, the music is grander, and when the audience is small, the music is flat. Adaptive music allows everyone to have a different experience in each performance to increase audience immersion through increased interactivity.

Similarly, when the audience walks to a specific area of the sound zone in *SNM*, the sound interactive system will trigger the corresponding sound effects according to the settings of the sound designer. As the actors gradually leave the room, it becomes a free area for the audience to explore, and they can choose to imitate what the characters have done, or try some new body postures, gestures, or step on several positions. It allows audiences who want to have a rest but without being lost from the story, providing them with new opportunities for exploration.

However, because of technical limitations, this system still has some shortcomings. Restricted by the range of optical detection, the director cannot apply this sound system to a space larger than the limit of the device's scope. Moreover, the environment using this system requires a certain intensity of light, because the depth camera needs to rely on the reflection of light to work. Therefore, the director cannot use the system in a space with insufficient light. Additionally, there is an upper limit to the number of users that can be detected by the system, so in practice, it is not guaranteed that everyone can be successfully identified in the case of a very large number of audiences.

To conclude, the sonic interactive system could control the sound reinforcement in the whole building and could capture the gestures of actors and audiences for controlling adaptive sound and music.

5.6 Reflection of the System Design

In order to evaluate the system design, I invited Chenzhong Hou, who is an expert of Wwise in the Great China area, to provide opinions and suggestions on the sonic interaction system design.

Hou was invited to evaluate the planned system design using Kinect, Unity and Wwise, which is only an example of the implementation of the system design and does not represent the only possible version of the sound interaction system. Since the system design was an initial flow chart and lacked information from the implementation of the code, I asked him to describe what he knew about Wwise, the game audio engine, and any projects he knew that used Wwise as an audio control system. This is a semi-structured interview

Hou is currently working in Audiokinetic which is subsidiary of SIE (Sony Interactive Entertainment LLC). He is a product specialist in the Greater China area. He is responsible for promotion, technical support and community construction. He has an electronic engineering background and was an audio designer in Ubisoft Shanghai for three and a half years.

In the interview with Hou, he agreed with the idea of using sonic interaction design and game audio engine, like Wwise, in the theatre performance. He said that most the performances were linear (performance follows scripts), while interaction could be considered non-linear because a person's interaction had no specific patterns. It was difficult to design interaction in performance. Some designers wanted to create a precise "cue" for the system to identify. "Cue" means that the designer sets a certain way, it can be an action, a pose, as a trigger for the system. However, due to technical limitations, cue identifying is not as accurate as designers imagined. So, the design of interaction should be fault-tolerant which can create a smooth transition between different states of performance. Hou mentioned that if a sound designer used Wwise to create the interactive system, the programme he/she created should have a slow rate transition between different system states (eg. play or stop music), in order to avoid the unnecessary results in the performance.

Besides, Hou also tried to analyse the sound design of *Sleep No More*. In his opinion, the sound design of *SNM* was a combination of linearity and non-linearity. Linearity showed in the place of performance when actors acting in this area. Sound and music were played as the script arranged. When actors left this area, the sound here became non-linear because sound and music was no longer related to actors' acting. Currently, audiences cannot interact with sound in *SNM*, but if

the sound designer use Wwise to create sound, this game audio engine can also design sound reinforcement for the whole performance area (building of *SNM*) as Hou suggested.

The content of the interview was analysed using Themes Analysis (TA) to refine themes and to reflect on the advice that Hou provided on this sonic interaction system design. The data extracted from Hou's interview is shown in the Appendix F Table 2. From the data collected from interview, we can organize and classify themes here:

1. The system flowchart is reasonable.
2. It is important to organise the linear and non-linear parts in a performance.
3. There are some alternatives to Kinect and Wwise.
4. It is more stable if Kinect is directly linked to Wwise, from the programming perspective.

Hou believes the system flowchart can be translated to practical use, but that certain considerations merit further reflection. For example, he encouraged further consideration on how the linear and non-linear elements of sound would be controlled; how to avoid phase cancellation and other acoustic problem; and how to reduce the probability of misidentification of data. The possible answers to these questions are in the system design proposal in section 5.4. Combined with Hou's suggestions, the implementation of this system has the following key points:

Firstly, system implementation should pay attention to the data processing. The data flow from the gesture recognition system, such as the Kinect, will have redundant data. To reduce errors, the system needs to transform continuous data into discrete data. One way to change the continuity of the data is that the states of the different gestures, the response of the sound, can be switched according to a set value. This approach makes systems have fault tolerance. When users do something that they don't really want to do, the delay of response can provide more time for them to correct it.

Secondly, sound design with the interactive system is important to balance the relationship between two types of narrative. The balance between the linear and non-linear parts of storytelling should be discussed with the director. The creative team needs to communicate the amount of space the interactive performance takes up in the entire venue, as well as the proportion of the story. To some extent, sound design for immersive theatre is not the sole work of the sound team. It is a big workload for the whole creative team, and communication is crucial.

Thirdly, complex sound reinforcement could be done by using Unity and Wwise together. Game Object in Unity and Positioning function in Wwise can precisely locate the sound in the system.

Therefore, the sound designer does not only design sound and gestures, but also designs the sound reinforcement by using the sonic interactive system.

5.7 Summary of System Design

Sensor-based gesture recognition is intuitive, accurate, and stable, but it requires plenty of practice, and it may have some risks while users touch or manipulate it. It also limits the number of users because each person would probably equip one device, but the number of devices could be limited by budget and scale of performances. Camera-based gesture recognition is multi-user and multi-data, supporting more users and more gestures. Meanwhile, it does not require contact with human bodies, and it is easy to learn and use. However, it is not perfect because computer vision technology is still developing, with one of its main limitations being that it requires a clear space for detecting human gestures.

In order to use sonic interactive devices so as to enrich the environment for audiences without being distracting, the system design proposed here uses camera-based technology to create a user map and flowchart. The user map describes the possible sound properties that actors and audiences can manipulate. The system flowchart describes how it works if Kinect, Unity and Wwise create the system. The system flowchart is an initial design for the research. Further experiments and programming are important to verify the feasibility of this system design.

The prototype design is for immersive theatre. A sound expert from China was invited to comment on the system design and he also provided important suggestions for sound design. Combined with a development platform, such as Unity, and an audio engine, such as Wwise, the sonic interactive system can design and control the sound and music in the whole performance area. In *Sleep No More*, this system is suitable for design and control within the sound zones which can help the creative team divide the area of different themes in the six-floor building. The concept itself of sound zones, makes it relatively simple to apply the system design.

6 Conclusions and Further Steps

This thesis explored the following research questions:

(1) Is it possible to apply sonic interaction design principles to immersive theatre?
(2) In the context of sonic interaction design for immersive theatre, what type of adaptable interactive techniques are both suitable for actors and audiences?
(3) How can they be applied to immersive theatre productions?

Sound, as a vital component in theatre, is also essential in immersive theatre, delivering information about environment and emotion in the performance, assisting in immersing audiences both physically and mentally in the story. Immersion is an essential feature in immersive theatre. Researchers have discussed the different levels of immersion and interactivity and their relationship. According to research, interactivity could enhance immersion. Therefore, in immersive theatre, allowing audiences to interact with the elements in the performance is important. There are some existing theatre production examples which have used technology to create interactions on visual effects. It is possible to use similar technology on sound design. Sound artists have designed various sonic interactive devices and installations, and sonic interactive design has been applied in music performance.

To answer the question of whether a sonic interactive design is suitable for theatre production, three sound designers shared their opinions through interviews. They discussed definitions of "site-specific", "promenade theatre", and "immersive theatre", showing the similarities and differences among them. Although these three types of performances are on a different scale and require different environments, they all have the same feature – immersion. Sound designers introduced their workflow in traditional and non-traditional theatre. We discussed the difficulties when they worked as a sound designer in a theatre production team. They also commented on the application of gesture recognition technology to sound design.

In order to find out about the audience experience in immersive theatre, I went to the immersive theatre production – *Sleep No More* – to explore the sound design in this typical immersive show. The case study presented is about my individual audience experience and sound design analysis. Section 4.1 briefly introduces *Punchdrunk*, the theatre company behind *Sleep No More*. Combining experience and analysis, I provided a potential approach for this performance to enhance interactivity, including creating sonic interactive installations.

The method proposed for immersive theatre to increase immersion and interactivity is to design a sonic interactive system with gesture recognition technology. Therefore, section 5.1 compares the advantages and disadvantages of different hardware. Then a system design is based on camera-based gesture recognition technology, using related SDK, development platform and game audio engine. However, the system design is waiting for implementation and use in actual performance, which will be the topic of future research.

Through an extensive literature review, interviews and a case study, this thesis mainly answers the first two research questions about the possibility of applying sonic interaction design and the appropriate technology for creating a sonic interactive system. The thesis also provides a solution for the question of how sonic interaction design could be applied in immersive theatre. In the future, experiments need to be conducted to investigate whether the hardware and system can work well in performances within a complex environment and needs more exploration about the methods to map sound and music with an actor's performance and audiences' involvement.

Glossary

Application Programming Interface (API) – An interface provided for programmers to connect multiple programs, software and hardware.

Binaural Audio – Audio format that simulates 3D audio over headphones by recording with a dummy head or processed by Head Related Transfer Function (HRTF). HRTF is a method to describe how human ears receive sound.

Computer Role-Playing Games (CRPGs) – Also called Role-Playing Video Games, a type of video game in which players can control uncertain number of characters in the game.

Computer Vision – An interdisciplinary field focused on computers understanding digital images and videos (Ballard, 1982).

Digital Audio Workstation (DAW) – A software used for recording and processing audio.

Digital Signal Processing (DSP) – An operation processing analog signal from real world to digital signal, like from sound to audio signals.

Gesture Recognition – A technology that recognises human gestures. It has a variety of implementations including using accelerometer chips, computer vision, infrared ray and myoelectric sensors.

Human-Computer-Interaction (HCI) – A multidisciplinary subject focusing on the interaction between human and computers and designing a way for users to have a good experience while they interact with computer systems (Dix *et al*., 2003).

Inertial Measurement Unit (IMU) – A device which consists of accelerometers, gyroscopes and magnetometers, measuring the specific force, angular rate and the orientation.

Interactive Arts – A form of art in which artists use various methods to allows audiences to interact with their art production and finally achieve their goals.

Interactive Fiction (IF) – A type of adventure game or role-playing game based on storytelling. Most IF have interactive narratives and various story endings.

Live Action Role-Playing Games (LARPs) – A type of Role-Playing Game in which players are physically playing the characters and achieving goals in the real world.

Max/MSP – A visual programming language for creating audio and audio plugins such as synthesizers and samplers (Cycling'74).

Microsoft Kinect – A gesture recognition device with depth camera, colour camera, infrared sensor and microphone, created by Microsoft.

Musical Instrument Digital Interface (MIDI) – A technical communication protocol used for connecting digital audio devices (Loy, 1985). It is commonly used in music production.

OpenCV – A library for real-time optimised computer vision programming (OpenCV).

Openpose – "real-time multi-person key point detection library for body, face, hands, and foot estimation"(Hidalgo).

Open Sound Control (OSC) – "A data transport specification (an encoding) for real-time message communication among applications and hardware" (opensoundcontrol).

Optimal Movement Selection – A model describing how human's joints and muscles will choose the movement pattern in the body movements (Rosenbaum *et al*., 1991).

Participatory Art – A form of art that has multiple contributors including creators and audiences.

Pedagogical Drama – A type of theatre having teaching goals and promoting learning or created for pedagogy.

Pen and Paper-based Role-Playing Games (PnP RPGs) – Also called Tabletop Role-Playing Games, a type of role-playing game in which players decide their characters' actions. The success and failure of actions will be based on rules.

Physically-based Sound Synthesis – Methods to synthesize sound that mimic natural physical sound based on physical and mathematical models.

Promenade Theatre – A type of theatre performance that usually has a tour for mobile audiences which allows them to walk through multiple places.

PureData – "An open source visual programming language for multimedia"(PureData).

Sampler – An electronic or digital music instrument creating new sound by using samples of sound recordings. It can be a hardware device or a software plugin.

Sampling – A technique using a sampler (musical instrument) to create a new sound recording.

Site-Specific – A type of theatre performance that happens in a specific space, usually outside the stage.

Software Development Kit – Software-implementing tools for different platforms. The abbreviation is SDK.

Sonic Interaction/Sonic Interaction Design – A interdisciplinary field of interactive design, electronic music, psychology, cognitive sciences, acoustics (Franinović *et al*., 2013). It explores how sound can be used to deliver information in an interactive environment.

Soundscape – A term to describe the sound components of the acoustic environment.

Synapse – A middleware to send data from the Kinect device to DAWs such as Ableton and Max/MSP (synapsekinect).

Synthesizer – An electronic music instrument creating sound by using audio signals. It could be a hardware device or a software plugin.

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Appendix A: Interview Questions

Opening question:

Would you mind briefly introduce yourself and your route into professional sound design?

1. Questions on immersive theatre.

1) how would you define “immersive theatre”?

2) What differences are there among “immersive performance”, “site-specific” and “Promenade theatre”?

3) What you think are the differences between “immersive performance” and “interactive performance”? Or do you have any opinion on them?

4) In your experience, what are the differences in sound design strategies between traditional theatre and immersive theatre (or immersive performance)?

5) What kind of role do you think sound design plays in immersive theatre?

2. Questions on working procedure in your project.

1) How do actors work with sound and music in your projects during rehearsals?

2) Do actors give advice on sound cues/effects when they are in rehearsal?

3) What challenges in terms of sound design have you encountered during rehearsals?

3. Questions on technology used in performances.

1) What kind of technology do sound designers use in immersive theatre? Are there any special techniques you’ve applied to your productions?

2) Does the role of sound designer change with the different techniques?

3) If there was a sonic interactive system using vision-based gesture technology would you look into applying it into immersive theatre production? How would you envision applying this technology?

4) Do you have experience designing game sound effects? What differences or similarities do you think there are between theatre sound design and games sound design?

Appendix B: Information Sheet

Gesture-Controlled Sonic Interaction for Immersive Theatre

UNIVERSITY of York

Department of Theatre, Film, Television and

Interactive Media Ethics Committee

Participant Information Sheet – Non-Anonymous Interviews

Project background

The University of York would like to invite you to take part in the following project: Gesture-Controlled Sonic Interaction for Immersive Theatre.

Before agreeing to take part, please read this information sheet carefully and let us know if anything is unclear or you would like further information.

What is the purpose of the project?

This project is being conducted by Xiaojie Xie (xx929@york.ac.uk), who is a doctoral researcher at the Department of Theatre, Film, Television and Interactive Media at the University of York. This research is being undertaken for the project Gesture Recognition and Sonic Interaction in Immersive Theatre which is being supervised by Dr. Mariana Lopez (mariana.lopez@york.ac.uk).

The work that is being performed for this doctoral thesis is being conducted according to restrictions that have been subject to approval by the TFTI Ethics committee. The Chair of the TFTI Ethics committee can be contacted on TFTI-ethics@york.ac.uk.

For this research project, we are interested in the possibility of vision-based gesture recognition techniques in sound design for immersive theatre. Your participation in this project will involve an interview introducing the procedure of sound design in your previous work; your understanding of the sound design in immersive theatre; your opinion about vision-based gesture recognition techniques' (eg. Microsoft Kinect) application to sound design in future theatre projects. This interview will be audio recorded and it will last no longer than 1 hour.

Please note that to comply with the approved Ethics requirements of this work, we do not intend to discuss sensitive topics with you that could be potentially upsetting or distressing. If you have any concerns about the topics that may be covered in the research study, please raise these concerns with the researcher.

Your participation in this project is voluntary. If you wish, we will provide you with access to the interview transcript and thesis chapter that elaborates on the interview. If you would like to receive access to these, you can indicate as such on the consent form.

Why have I been invited to take part?

You have been invited to take part because you are a professional sound designer in theatre, film, television or game industry. We are exploring new opportunities for the use of sound technology for sound design in immersive theatre, and would like to discuss your opinion as a professional sound designer.

Do I have to take part?

No, participation is optional. If you do decide to take part, you will be given a copy of this information sheet for your records and will be asked to complete a participant consent form. If you change your mind at any point during the research activity, you will be able to withdraw your participation without having to provide a reason. To withdraw your participation you need to contact researcher Xiaojie Xie by email xx929@york.ac.uk. Upon receipt of your email, all your data will be deleted as soon as possible.

On what basis will you process my data?

Under the General Data Protection Regulation (GDPR), the University has to identify a legal basis for processing personal data and, where appropriate, an additional condition for processing special category data.

Personal data is defined as data from which someone could be identified. For example, in this study we will be collecting your name and email address, which are needed in order to schedule the session and provide you with access to the research paper upon the project's completion.

In line with our charter which states that we advance learning and knowledge by teaching and research, the University processes personal data for research purposes under Article 6 (1) (e) of the GDPR:

- *Processing is necessary for the performance of a task carried out in the public interest*

Special category data is personal data which the GDPR says is more sensitive, and so needs more protection. In this study, we will not be collecting any special category data.

Research activities will only be undertaken where ethical approval has been obtained, where there is a clear public interest and where appropriate safeguards have been put in place to protect data.

In line with ethical expectations and in order to comply with common law duty of confidentiality, we will seek your consent to participate where appropriate. This consent will not, however, be our legal basis for processing your data under the GDPR.

How will you use my data?

Data will be processed for the purposes outlined in this notice.

1. Your data will be used as references for the next research stage – prototype design.

2. Your name may be used in my doctoral thesis / research reports / publications and presentations.

Will you share my data with 3rd parties?

No. We will not share any data with 3rd parties.

Your data may be used in my doctoral thesis / research reports / publications and presentations.

How will you keep my data secure?

The University will put in place appropriate technical and organisational measures to protect your personal data and/or special category data. For the purposes of this project we will store data using secure University services provided by Google and the University Filestore.

Information will be treated confidentially and shared on a need-to-know basis only. The University is committed to the principle of data protection by design and default and will collect the minimum amount of data necessary for the project.

Will you transfer my data internationally?

Possibly. The University's cloud storage solution is provided by Google which means that data can be located at any of Google's globally spread data centres. The University has data protection complaint arrangements in place with this provider. For further information see, https://www.york.ac.uk/it-services/google/policy/privacy/.

Will I be identified in any outputs?

Yes. Your participation in this interview is non-anonymous and therefore you will be identified in the following outputs:

1. Your Name

2. Your Job

3. Your Projects

How long will you keep my data?

Data will be retained in line with legal requirements or where there is a business need. Retention timeframes will be determined in line with the University's Records Retention Schedule.

What rights do I have in relation to my data?

Under the GDPR, you have a general right of access to your data, a right to rectification, erasure, restriction, objection or portability. You also have a right to withdrawal. Please note, not all rights apply where data is processed purely for research purposes. For further information see, https://www.york.ac.uk/records-management/generaldataprotectionregulation/individualsrights/.

Questions or concerns

If you have any questions about this participant information sheet or concerns about how your data is being processed, please contact the TFTI Ethics Chair (TFTI-ethics@york.ac.uk) in the first instance. If you are still dissatisfied, please contact the University's Acting Data Protection Officer at dataprotection@york.ac.uk.

If you have any questions about the project itself, please contact the researcher Xiaojie Xie (xx929@york.ac.uk) or project supervisor Mariana Lopez (mariana.lopez@york.ac.uk).

Right to complain

If you are unhappy with the way in which the University has handled your personal data, you have a right to complain to the Information Commissioner's Office. For information on reporting a concern to the Information Commissioner's Office, see www.ico.org.uk/concerns.

Appendix C: Blank Consent Form

Gesture-Controlled Sonic Interaction for Immersive Theatre

UNIVERSITY of York

Department of Theatre, Film, Television and Interactive Media Ethics Committee

Participant Consent Form – Non-Anonymous Interviews

Thank you for your interest in this project. This interview is part of the doctoral research project: 'Gesture-Controlled Sonic Interaction for Immersive Theatre'.

Please read the following statements carefully and tick the appropriate box:

	YES	NO
I have read the information sheet about this project		
I agree to take part in this project		
I consent to being interviewed for this project		
I consent to the interview being audio recorded		
I understand my right to withdraw and/or destroy my data from this project at any time		
I consent to be identified by name in the outputs from this project		
I am over the age of 18		

Participant Name:	**Researcher Name:**
_____	___**Xiaojie Xie**_____
Participant Signature:	**Researcher Signature:**
_____	_____
Date:	**Date:**
___/___/_____	___/___/_____

If you wish to be informed about the outcomes from this project, please provide your email address:

_____

Appendix D: Consent Forms

Gesture-Controlled Sonic Interaction for Immersive Theatre

UNIVERSITY of York

Department of Theatre, Film, Television and Interactive Media Ethics Committee

Participant Consent Form – Non-Anonymous Interviews

Thank you for your interest in this project. This interview is part of the doctoral research project: 'Gesture-Controlled Sonic Interaction for Immersive Theatre'.

Please read the following statements carefully and tick the appropriate box:

	YES	NO
I have read the information sheet about this project	✓	
I agree to take part in this project	✓	
I consent to being interviewed for this project	✓	
I consent to the interview being audio recorded	✓	
I understand my right to withdraw and/or destroy my data from this project at any time	✓	
I consent to be identified by name in the outputs from this project	✓	
I am over the age of 18	✓	

Participant Name:	Researcher Name:
Miquelon Rodriguez	Xiaojie Xie
Participant Signature:	**Researcher Signature:**
	
Date:	**Date:**
02 / 12 / 2020	03 / 12 / 2020

If you wish to be informed about the outcomes from this project, please provide your email address:

miquelon.rodriguez@gmail.com

Gesture-Controlled Sonic Interaction for Immersive Theatre

UNIVERSITY of York

Department of Theatre, Film, Television and Interactive Media Ethics Committee

Participant Consent Form – Non-Anonymous Interviews

Thank you for your interest in this project. This interview is part of the doctoral research project: 'Gesture-Controlled Sonic Interaction for Immersive Theatre'.

Please read the following statements carefully and tick the appropriate box:

	YES	NO
I have read the information sheet about this project	X	
I agree to take part in this project	X	
I consent to being interviewed for this project	X	
I consent to the interview being audio recorded	X	
I understand my right to withdraw and/or destroy my data from this project at any time	X	
I consent to be identified by name in the outputs from this project	X	
I am over the age of 18	X	

Participant Name:

Nick John Williams

Participant Signature:

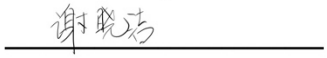
Date:

02/06/2021

Researcher Name:

Xiaojie Xie

Researcher Signature:



Date:

05 / 06 / 2021

If you wish to be informed about the outcomes from this project, please provide your email address:

nickjohnwilliams@gmail.com

Gesture-Controlled Sonic Interaction for Immersive Theatre

UNIVERSITY of York

Department of Theatre, Film, Television and Interactive Media Ethics Committee

Participant Consent Form – Non-Anonymous Interviews

Thank you for your interest in this project. This interview is part of the doctoral research project: 'Gesture-Controlled Sonic Interaction for Immersive Theatre'.

Please read the following statements carefully and tick the appropriate box:

	YES	**NO**
I have read the information sheet about this project	YES	
I agree to take part in this project	YES	
I consent to being interviewed for this project	YES	
I consent to the interview being audio recorded	YES	
I understand my right to withdraw and/or destroy my data from this project at any time	YES	
I consent to be identified by name in the outputs from this project	YES	
I am over the age of 18	YES	

Participant Name:

_Yaiza Varona_____

Participant Signature:

_____

Date:

__11_/08_/_2021

Researcher Name:

___Xiaojie Xie_____

Researcher Signature:

_____

Date:

__11_/_08__/___2021___

If you wish to be informed about the outcomes from this project, please provide your email address:

yaiza@yaizavarona.com

_____

Gesture-Controlled Sonic Interaction for Immersive Theatre

UNIVERSITY of York

Department of Theatre, Film, Television and Interactive Media Ethics Committee

Participant Consent Form – Non-Anonymous Interviews

Thank you for your interest in this project. This interview is part of the doctoral research project: 'Gesture-Controlled Sonic Interaction for Immersive Theatre'.
感谢您对这个项目的关注。 这次采访是博士研究项目的一部分: "沉浸式戏剧中姿态控制的声音交互设计" 。

Please read the following statements carefully and tick the appropriate box:

	YES	NO
I have read the information sheet about this project（我已经阅读了这个项目的信息表）	V	
I agree to take part in this project（我同意参加这个项目）	V	
I consent to being interviewed for this project（我同意参加这个项目的采访）	V	
I consent to the interview being audio recorded（我同意这次采访被录音）	V	
I understand my right to withdraw and/or destroy my data from this project at any time（我明白我有权在任何时间从这个项目中撤回或销毁我的信息）	V	
I consent to be identified by name in the outputs from this project（我同意我的名字出现在这个项目的成果汇报中）	V	
I am over the age of 18（我大于十八岁）	V	

Participant Name（参与者姓名）：

Hou Chenzhong

_____

Participant Signature（签名）：
Hou Chenzhong

_____

Date（日期）：
26 06 2022
___/___/_____

Researcher Name（研究者姓名）：

___Xiaojie Xie_____

Researcher Signature（签名）：

_____Xiaojie Xie_____

Date（日期）：

_26__/_06__/___2022___

If you wish to be informed about the outcomes from this project, please provide your email address:
如果您希望了解该项目的成果，请提供您的电子邮件地址:
houchenzhong@gmail.com

_____

Appendix E: Table 1 Data extract from sound designers' interviews

Data	Code
Rodriguez: I would classify as three different types of theatre	three types of theatre performance are all immersion.
Rodriguez: from least immersive to most immersive, I would rate them at site-specific first, promenade theatre next, and then immersive theatre.	
Rodriguez: but each of them has a level of immersion to them, which is what makes is why you might find sort of inaccurate descriptions	Hard to define "immersive theatre"
Williams: I think it's definitely a term that you will not find a consensus on.	
Varona: For me, it is a broad definition	
Rodriguez: (Site-specific) just means the show that's happening was either created or directed towards a place a specific site…. it's not immersive, unnecessarily	Site-specific is directly relative to a specific location. Immersion is not a key point to site-specific.
Williams: (For site-specific) my preferred term is site-sensitive performance. I think site-sensitive performance is going to a site so going to the forest and responding to it.	
Varona: Now something site-specific means in my head, that it's going to be the narrative, whatever it's been told what if it's been offered to the audience is specifically determined by a specific location.	
Rodriguez: Promenade theatre, is I would describe it as a multiple site-specific theatre, where part of the experience of the audience is to move through those spaces.	Promenade theatre has a defined route for audiences. The movement of audiences in the Promenade theatre is a key point. Three sound designers have similar definition of Promenade theatre.
Rodriguez: A part of it is like VR, part of it is tactile art of it is auditory only but it requires you to move from space to space.	
Williams: (Promenade performances) we've got this idea for a show, we're going to put all this stuff and all this protocol in place within this environment, and we'll do our show there.	
Williams: Yes, it is site-specific.	
Williams: So, there might be it might be a promenade performance that happens along a defined route.	
Varona: (Promenade Theatre) It's like a like a scavenger hunt or you know, a treasure hunt where you need to find something else.	
Rodriguez: (Immersive theatre) Then I so what how I would classify immersive theatre is using immersion as a whole.	Immersive theatre is hard to

Rodriguez: Around a space and your experiences can be completely either crafted by them or you.	define. Immersion has multiple ways.
Rodriguez: and depending on the show, when it comes to immersive theatre, then your ability to affect the outcome is also part of how the show is designed.	
Varona: Anything which is any immersive performance is just, a, this wealth of happenings as well for performance as we were mentioning before, so anything where the audience is going to be involved in a more immersive, immersive, in a more…I tend to have matter because they are very submerged with experience and that takes many forms.	
Williams: I think for me, the way I think about immersive has changed. I thought it was a technically mediated experience or technically mediated phenomenon. I thought immersive was something that if I created something technical that responded to people that could make an immersive environment. But actually, now I think immersion and in immersive, to be immersive or to create an immersive experience, immersive happens in the audience. Immersive happens in the viewer. We don't create immersivity we create environments or technologies or relationships. I think the audience experiences immersion. So, for me, immersion is something that happens in the audience.	Different people perceive immersion differently. Immersion happens on audiences (both emotionally and physically). Immersive experience could be positive and negative. Immersion is not relevant to the tech and the form of performances.
Williams: So, I guess I've got immersed with like love and anger and all these other things that you can that you can feel where it may scare you.	
Varona: for me, immersive always means that you're going in a way the audience is going to be put at the centre of the of the story, not necessarily that the fourth wall is going to break that they're going to be speaking into, not necessarily that but the fact that basically you make use of the space so that the audience is immersed, even if they are just you know, a passive, watching listening audience.	
Varona: But the main aim is that you're going to be part of the story in a way you're going to be submerged in that illusion in whatever way that takes form.	
Varona: What depends because I think that there are different degrees on how immersive do you want something to be or how tech oriented because that's another thing you may have immersive theatre without any tech at all.	
Rodriguez: So, there's interactivity where you are. There're different ways of being interactive. So, you can either be just and observer but you can be led by actors.	Audiences interact with immersive performance in multiple ways. Interaction brings immersion.
Rodriguez: (Immersive theatre) Around a space and your experiences can be completely either crafted by them or you.	
Rodriguez: It's about like your ability to move freely or more freely than just promenade theatre. But it doesn't necessarily mean that you have to interact. You just be an observer, but that you have that option. And that interaction kind of unlocks different stories, depending on what you do.	
Rodriguez: Some of it is like you can interact but it has no effect on the outcome. Some of it is you interact and you only have that track now for the rest of the show.	
Varona: Well, if it is interactive, for sure, it's immersive, because there is no way you can be interacting with an actor a set a cue or something and the not being	

engaged in what you're doing	
Rodriguez: I think the differences are largely to do with use of technology because of the way that you want to create the world and so what that means to me is.	The differences on sound design in different types of theatre is technology designer they used. In non-traditional theatre, sound designer may design more things. The environment in non-traditional theatre is unforeseen.
Rodriguez: Immersive theatre has not only done the actual writing of it and creation of it take as much time as a regular theatre piece does and then probably even more. You also have to plan logistics and the logistical component of your design requires it's almost like a whole other show, if not two or three other shows.	
Williams: there's two big differences that jumps around this the technical one, which is I will feel more confident at least that the theatre is a much more controlled environment.	
Williams: The technology changes the environment. changes.	
Varona: So, it has an adaptation to whatever language that project takes. ... even if it is not necessarily moving you know all over the place with 3d technique and no need for that either.	
Varona: And as I say, the tools may change, how I bring that sound, how I make it happen.	
Rodriguez: the similarities are you're creating a world, you're adding to a universe into a world and creating that atmosphere, that mood, creating the pushing the narrative along pushing the story along with rhythm and tempo and all those wonderful musical terms, but that's the key commonality across the board for any theatre that I that helped create.	Sound's function on stage is offering extra information and creating emotion atmosphere.
Varona: One of them is anything that is, has to do with content through sound through recording voices through you may offer extra information that the narrative needs to go on. …And something that in that stage is missing, because you don't have precisely another actor saying that perfect bringing you that extra information.	
Varona: the second the second item that the whole soundtrack addresses has(have) to do with emotion.	
Williams: we've been doing that for years and improvise music and sound art and all this why don't you talk to some sound artists and installation artists, and that's how I got into theatre because they didn't know they could do this stuff with sound they didn't know as possible. Theatre is quite behind when it comes to sound.	Technology of sound in theatre is behind the trend. Technology could bring extra resources for theatre storytelling.
Rodriguez: It's rare to see it in sound in a fully just theatrical setting for a couple reasons. One is that theatre is very behind when it comes to technology in Canada specifically. Everyone here is a little bit too traditional and are afraid of change.	
Rodriguez: In creating and I think it would be the reason I'm excited about it and why like I love that you're working on this is because the I want to see more science fiction on stage and that's a genre that is rarely explored in in theatre.	
Varona: That is an extra technology is allowing you an extra storytelling resource that you didn't have in a more traditional environment.	

Varona: My point is that yes at some point, having an extra part of technology may afford you new storytelling resources, but the core of that storytelling is like saying yeah, the difference between TV in black and white and when we got technicolour and onwards the fact that you already have that you have colours means that you can tell something else through colours and you couldn't do that in black and white	
Rodriguez: (Rehearsal) there's usually a point that shows will reach called Tech Week and that is a week, or more or sometimes less, in this space, where the director can now see what the show looks like in live.... and so, you need that time in tech week to kind of relearn how you move because everything is a little bit different than what it was in the rehearsal hall.	The rehearsals of traditional theatre and site-sensitive performance are different. Sound is provided in the rehearsal room for actors and directors. Preparation (rehearsal) includes risk assessments and safety check.
Rodriguez: (Rehearsal) Sometimes the script will have like a certain sound happens and that's a cue for an actor or that's something that an actor has to react to. And the sooner that they can get the sound, the easier it is for them to integrate it into their work and for the director to integrate it into their work as well.	
Williams: (Site-sensitive/site-specific) So there's there was no rehearsal there was just preparation. So, and so we wouldn't rehearse but we would talk about visit the site. And we would talk about the site and the kind of things we'd like to explore in the site.	
Williams: I think we've promenade performance are a much bigger part of the preparation, and much more time is spent on safe health and safety. ...We have to do risk assessments. There's a lot more health and safety preparation involved with promenade performances.	
Varona: I try to have everything that I can in shows as early as possible. So, the actors as well have some time to get used to that precise sound.	
Varona: I definitely my go to I go whenever we're going rehearsals the very thing and I see the chart for you know, tech rehearsals, how everything is a lot of it like Okay, the first thing is when do I have quiet, quiet time when can I go Where do the things	
Varona: The main challenge that I encounter is the lack of silence that is inherent to working in a room with various people because the thing is that with sound when you want to hear the full long result, as I was saying before, it's an it's a time-based art form. You need to hear everything from the beginning all the way through the end because it's not in terms even as well for volumes and such.	Theatre rehearsal lack silence time for sound design. Sound is affected by objects in the space.
Varona: As I say it, there needs to be a coherence and what kind of language do you want to establish whether performance and also if you want that language to evolve because at some point, if you have the kind of traditional theatre where at some point, that helicopter is flying over the heads of those characters on stage, if you do it so immersive, that that helicopter goes, feels like it's on top of your head in that moment where you have that doubt, like why is this happening to me, you have disconnected from what's happening on the stage.	Sound in theatre has emotional properties and also has physical properties. Sound design should according to the types of performance.
Varona: Now, if you have already established that things happen around you, and you know that's part of the stage, it's much more sensual. It's much more physical if the sound pretty much is in your face or very close all around you because it's going to make you feel much more powerfully everything that's been offered to you because you know, it's just it's you can feel it in your body.	
Rodriguez: So as a sound designer, then that also becomes like a difference in	Loop is a common

loop for a lot of things.	technique in the sound design.
Rodriguez: But the closest thing that I've seen to something like that being used is actually in dance.	Gesture recognition technology was used in dance performance, sound PhD's project (sound installation), and interactive light performance. MaxMSP, PureData, Wii controllers, joypads, Xbox controllers, camera, Isidor, Arduino.
Williams: So, yeah, I've used all sorts of technologies. For a while the main brain of my any sound stuff I did was MaxMSP, which is a bit like PureData. So that was the software I'd use and then it was a case of how do I get gestural information into that so to get gestural information into MaxMSP I would use I've used I didn't ever use a connect but I did you use Wii controllers, if used all sorts of controllers actually like joypads and Xbox controllers and all different games controllers. But then I moved when I did the big environment sensing environment stuff. I used a video camera I was going to use a connect by ended up using a video camera which I fed into my laptop and took the visual signal into a soft piece of software called Isidor. And Isidor allow me to do block tracking and kind of create the I was kind of like a tracking middleware for me. And then all the tracking information so velocity acceleration, high colour, tone, whatever speed would go into MaxMSP and then MaxMSP would create all the synthesis and all the sound. ... And then since the PhD I've used primarily still used MaxMSP but primarily use Arduinos and different types of sensors to get the gestural or trigger data motion data into MaxMSP and I'm just now in the light in recent years moving on to self-contained kind of noise making objects. So, I'm looking at actuators so I just created an interactive bell ringing exhibition, which actually didn't use a computer at all. It used an Arduino, which then triggered motors to ring bells and it was triggered by emotions.	
Varona: About installation that I saw 2015 I think I don't recall the name in the Barbican. That employed something similar, they had beams of light projected to the floor and you would have something that was not in a room and the audience could walk in and they could kind of interact with these beams of light is the interrupted them, divided them they would create new beams of light.	
Rodriguez: (Game sound) It's just a different technology that a lot of the elements are the same and like again, you're creating a world you're creating an atmosphere that doesn't go away.	Game sound uses different technology. Game sound design is similar to theatre sound. Game sound is designed for non-linear narrative.
Varona: Basically, everything that I do in theatre I do with like so because many of the things that I do is theatre work like a video game in the sense that they are loopable tracks. Yes. And they hold it until the next event happens until the next event and none of us knows when that event is going to happen. It will happen with you know whenever the actor so it's always triggered by something external and you need to make it in such a way you know that they morph from one plane to the next smoothly and everything that you will need to consider when doing music for video games.	

Williams: Like the Kinect seems like because it's so outdated the Kinect in you might get might cause you problems, more problems than it's worth, you know, like you might be better off just getting an Arduino or Raspberry Pi and building it from Scratch with PIR sensors and ultrasound sensors and infrared because that's something you can then build on and work with for years and years. Like to get a connect working I was gonna use a Kinect in 2007 and I decided against it because it just wasn't worth my time trying to work out how to get it interact. I was using MaxMSP at the time and trying to get the connect to it with a MaxMSP, I was like, there's better ways of doing this. You know, I wonder if you're, I don't know if you've tried it yet, but I would my hunch would be to rather than go the connector route to go the Arduino Raspberry Pi sensors route.	He thinks that Kinect is out of date. He considers that Arduino or Raspberry Pi (Single-board computers) are suitable for sonic interaction.
Williams: Yeah, I think oftentimes, with immersive with kind of immersive projects. People focus so much the makers can focus so much on the technology and forget these other relationships that are happening.	Immersive performance should focus more on immersive experience. The relationship between technology and performance is a difficulty.
Williams: How that could you know, when you're thinking about the audience's relations for technology, of course, you mustn't lose sight also of their relationship to those actors. Because if those actors get that relationship wrong, then that could destroy the whole immersive thing you know, that your technology might be super immersive like interacting with your technology might be super a super immersive experience.	

Appendix F: Table 2 Data extract from interview with Hou

Here is an interview questions list for Hou:

1. Would you mind introduce yourself briefly?
2. After looking through my system flowchart, do you have any suggestions for it? Do you have any ideas on how I can use the function of Wwise that can help create a interaction with sound in performance?
3. Have you heard any performances using Wwise?

And here is the data from interview:

Data	Code
It was done by people from Tokyo University of the Arts, but he is not actually a stage, it may be more of a simple interaction. Then I remember that he is using Realsense, not Kinect. But with Realsense, if your own document reading ability is relatively strong, you may buy one and find that there may not be much difference.	Realsense could be an alternative to Kinect.
I think linearity must have certain advantages. It is more stable and less prone to accidents.	Linear narrative has advantages on stabilities.
I think it is like *Sleep No More*, … the round went on, and he (sound designer) must have strictly controlled it. For example, I want to separate the place for comparison from the place where should be controlled, and let it be less controlled in the place where should be less controlled. You have to take different control methods for this result, so in this way, you can actually avoid some questions which are not necessary. the biggest problem of some people I have met before is that they have a linear way of thinking, and then they hope that all of their solutions can provide a very accurate cue recognition, but the recognition maybe not so accurate. So actually, I think it means that you need to know where your non-linearity should be placed. so I think the first thing you need to do is to take into account how your tools are used in the narrative, so that if you have some goals like this, you will not be wrong.	The sound design in *Sleep No More* is strictly controlled. The linear narrative and non-linear narrative are carefully organized. The most important of design is make a clear goal of performance.
the game is actually a combination of linearity and non-linearity.	Game also has linearity and non-linearity.
You want it to smoothly transition to this side, from 0 to 1, it transitions smoothly, but you must switch a state when its value is greater than 0.5. So, you can control one of his behaviors in a way similar to continuous becoming discrete to avoid some unnecessary results. In short, there is no problem with the tools.	The method to deal with gesture dataset is to make continuous data become discrete.
So I think it means that his grasp of the emotions of people in different areas entering different stages is quite correct.	Divide stage into areas for sound

But he will also use some classic music and sound, because each speaker is in that kind of environment, and the sound reinforcement range of his voice is actually limited. But with this method, you may only hear this sound when you enter this area.	design.
And then another point to consider is because it will have a lot of speakers, the phase of the sound you play in this space will be generated, or the vertical filter, we will phase cancel. You may have to think a little about the content of the broadcast, a relationship between them.	Consider about the problem of multiple speakers.
Even he may not necessarily use Wwise, that is, some people may directly use linear design in Reaper and then divide the speakers. Then he will think very clearly and say which sound is the speaker number 1 and number 3, and then which sound is the speaker number 2 and number 4. Yes, maybe this is a consideration above pure sound, but if you use Reaper linear, of course, what do you want to make, but non-linear (is harder).	Repear? can also implement complex sound reinforcement system designs. But it can not create non-linear sound design.
Its artistic effect is also established with Kinect, but it depends on how you design the system.	Kinect is OK? for performance.
Star Wars is working on a very large hotel project recently…there is a man named Jedi training center is to let you go in and train you to become a Jedi Knight… they do it with Wwise, and they put a Kinect in front of it, and then you hold a knife like this and swing a sword like this, and then he will definitely be C++ or C++ because it is equivalent to Kinect It is how to do its image, it is directly C++ to trigger Wwise, so this system is very stable, and then they are also implemented in this way, there are already ready-made examples, or you can write directly.	Kinect can be directly linked to Wwise by programming with C++. It is more stable.
Understand, in fact, I don't think it's a problem. In terms of position, you can also say that you can place the sound in the Wwise, detect the direction, and create a game object to play the sound. This is very simple.	Using Kinect to detect the position is also feasible.
I don't think there is any problem, it is also convenient for people, that project is well done, the other is nothing, the other is the position I just saw, the thing about a sound reinforcement is the object and base audio. In the past, it was your 5.1 or something. Now that there is an object, the positioning of the sound can be made more accurate, and that's it.	The system design looks fine. Unity can afford the complex sound reinforcement in practice by using game objects.

Appendix G: Interview with Miquelon Rodriguez

Xiaojie:

Okay, thank you so much. And let me introduce myself first. Um, I'm Cheryl and I'm from China and currently I'm in China. The PhD student in theatre, film, television and interactive media in the University of York and my research project is about using gesture control. technology to do sound design for the immersive performance and immersive theatre. And the reason why I want to interview have an interview with you is because I'm from technology background I used to study the computer programming. So, I have little knowledge about sound design and theatre. That's why I want to like have a chat with you to know more about current theatre, what kind of technology they use and what kind of like designing methods they use in a real theatre. So, yeah, and I think you have looked through my questions in advance, right?

Miquelon Rodriguez:

Yes.

Xiaojie:

yeah. And, okay. So,

Miquelon Rodriguez:

bring them up here.

Xiaojie:

It looks a little bit… It seems many questions, but I think you can choose some of them to answer. It's, it's okay.

Miquelon Rodriguez:

Yeah, no, I mean, they, they all seem reasonable. So, any of them that I can probably answer all of them if you want. It's completely up to you.

Xiaojie:

Okay, so okay, if you can give me like, written version of answers. That's cool. But I also want to like, have a chat with you and maybe we can talk something outside of these questions.

Miquelon Rodriguez:

Absolutely. Yeah. Yeah. What would make what works for you? What would you like to start with?

Xiaojie:

As my questions (says), would you mind briefly introduce yourself? And your routines into professional sound design and...

Miquelon Rodriguez:

for sure.

My name is Miquelon Rodriguez or Mickey for short, and I am a theatre artist that sound designer composer sound editor now with and broadcast designer in Toronto. And my professional sound design came from a background in music as a kid. I'm a classically trained pianist. And I started

when I was really young. And then in, in high school, I really wanted to know how to produce music. And that led to a class in in grade 11, which was just easy creation. Or I got to learn about how to use analog technology for sound and then how to use digital programs to put sounds together. And that became a skill set that I brought into when I went to York University in Toronto. Which admittedly, I thought that this that you also the York University, University of York better. So, it made it even more exciting to have to speak with you today. But I went there for theatre. And there is a program that I streamed into called device, we call the creative ensemble, but it is a device theatre program. Where in theatre you can either work with a script that someone's written and everyone puts on the show. With device theatre, we created everything together. From the writing to the directing to the acting is the design and the sound design because no one else in my class really knew how to do it. Because I had this skill for it, then I use that in our creations. But I would also act in them and I would also write them with my class. And my professor in third year Michael Gray Eyes who's a professional choreographer. He's an actor actually right now doing his acting in LA. And he, he is he hired me in our third year when he was at one used to fester for my first profession. Yeah. And it was a sound, uh, he made me. He was like, hey, I really want to work for you. Do you want to do the sound for this television show? And I said, Yeah, of course. And I didn't know what I was doing. I just I said, I'm not gonna say no to this opportunity. And so, I figured it out and kind of learned as I went along, but yeah, my first professional gig was through him and then we ended up working together for years after I compose music for a lot of his shows and did sound design for a lot of his shows as well. And that's

Xiaojie:

That sounds really great.

Miquelon Rodriguez:

Thanks. So yeah, I have been… like 15 years.

Xiaojie:

So, you have experience on sound design when you're very young.

Miquelon Rodriguez:

Yes. Yeah. Yeah. And I just didn't know that. That's what I was doing. That's I like playing with sound and putting them together. And then it turns out that theatre has sound designers so…

Xiaojie:

I have a very similar experience on like, producing music when I when I was in secondary school, but actually I have I also, I was also didn't understand what I'm doing. I just like, I like singing and then I want to have my own song then I try to create my own one but it's is just like, a game for me at that time. It's not very professional. And now I'm thinking I want to be a professional sound designer. So, I go to York, trying to get more knowledge about this.

Miquelon Rodriguez:

Yeah, that's great.

Xiaojie:

Yeah, I hope that one day I can become the person like you.

Miquelon Rodriguez:

You can. I mean, if you I mean, you should be a person like you. But like, Yeah, I mean but you can do it when I like to have my goals to them that habit Well, one definitely one of my good friends who's also sound well, one of my friends we met through sound design, who works in the industry here as well. Started in psychology, I want to say in psychology, I think so. Yeah. No, she has a degree in psychology and then decide and she's a classically trained violinist. And so, she and then she decided sound design that's really cool. And just like went for it and learned it and like this was, again after she got her degree, and just decided I'm gonna try something different. And now she's one of like, the best sound designers in the city. It's great. Yeah, like, Gee, she just kicked down the door for herself. And she's like, she's younger than me by a bit and literally just kind of like, appeared out of nowhere and said, I want this and so you can totally do it. Yeah, totally possible.

Xiaojie:

Thank you. Okay. Oh, I have some questions about the immersive theatre. I remember you have some experience on it, right? Yep. So how do you define immersive theatre because recently in last year, I read articles and books about immersive theatre, I found that it seems not very critical or not critical, accurate. It is not a very accurate term. So far in the in the, in, in academic because I found many words like you can see in the questions immersive performance or site specific. And also like promenade. Yeah, yeah, promenade. So how do you define it?

Miquelon Rodriguez:

Yeah, well, it's interesting because those three, immersive performance, site specific and Promenade theatre, I would classify as three different types of theatre, but each of them has a level of immersion to them, which is what makes is why you might find sort of inaccurate descriptions, where they just as a blanket as an umbrella, call it all immersive theatre. Yeah, but I'll kind of go backwards from it. So, I would say in level of immersion, from least immersive to most immersive I would rate them at site specific first, promenade, theatre next, and then immersive theatre as like the sort of that in itself is its own genre. Its own classification of theatre. So, site specific theatre, just means that the show that's happening was either created or directed towards a place a specific site. So, whether it is a specific, like around architecture around statues, or maybe it's a specific building and In, in Toronto that has history behind it. And so that's why they chose it or if it's in a cornfield, it's site specific because the show can't, can't really exist anywhere outside of that site. You can make different versions of it. You can have rebounds of the show that are changed and altered slightly but again, because they're in a different place in a different site, little things change about it. So, the blocking like where you were, everyone has to move. Even if I'm doing sound design on the site, specific space, then even like the placement of my speakers are going to differ slightly from every space that I'm in. Right. So that's site specific, where I can't necessarily do this show in a regular theatre because maybe I need a forest maybe I need to have like an actual like coffee shop or something like that. So, it's, it's not immersive, unnecessarily, because with a site-specific show, there's still like the audience, like boss, right the audience and then the performance and the performance just happen to be in a singular place that isn't just a regular theatre. So yeah, that's site-specific theatre then then promenade theatre, is I would describe it as a multiple site-specific theatre, where part of the experience of the audience is to move through those spaces. So, for instance, there's a wonderful promenade piece called the stranger. And that was, yeah, that was created by I'm going to figure out how to pronounce her name is theatrical. … DLT. I'll send you the link for you.

Xiaojie:

Thank you. So where is the company?

Miquelon Rodriguez:

They are based in Toronto, but the creators from Italy. And so, it's an it's an Italian Canadian company, and they specifically create immersive site specific and promenade theatre like that is

their mandate. And they're, and they the show, the stranger is a one on one show, but it's not just one actor. It's multiple actors that one person encounters along a route and they're guided through sections of the city. In one version, and also in another version, they were guided through a community centre, where every next actor is a different experience. And in that show, specifically, it was all about like, how do you interact and how can you trust a stranger? And part of it is like VR, part of it is tactile art of it is auditory only but it requires you to move from space to space. And that's what makes it a version of promenade theatre. When I was at York, one of the projects that I helped with was a promenade piece that happened within the theatre so like within a black box space, I had created it, it was like five stations that went around. And so, the audience kind of moved through the space to go from scene to scene, and it was guided by lights. So, it was like there was no one telling them Okay, now you have to move over here. There will just be environmental indications of where you should be looking next. But there are no rules really, you could look anywhere but we kind of carved it down so that you could only see what we wanted you to see. So even if you wanted to look behind you, it's just dark and it's not really interesting. So that's promenade it's you can be site specific, it can be mounted in a specific space like a theatre, but.

Xiaojie:

It requires movement.

Miquelon Rodriguez:

Yeah, exactly. Then I so what how I would classify immersive theatre is using immersion as a whole. So, there's interactivity where you are. There're different ways of being interactive. So, you can either be just an observer but you can be led by actors. Around a space and your experiences can be completely either crafted by them or by you. And the example that I use for this is Sleep No More in New York City. It's probably the most ubiquitous name in immersive theatre. And if you don't know it, it's a five-storey building that is all dedicated to this show. Have you seen it before?

Xiaojie:

I haven't, but I am planning to go to you know, from 2016 will move to Shanghai and I'm planning to go I'm planning to go there this weekend. So, I will have a very good experience.

Miquelon Rodriguez:

I'm just gonna leave you experiencing it.

Xiaojie:

Oh, thank you.

Miquelon Rodriguez:

Definitely part of it. And what's, what's interesting about that show is I have the most vivid memories from that show where I can describe exactly what happened to me that I can't do with shows that were on stage and had scripts and like dialogue and stuff like that. So, it's um so that that to me is immersive theatre. It's not. It's about like your ability to move freely or more freely than just promenade theatre. But it doesn't necessarily mean that that you have to interact. You can just be an observer, but that you have that option. And that interaction kind of unlocks different stories, depending on what you do. Yeah, so there's a level

Xiaojie:

like they interact with the script itself. Like story itself.

Miquelon Rodriguez:

Yeah. And depending on the type on depending on the show, when it comes to immersive theatre, then your ability to affect the outcome is also part of how the show is designed. Some of it is like your you can interact but it has no effect on the outcome. Some of it is you interact and you only have that track now for the rest of the show. But yeah, I think it's the one of the sorts of key definers for an immersive theatre piece for me is that I will want to go back to see it and then next time will be different because of that, that's the high that's the highest or higher level of immersion, then a site-specific show specifically or promenade theatre show specifically. So that's why to me it's like they are all levels of immersive theatre, but truly immersive theatre is along the lines of sleeping more. Or in New York on the show's done. Then she felt was another excellent piece by third rail projects in New York City.

Xiaojie:

That make sense. I've heard many people who go to sleep no more and they tend to attend one more time or maybe more time to explore the whole stories in Sleep No More because for, just only one time is not enough.

Miquelon Rodriguez:

Especially if you enjoy it. I mean it's the only thing I will say is that the primary I would say the primary language and it is dance, but there is dialogue, but it is a dance piece primarily. And but if I'm not excited that you get to see it I haven't I every time I go to New York to visit my friend for Thanksgiving, we go see the show like so I've seen it three times four times at this point. Yeah.

Xiaojie:

So, do you have like new experience when you go to the show?

Miquelon Rodriguez:

I do. Yeah. And I go, I just let it be about curiosity like the I found out kind of during that you can have these experiences that are actually just for you. Depending on if you're selected, but you there's no way to force it. There's no way to like it's random and so it's either part of your experience or it isn't. And when I when I got I got one of them in the first time I saw it, I think yeah, it was the first time I saw it. And that's what kept me coming back. I was like, oh my goodness, like I want to do this again. This Yeah. Yeah. So, it's that's pretty wild.

Xiaojie:

Let me see. I want to ask, Oh, what's your opinion when you doing the sound design on the traditional theatre and the immersive one, I mean, the difference of the similarities between these two?

Miquelon Rodriguez:

I think the so the differences are mainly I think the differences are largely to do with use of technology because of the way that you want to create the world and so and so what that means to me is the similarities are you're creating a world you're adding to a universe into a world and creating that atmosphere, that mood, creating the pushing the narrative along pushing the story along with rhythm and tempo and all those wonderful musical terms, but that that's the key commonality across the board for any theatre that I that I helped create. With immersive though, the it's it is the ultimate control of your sound. And it's which means that a lot more technology and a lot more budget, but the whole idea behind it being that in order to create a truly immersive whole universe, the sound has to be wherever the audience is. And that rule also applies in a standard theatre, except that the audience stays still and the audience is all listening to the same thing at the same time together. So, with that, I only really have to control on stage which I know

in advance will go in a specific order and will only last a specific amount of time. With sound design in immersive theatre because immersive experiences like Sleep No More tend to be much longer than then they got in Toronto. The most popular lengths of player like 60 to 90 minutes. They can go as long as like three or four hours but there's an intermission and you know, there's two acts and whatever. But in immersive theatre, a common technique used is to loop the stories, because there's so many of them. That if you were to only give the entire audience one chance to see all of them, then they'll see none of them right. So, the stories tend to be if you look at the storylines individually for a lot of those immersive pieces where you can decide which track to go on your own. Then those pieces will tend to be maybe like only 10 or 15 minutes each, but because of the way that they're tied in together and they're looped together through the other narratives in the piece. Then you have the ability to loop them back again so that other people can experience it too. So as a sound designer, then that also becomes like a difference in loop for a lot of things. So, within a standard or a traditional theatre. Yeah, I use loops as well. But it's oftentimes like either it's like a continuous sound. That's just because like it's a soundscape where I'm just trying to place the audience in a specific location. And the reason that I have to loop it is because I don't know this is the actor will change your performance a little bit. Day to day, right. So, some might, they might have, they might be very energetic and suddenly they're a lot quicker at their speech or their monologue or their dialogue. And some nights there. They might be more relaxed and so it can take them. But it's easier on the stage manager it's easier on the designer to just create a loop that a seamless loop, where the stage manager just calls when the loop ends as opposed to trying to specifically time something so that's like, traditional thing that I do and then in immersive theatre, it's that same thing, but the loop could be the entirety of the show. Yeah. Could be like there's a constant soundtrack in this one room that doesn't stop. There's a soundtrack in this room that doesn't stop. And then there's a there's like a warning soundtrack to that lets everybody at least lifts the actors know and the stewards know for the volunteers know that it's time to try to like get the audience into a specific location and kind of guide their paths and block their paths and sort of direct traffic. So, the general design is kind of the same because it's just about creating a world and if they need music, then there's specific music. If there's incidental or practical sounds upside then there's that that's something that gets required to you. So, the work on my end is the same workflow, but it's just about volume of work. Because an immersive theatre I could be designing seven or eight or 10 different shows all in one show. Because the tracks and those are the different lines. But in in traditional theatre, I'm just following along the script. And so, it's just one that I'm doing

Xiaojie:

so, you have more like freedoms in the immersive theatre. I mean…

Miquelon Rodriguez:

I'd say so yeah, only because it doesn't necessarily have to follow. Actually no, it could it could follow there could be like exact time things that to a script, but the freedom comes from the fact that the freedom actually becomes an obstacle. Because it is in a traditional theatre space. I'm technically more restricted because I have my specific inventory. I have my specific building and they're tuned in a specific way, that sound that are optimized for that face. So, a lot of my work is done when I go into a traditional theatre in terms of technology, because I'm just using what's there. If I'm designing for an immersive show, I will almost always want to work with an audio team like an engineer. Yes, because they can take care of that part and I can focus on creating the worlds. Yeah, that doesn't always happen and sometimes I have to do both. And luckily my experience in immersive theatre hasn't been as large as something that's more or I've so it's more patchable but I know like from working in like in larger theatres and musicals that having a sound team. Yeah, specifically just thinking about the engineering side of it and the best speaker placements. As much as I know there are people who know more than me and that's why I prefer to work with a team that way, but I know how to work with directors in terms of getting their vision across. That's what I'm good at. So that's why if I have someone that can take care of the one thing then I can focus on the other thing and together, create the whole design. So yeah, sorry. I lost my train of thought there but yeah, that's essentially it.

Xiaojie:

This is my first time to hear about the team of sound design in immersive theatre, because I, before you say it, I'm thinking that oh, maybe some designer is responsible for everything. But okay.

Miquelon Rodriguez:

Sometimes.

Xiaojie:

Yeah, sometimes, sometimes they have to do some technological stuff in their in their project.

Miquelon Rodriguez:

Well, it's, it's useful to. Sorry, it's means to interrupt you.

Xiaojie:

I just want to say I just want to say that's a very big challenge.

Miquelon Rodriguez:

It can be it definitely can be but it's the kind of have to love it. Which is which is which is why I do it because it's fun to me. Like I said, creating worlds like it's still about playing and so to me, it's when I think about like Oh so you're gonna pay me to play Okay, sure. I'll, I'll take the contract. But yeah, it's useful to know the audio engineering stuff anyways, because you troubleshoot and it helps you to talk to other technicians because you'll never have the same team all the time. So, if you know your process and your workflow and how they've worked in multiple spaces, then it's easy to go, oh, this is kind of like the other theatre that I've worked in and I've seen disappointment there. So, I remember how that works. But I feel like in every space I go and I'm always learning something new, even if it's the same space because oftentimes like something I didn't realize the last time I was in that space.

Xiaojie:

Yeah, when you work with different people, you always have different knowledge.

Miquelon Rodriguez:

Yes, yeah. Absolutely.

Xiaojie:

I just wondered, because I never worked with real theatre projects before. So, I wonder how do actors like when like when you finish, initial sell for theatre and then actors come in how to like, work with those sounds and music in the rehearsal stage.

Miquelon Rodriguez:

So, it all depends on the show with musicals I'm usually depending on my role because we're the Muse sometimes in a musical I've been sound designer and musical director so that that means that I've been there from the beginning. And so I'm in the process but be more of my work has been in traditional theatre. And in that, when it comes to sound design, specifically. Unless there's something in the script that calls for certain Actually, no, it doesn't even matter. Sometimes the script will have like a certain sound happens and that's a cue for an actor or that's something that an actor has to react to. And the sooner that they can get the sound, the easier it is for them to integrate it into their work and for the director to integrate it into their work as well. So if there

are sometimes there will be instances where I have to have specific sounds ready for like the end of the first week, but a lot of the times my design comes into play, closer to opening. And the reason that's the case is because oftentimes I need to know what the show is and you can't get all of it from a script. And I've certainly do a lot of preliminary work with the script, but a large chunk of like the beef, the meat of my work is after I've seen a run of the show. In the rehearsal space, everyone's got they've blocked the whole show. The actors might not be fully memorize your lines, yet, it doesn't matter. But it gives me a sense of the rhythm of the show. And it gives me a sense of oh, this, this feels a certain way this feels different than what I read in the script. And then that indicates to me okay, this is now the world that I want to build. And then I combine that with whatever the director's vision is. And when I tell them like make me a wish list, what do you hear? What are the things that you know, that you want to have in the show? What are the things you want to explore? And so, depending on how much the actors rely on the sound, whether it's your cues, or if it's like mood and atmospheric and the director wants to set that tone, then either I'm, I'm still usually not giving them a design until I've seen the first run. Because it's like, it's nearly impossible for me to do it. Because that will that will change as well. So I find that that I mean, the actors will certainly get samples of the sound sometimes they'll ask me like, Hey, can you send me those cues? I want to listen to them on my own so that I can recognize them with the design at home. When they're memorizing and if there's music involved in at the Syndicate, then I'm getting them versions of those songs, even if it's just like, like a piano arrangement until I've created the orchestral score. I'll give them that so that they can practice with it. If they have to sing to it and things like that. So it becomes just like pretty much actually, I'd say it's, it's, it's more along the lines of something like even a costume design. It's very unique because I can give my sound design to actors for them to practice at home. Yeah, but if they want, like, experience the set experience, the lights experience, the costume, they have to be in the space. So we want to think about it the one aspect of theatre design that an actor could take home with them during the rehearsal process and use effectively to either get used to it or to learn it. Actors oftentimes will want to bear their shoes that their character will have onstage because then you have a feel for the space in as on your feet. But there's no point in bringing that home to walk around in unless they really, really want to get into character because of whatever their method but it yeah, I've never thought about that before. It actually is the one design element that can go home with an actor if they need to.

Xiaojie:

So actually, the most part of your sound design is finished on well after you see the first rehearsal with actors in on like on stage or on the rehearsal room. So when you see the Wauchula scene, then you come up with other ideas on sound design. And then and then you combine them together just before the play open, right?

Miquelon Rodriguez:

Yeah, yeah. I mean, there's usually a point that shows will reach called Tech Week and that that is a week or more or sometimes less, in this space, where the director can now see what the show looks like in live. Listen to the sound see the costumes in lights, see the set, and the actors get a chance to actually experience the real set. Now depending on the size of the theatre, sometimes they have like duplicate sets and they just like it's easy to transfer but most theatre doesn't have that much money in Canada at least. And so you need that time in tech week to kind of relearn how you move because everything is a little bit different than what it was in the rehearsal hall. So that week is all spent towards putting all of those things together. There's usually a session called levels where your director and the lighting designers all the designers actually will be together and sort of going through the cues of the show through the looks of the shot through the environments of the show the different rooms and worlds what have you, and that's when I get to really test out the design. Oftentimes, I'll actually have a lot of that work done for like almost the last week of rehearsal before going in so that they can start to hear some of those things in the space or just during rehearsal. And that way it doesn't necessarily they don't have to adjust to it as much in the space they'll they will because it's always going to be louder but the Tech Week is integral to just testing everything out and finally doing really the show for the first time, even if

it's just for what we call it a tech run in Canada. And that run of the show is it's just us trying to work out the bugs. It's all it's just like well, that doesn't work. I thought it does that or like that. It doesn't work anymore. We got to throw that out and so it's my favourite time because it's just like you spent literally like a week in a space in a traditional theatre where you don't even see the sun the whole day and so you don't know what time it is most of the time. But you're immersed in what you're doing. Yeah. Loves immersive theatre. It's like I can't get more immersed than when I'm in tech week for a design. So that yeah, that tends to be the most of my fun happens in the second half of the process. Yeah, all the way all the way to opening sometimes a little bit after but

Xiaojie:

so is the process very similar to what I mean, in the in the traditional theatre, The process is very similar to immersive theatre when you do sound design or they have some difference like you just said you have to create many loops for immersive theatre. So is there any difference when you when you create an immersive one?

Miquelon Rodriguez:

The differences come in in time.

Xiaojie:

Time. Okay.

Miquelon Rodriguez:

Yeah, in so the general most theatre shows here in Toronto tend to go on like about a five to seven-week contract. So, like a week of prep, usually about four weeks of rehearsal, including tech week or sometimes tech week added on and then and then the show opens. So my contract is done by then and then I don't have to do anything because the design is done in the show just on without me because my design. So that's like Boom. That's it. By weeks done. Some shows are more involved because of the sound is a very integral part of the piece so that an AI might be included in the creation process of the show before the actual production and shows in in Toronto at least, can be under development for like 1, 2, 3, 5 years sometimes. But it's because we don't necessarily have the ability to only work on that thing without having to work on like another job to be able to pay rent. So that's why they like go shoot. We're just gonna make this five weeks so that we can pay you all in a chunk and that's it. With immersive theatre that's impossible. Immersive theatre has not only does the actual writing of it and creation of it take as much time as a regular theatre piece does and then probably even more. You also have to plan logistics and the logistical component of your design requires it's almost like a whole other show, if not two or three other shows. There's a piece I'm working on right now that we done. I want to say maybe one maybe two sessions over the last three years. And we've only like we barely have the story done. And we have about like we're we have like a skeletal structure of the logistics of the piece. But even that's changing. And that because there's no one funding us to do that. It's we write good. We weren't grants to our arts councils. And if we're lucky, we get them and then that allows us to continue the work. But it's a it's because of the way that Canadian theatre is it's such a start and stop process that that is why it takes years to finish even just a scripted one hour or 90 minutes show. So an immersive theatre even what it's very hard to come by in Canada in general anyway. And when I do immersive pieces, they tend to be shorter experiences because there is no development time. But if he's like Sleep No More requires like teams to put it together. So the biggest difference is in time and the but the but the same content, the same concepts of communicating designs and telling stories is the same. There's just more of them or they're longer or they have to be looped and have to have an actual physical thing that is dependent on the design or the other way around. So it is a more daunting task only because there's more work like quantitative more work. But in terms of like but all of the same principles of like sound design apply and all of my fundamentals apply I still have to create a world I still have to not distract

from the story. I still the actors still need to know what they're listening to you before they start and tech week for an immersive pieces like it should be tech month. There's so much like there's so many avenues that you have to take care of where it's like, which is why I'm like you need a team. There's no way if I'm working on I get to work on a piece that is as large as something like Sleep No More when it comes to immersive theatre. But if that in that show, I can't remember what their entire team was but like I would probably have had two or three assistants on designers on that show. That's because just because of the workload like if it was only me it would be fun, but the show would take even longer to put up because I'm only one verse. So yeah, it's time is the biggest factor and not unless from I would say in an immersive piece. Even in like a promenade IPs or a site specific I'm usually included way earlier in the process than in a traditional theatre show because of the fact that it's that I actually have to design how the sound is delivered. Yeah, as opposed to in a theatre space. My design is based on my inventory. And the places that I can put speakers are more finite than they are in immersive theatre where it's literally whatever I want. Which is the same thing as like asking the artists like a blank canvas is the scariest is the scariest site because you have to you have to start somewhere. And it doesn't get more blank canvas than immersive theatre. Because again, ops obstructions are good when it comes to creating because I have restrictions I go okay, like I have to do it within this. So at least that part of it kind of takes my brain power to just creating around that obstacle. But the obstacle is free reign and complete, blank canvas. And it's the scariest because it's like well, I can start anywhere and I don't know where I want to start. So it becomes like I just got to dive in somehow. But it is it ultimately is more rewarding and more fun because you get to do whatever you want.

Xiaojie:

Yeah. And I just remember you say something about the technology. You've seen in the immersive theatre. And so I one of my key points in my research project is the gesture recognition technology. And I just wonder, is there any similar technology currently, currently using in the immersive theatre or immersive performance or in your work do you use some technology like this where you're doing sound design?

Miquelon Rodriguez:

So in terms of immersive theatre, there are some I can't remember their names but there are pieces that that have used something like an Xbox Kinect before, in around the world and so I personally haven't seen it in an immersive show like sleep no more, at least not to my knowledge that it's being used in there. But I've definitely seen it used before. Almost theoretically, in certain like science centres around the world. But the technology does exist and it is it is used in by one of my friends. He doesn't use it specifically for sound design, but he's a he's a he's a doctorate in theatre here in Toronto and he designs mostly around projection and doing wireless technology. And but he's used connect as well before Montgomery Martin is his name and he uses that to control projection. Well, like your body is the player.

Xiaojie:

I saw many examples on like, they mainly use Kinect for visual effects in the performance.

Miquelon Rodriguez:

It's rare to see it in sound in a fully just theatrical setting for a couple reasons. One is that theatre is very behind when it comes to technology in Canada specifically. Everyone here is a little bit too traditional and are afraid of change. So it is like I'd say outside of Vancouver, there really isn't a huge push on creating using technologies like Kinect and motion sensing technology and motion tracking technology. But it does exist and it's just a matter of, you just, finally, kind of pushing the forms ahead in time it's certainly more prevalent in I would say Europe. And but I'm sure it's even prevalent in other places. I've just not aware of it myself. But the closest thing that I've seen to something like that being used is actually in dance. And was it a motion tracker that she was using? I can't even remember I might be mixing t shirt in my head. But

Xiaojie:

they're also using the motion capture but not Kinect or XBox.

Miquelon Rodriguez:

That's I'm trying to remember I think I'm mixing up some of Montes work with my friend Mingo lambs who work, for them together in my brain. No, I am meshing it together in my brain because both was about using microphones to capture the sounds of her dance and it was creating atmospheres. That's right. But in terms of so there's specifically to create sounds with it is not something that I've seen in in a regular show again, I've seen it used as sort of demonstrations of what's possible. Where it's led to certain things like there are like air drums is almost like it doesn't necessarily start with motion tracking but that it was or that doesn't start with something like a Kinect, but it uses kind of the same principles and then that ended up leading to just using sticks that track that instead. Where the motion isn't about visual converted into or motion converted into sound but it's oh sorry about visual emotion word into sound because it is about motion but it's kinetic motion through the movement of the sticks, but they're there. Again, seeing it theoretically just not used in the theatre spaces. The possibility is there though because of specifically someone like Monty's work. It's just no theatre has approached him about how to

Xiaojie:

use this. Yeah.

Miquelon Rodriguez:

I'd say yeah, there is a company in Vancouver that I can imagine have probably played with it or would want to play with it and are looking into it and they're called Hong Kong exile in Vancouver and they create a lot of forum forward shows that have levels of immersion, but I wouldn't necessarily call them immersive theatre. But that they've used coding technology they've used AI they must have used some sort of like a link from motion capture to projection before. But if there's a company that I would, I would foresee figuring out a way to do that first it's probably them.

Xiaojie:

so why I'm thinking maybe in the theatre, we can use gesture recognition because I link immersive theatre to computer games. And yeah, I regard immersive theatre as like a game in reality and audience are the game players they are willing to work and they can see and watching sometimes like an inter actor with the actors and the set installations or something else. So that's why I think maybe in the sound aspect, maybe we can have some interactions by using the gestures and or other maybe other things like eye tracking or something. Yeah, but so far I I'm choose the gesture recognition technology for my project and I just wonder if from a professional sound designer’s opinions. Do you think it has like, do you think this technology has future in the theatre area? In sound design?

Miquelon Rodriguez:

Yeah, I like so my answer is yes, because I want to push the forum's forward. And the possibilities become actually quite exciting for immersive theatre because the using motion gesture recognition it excites me to be used in something like dance theatre. Because yeah, I know many choreographers that would love to like dance their score, or dance the music where like I know a couple where they've always wondered like what like I've created with dancers before where it's like I create based on their motion. And I know that if I were to say to someone like Shannon listen Berger was an amazing dance artist and admin and works in arts policy as well. And she, I know that she would be extremely excited if I said, Shannon, what if I told you that your movement makes the music? Yeah. And at her mind would be blown and she would absolutely play with that technology so that in any theatre, I think you'll you would probably see experiments

with it first, in immersive theatre ways that that I can imagine being used. It's either to one you could create scenarios for actors to control sound in a very similar way, but in a way that is unintelligible to an audience. Where the gestures aren't necessarily have to be super pronounced. It can just be because you programmed it to recognize that it is a specific trigger because it only is specifically to that actor. Then the smallest little gestures can be like, trigger something, which in a traditional theatre, the way that it would work is we would wait for the actor to make that play. But then for them to do it on their own. would be would be pretty fantastic. In creating and I think it would be the reason I'm excited about it and why like I love that you're working on this is because the I want to see more science fiction on stage and that's a genre that is rarely explored in in theatre. Mainly because of budget and mainly because a lot of stories tend to really focus in on like one relationship and like within a specific period of time and so you kind of miss out on the epicness of a sci fi show. So for me, I can imagine like one of the things that I've always wanted to try to create is like a light projected interface. Yeah, where you're touching air but you're controlling things and that exists. That technology exists right but for the audience to see it as well as like something where like if the actor it's like kind of like it's the Iron Man like Oh, yeah. Like yes, like it goes with you and you know, it's that is that but motion sensing that for sound as well means that if I do this, if I do this, then

Xiaojie:

it's like you have magic and you can control the sound when you're you using different gestures and like, yeah, I wandered there somewhere. And I point out there and then there's something Wow, that's pretty cool. That's why I'm thinking of I can use gesture recognition.

Miquelon Rodriguez:

Yeah. Immediately that like what I thought of was that because there is a technology that that does the projection thing that I'm talking about? It's called a hollow scrim. I can't remember the exact time name I'll try to find it for you. But if it is just like a projection, but because the projection is on a surface that is almost see through a fabric that is almost see through then it actually becomes about accessibility. And so an actor has the ability to interact with this visual piece. But it is being projected in the air, so to speak. But yeah, it's exactly that like that's what that's what I want to create. It's that simple. That's the basic concept. But I can also see it being used for audience participation as well. Where, where it might be more about motions, seeing the gesture recognition, but you can still use a connector to do that, where if they get to a certain point in their space, that that can trigger a sound because of the angle that the Kinect is because of like you know the different ways that you can move your audience around in a space or even have it where it's like purpose where you and I'm thinking in that and more of like an element of surprise or without letting the audience know that they are controlling certain aspects of it. And that's a version of that. Theatre where you tell the audience that you get to play that like you do get to create the sounds and this is how you do it. You move through the space and wherever blah, blah blah then that's the sound will come out and the way you go and have fun. So I do see a future in it for sure. With very specifically in immersive theatre, maybe promenade theatre as well. Only because it heightens the sense of interactivity. As much as it is very fun and very enthralling to be able to interact with a performer and have that as a main form of interaction. That's not always one of the most feasible nor is it the most safe for both actor and for and participants, right. So, a way I'd say that like using technologies like this introduces an element of immersion that is very safe. And that doesn't require like almost security for an actor. And by that I mean like having to have physical security around an actor because like maybe people will get too fresh. So that's that to me is what makes that a possibility for sure. The obstacle does not come from creativity, nor does it come from the wants to do it. The obstacles here come from funding and from the how arts are valued in Canada in Toronto, and they're not valued that much. So that's that becomes a that's why I go like you know what Europe, maybe Asia probably has quicker access to the use of that tech. In their performance spaces. And maybe Vancouver, but certainly like we are soul behind in Toronto when it comes to thinking forward about tech that there's literally like one company that's doing it, and they're not even in Toronto. They're in like a city beside Toronto. So it's very slow here. So that's why when I see things like this, I get excited because it's like

someone's thinking of the things that I want in this city. So yeah, it's very possible like I would, I would be shocked if we don't see that become more prevalent specifically in immersive theatre. Yes.

Xiaojie:

When I look when I look for articles about using this technology in theatre performance I most mostly found that they use this technology for visual effects and visual stuff like they use projections, but I haven't seen any of them to you using them on the sound design. So I in my own view, I think it has a great possibility when if I, if I had to say if I gave these ideas to the, to the world and for the theatre producers and sound designers to give advice I want to provide this possibility to all sound designers and to help them grasp new ideas on their sound design. And last question is about game audio design actually, that is also link to my previous question. Because I mentioned the computer games. So I just wonder, do you have any experience on designing gaming sound? If you if you have, Could you please also say something about differences, similarities or if you do not have, it's okay because it just like say an extra question about this.

Miquelon Rodriguez:

No, I so I've created game sound effects before but not for a game. Did for shows that are trying to simulate video games being on stage so I've done it in that regard. But I know about game sound design, okay. Mainly because again, one of my friends also was just like, I kind of want to do this and then went to school for it and now she is literally designing for movies and video games. And so she so I've seen some of her work and some of the tech that they use and it's fascinating and I want to I want to do it but it is a different. It's just a different technology that a lot of the elements are the same and like again, you're creating a world you're creating an atmosphere that doesn't go away. But because your design then also has to integrate with specific inputs from the player, as well as from the AI that is programmed into it. It becomes a whole other thing where a lot of the designs that I do are not three dimensional or two dimensional, right? It's just I'm only I'm only playing with live with in front of bool usually. And even if I'm playing with an immersive piece a lot of the times it's really just an a circle so on a plane for full like 360 degree immersion, but only in this direction. Whereas like in a video game it has to be everything like the entire like looking up looking down. Yeah, sphere of immersion, right when it comes to sound. I can I can fake that a little bit in theatre, but it's all about speaker placement at that point. If I don't have speakers in those places I can make a video game it's about making stereoscopic where it's like I'm wearing headphones. It's about playing with tricks in headphones for me to like want to look in combination with the visual indicators as well. So the programs in general are just different. It's completely different. The creation of the sounds themselves are probably in similar software like Logic Pro or Pro Tools or Ableton Live but it's about the when I look at theatre I take all of those sounds and I put them in Cue Lab, which is the standard for playing cues in theatre pretty much around the world. If I'm doing that in a game, it's a specific program that is that I think I actually don't know if it's just the coding program themselves. But it is like it is a whole other just suite of programs that you use in order to place the sound and integrated into sort of the code of the game. So for that it's a that is the largest difference that I know of. It's just it's the software and it's the implementation of the design through that software. But to get to that point, it's still a lot of the same process. It's just that you will probably have a longer sort of development process or testing time because of the way that games develop. It goes through multiple testing phases. Theatre doesn't do that. Necessarily. They we do through workshops, but not it does not go to the extent of what a video game can do in terms of its testing, because a lot of the testing for video game is like half is about the immersion of it. It is about the creation of the world and all of it and how all those pieces work together for your experience as a player. Whereas workshops in theatre tend to go like well this workshop is just for the story. This workshop is more of a tech workshop where we work on just that this workshop is like maybe a production or a workshop production where we start to put them together. And then there's the five to seven week contract where you put it all together and produce it and marketing and whatever. Whereas with a with a video that that process is integrated into the development of the

game. Yeah, you're doing it over and over until you finally are at your golden master and you're like that's it. There we go. Well, let's run the software. Let's publish it. So, the again, world creation is the same aesthetics set or another set your design concepts or principles are the same. It's always that that becomes like my year is applicable everywhere. No matter which way that I use it. I know when like when a fade is off when the timing is off when the time is off that applies no matter what I'm doing when it comes to sound, but yeah, it's just it's just the software and I really want to learn that software because it looks so fun. Yes, just work on a video game in general.

Xiaojie:

I know and audio enjoying named Wwise I do know is his it's his game audio Angie, and I search some like theatre application on their website and I found two examples about theatres designers using the computer games audio engine to create the theatres project. So I think that that is pretty interesting. If you if you are also interested in it, I can send you that link. That'd be great. I'd love to look at Yeah, yeah, so they so they're using the audio game audio technology to create the theatres pieces. So that's pretty cool. And I'm also thinking maybe I can use that engine for my own project when I using the gesture recognition technique and using these game audio engine with I combine them with the performance. So yeah, and okay. That's, that's all that's all it is, is already one hour. I'm so sorry. It's

Miquelon Rodriguez:

Oh, no, I love talking about this. I lose track of time when I do it.

Xiaojie:

Maybe we can have more checks in the future. When I finish my first experience, experiment, maybe we can I can show you some results and maybe others things about my ex experiment.

Miquelon Rodriguez:

That will be great. I would love if you could Yeah, I love to chat about this again. You've done more stuff.

Xiaojie:

Thank you so much.

Appendix H: Interview with Nick John Williams

Nick John Williams:

Wow, that was loud. Yeah, so that's recording. Okay, just remind me at the end to share the file with you. If I don't share it, share it with you just send me an email and say, hey, send me the file. And I can do that.

Xiaojie:

Let me introduce myself first. Yeah, that's great. I'm a second year PhD student in the University of York and currently doing research about how to use gesture recognition, technology to do sound design for immersive theatres, and immersive performance. I think it's quite similar to what you have done when you're in PhD. The something very similar, but the device I choose is something like Kinect, although looking at it. It's not productive anymore, but there are some very similar device and technology out there to thinking using that device and technology to continue my research. And this interview the aims of this interview is that I because I'm from a background of programming and digital media. I want to know more about sound design in the industry live in the theatres.

Nick John Williams:

Sure. That's great. Okay, well, I've done my stock. I think you froze but I can hear you. You did freeze. I think you are frozen. But I can still hear you. So maybe reef just restart your camera maybe I should make some notes on what you just said. Can you hear me? Can you hear me?

Xiaojie:

I'm sorry that I will quit for several times.

Nick John Williams:

Yeah, don't worry if we need to. That's totally fine. Don't worry about me. I'm you know, I've got an hour so it's well already, in your introduction, their knees really interesting. It's really interesting to meet you doing this project because of course I was. I was looking at very similar things when I did my PhD in 2000. It's kind of 2007 to 2013. I finished but the practical side was really like 2017, 2002, eh, 2009. So that which is now what, 12 years ago, which is unbelievable. So it's, it's really interesting to talk to you when you're at that stage. When you're at that stage of your journey, where I was all those years ago to see the differences and similarities. How do you want to do this? Do you have set questions or do you want me to introduce myself what's useful to you?

Xiaojie:

Yes, I have some questions here, but could you please introduce yourself briefly as opening?

Nick John Williams:

Sure. So I've so where to start? So from the end of my PhD to lockdown last year, I was a professional sound designer. Mainly I was professional sound designer in theatre. So I work in theatre and I worked on productions mainly in the northeast, but I did touring shows I did large scale musicals. I did small scale one woman one man shows I've worked I've done a lot of site-specific work over the years I've worked in all sorts of different types of theatre productions in the last 12 years. But prior to that, I'll jump back to where my musical journey began. Because it will tell you a little bit of how I got to a sound design Theatre, which might be relevant to some of the other things you've mentioned already. So I did my training. I started as a pop drummer and wanted to make music and rock and roll. I went to uni[versity] and I was introduced to

interdisciplinary art. I was introduced to interactive art installation art Sonic Car, the idea of sonic art. And so after uni[versity] that was in 2001. So after uni[versity], I formed a performance company called Daybreak in pieces, which is which was an interdisciplinary performance company and we would do site specific performances. So we would do dance and music and improvise, it was all improvised, and we would make instruments and I would make software and we would make installations to document our performances. So it was a very much a technical practice, but also improvised and sound was very much woven into that practice. So in that practice, I did a lot of improvising in terms of sound. I did a lot of improvisation. A lot of making instruments and technologies. And I did a lot of kind of non-traditional venues. So a lot of site specific works of car parks, factories, setting up speakers and all sorts of sound systems and those kinds of environments or sometimes just going into an environment and seeing what sounds are there so we go into a forest and make instruments out of the timber that fall on the ground kind of thing. So that I did that for alongside that I also did improvised music so I would do shows I would do gigs with I do noise music, so I'd use a lot of electronics and make noise. I did improvise music using some of my friends home built instruments, a lot of Bode instruments, I can point you to some websites if you're interested in any of that stuff. So I'm kind of familiar with the improvised music scene and how new technology is taken and developed. In the improvised music scene. I was always interested in the instruments that we'd make. So I would make gestural instruments, instruments that respond to your body, for example. And there's a number of course there's a number of practitioners that are doing all sorts of gestural instruments and body, you know, instruments that respond to your heartbeat, or attaching microphones to animals and making music and that kind of thing. I was involved in all of that stuff. And that's what took me to my PhD I took I took the site-specific work, I took the improvisation, I took the electronic music practice and I took the installation of practice my sonic art practice. Sorry, my sound installation practice and I wanted to bring them all together. And I didn't know how to do that. So my PhD was really my goal was to bring all these different practices that I developed and all these different skills and experiences that I've developed to bring them all together in the PhD. And that was 20. That was 2007. And then the PhD what that became was that became how I might construct technologically mediated environments to facilitate Sonic improvisation or interdisciplinary improvisation. So I am and the focus very much became about working with dancers to creating a sensing environment of technology. So visual tracking, gesture tracking, that kind of thing. Working with dancers, some collaborators that I'm very close with, and looking at how they might move and play within a sonic environment and looking at the relationship between how they move and that sonic environment, so playing with different dynamics and different parameters and to really make it an environment that not only encourages control, but also could resist them, and could allow them to play and explore and learn so in a nutshell, that's the whole story.

Xiaojie:

We have same thoughts I think. but my background is from game actually is like computer in game so I'm thinking using game technology to continue this thoughts, like using game audio engine with Kinect.

Nick John Williams:

so use Wwise is it?

Xiaojie:

Yes, I'm planning to use wise to achieve my goals in this research program. But this is not the goal for my thought for future. So currently I'm we're using like game audio engine but maybe there will have some more opportunities using some similar software or middleware. So maybe, yeah, yes. So it's like, just have a thought because I learn from readings and I went to the for the immersive theatre Sleep No More in China. And I found I found lag is quite game changing theatre performance, so I'm thinking maybe I can use like, like transform audience into a game

player. So that's why I'm thinking using game technology to do our Sonic interaction in the performance.

Nick John Williams:

Nice. I just done a film. I don't know if you're familiar with Ambisonics sound at all, but I've just done my first 360 degree film. I was on a film set a couple of weeks ago. And I'm just mixing I'm in post-production now. I'm mixing Ambisonics it for the first time I know it's different to game audio, but that idea of interactive sound and interactive gaming environment. I'd be really curious to use Ambisonics within something likewise within that kind of gaming environment. So that's something I'm exploring in a different area at the moment as well. So yeah, gaming for me is like a really exciting area to gain technology and sound because they have procedure audio right way before anybody else really dealt with it. And gaming has been dealing with procedural audio for years and I think that's a really interesting area as well. So do you by your name do you prefer to go by Chanel or GC? GC? Cool I think you frozen either Can you hear me?

Xiaojie:

I didn't hear you the questions.

Nick John Williams:

I was just asking about your name because you signed your email, Cheryl, but obviously, that's my English name. So is it okay for you? Sounds Yeah,

Xiaojie:

because I know it's quite hard to pronounce. Always use my English name. Okay.

Nick John Williams:

Thanks. Okay. It's good to know.

Xiaojie:

Okay, can I can we start my first questions? Like, I know you're so professional in the like size specific and immersive theatre something like this. So how would you define immersive theatre, this term? Because I read many articles and chapters about immersive theatre, but unfortunately, I still cannot really have a definition about what it's what is.

Nick John Williams:

Yeah, I think it's, I think it's definitely a term that you will not find a consensus on. So that's the first thing about immersive it's one of those terms, like participation or collaboration or improvisation and where you can ask 10 different people and they'll give you 10 different, very different definitions. I think for me, the way I think about immersive has changed. I thought it was a technically mediated experience or technically mediated a phenomenon. I thought immersive was something that if I created something technical that responded to people that could make an immersive environment. But actually now I think immersion and in immersive, to be immersive or to create an immersive experience, immersive happens in the audience. Immersive happens in the viewer. We don't create immersive we create environments or technologies or relationships. I think the audience experiences immersion. So for me, immersion is something that happens in the audience.

Xiaojie:

Yes. And so in your thought that immersion comes from physically like to psychologically,

Nick John Williams:

or Yeah, it's a it's a, it can be as a consequence of physical interaction or of emotional interaction or combination of the two which I think is what theatre is. But it's a it's a I guess it's an emotional phenomena. I think.

Xiaojie:

Thank you. So yes, because I read many articles about this. They both gave me thoughts like from the physical immersion to like a mentally or maybe consciously immerse immersion, something like that.

Nick John Williams:

Yeah. I think when audience if you asked an audience member who just seen a show whether that shows immersive, they would tell you about their emotional response. Yes, I don't think they'd say I don't think they'd say like, oh, yeah, the like, big being surrounded by speakers and like, made me feel enveloped I think they'd say, Oh, I was so immersed because of I was surrounded by the speaker. I know it starts with the emotional I was I experienced emotion because the sound was all around me and moved around and the awesome thing you know, I think they talk about their emotions. I think.

Xiaojie:

so, um, I heard you have many experiences of site specific so how do you think the difference between immersive performance or immersive theatre and site-specific and there's another word promenade.

Nick John Williams:

So well, promenade and site specific is probably easier for me to wrestle with so from so immersive is more tricky. So promenade. I'm just showing these three times I know I forget what I'm talking about. So promenade performance. Yes, it is site specific. But I think if you speak to theatre people about promenade performance, if I if I get hired as a sound designer, and they say, Oh, it's a promenade show, then that implies that implies that there'll be an audience and there'll be some kind of audience management, that that there'll be sound systems, and that there'll be certain kind of protocol and infrastructure that we're kind of familiar with in the theatre world. So there might be it might be a promenade performance that happens along a defined route. So we might cordon off a route through a forest. So let's say we're doing a promenade performance in a forest, or a site specific performance in forest. A promenade performance will have likely a car park and someone to welcome the guests in, and a route defined through the forest and the guests can either walk that route or stand either side of it. And the performance will happen along that route. And we kind of all know what's happening. Now site specific is actually a term I said, Say specific because it's a more common term, but actually, the preferred term, my preferred term is site sensitive performance. And, and that is quite different to a promenade performance. I think site sensitive performance is going to a site so going to the forest and responding to it. Not us, not us imposing anything on it. So for me a promenade performances, we've got this idea for a show, we're going to put all this stuff and all this protocol in place within this environment, and we'll do our show there. Whereas the site's sensitive performance, which is what I think of when I think of site-specific site sensitive performance is going to the forest, spending time there, working out what that does to our creativity. So if you're a dancer What is it like to move amongst the trees or on a hill or in a factory or in a car park? How does that change my behaviour? How does that change my mooner You know, so if I want in a theatre, I might do this. But in a forest I might do this and hit a branch so now I'm doing this and so site sensitive to me is about leaning on the environment and tech and being inspired by the environment or being or being resisted by the environment. promenade is a much more when I think of Promenade performance, I think of a much more managed controlled event.

Xiaojie:

Okay. Yes. So what do you think the immersive one

Nick John Williams:

Oh, so immersive? Yeah, that's the tricky one.

Xiaojie:

Like what's the difference? You think? The immersive theatre and site-specific?

Nick John Williams:

I don't think there is because back to my definition of immersive, I think immersive happens in your, in the reader, in the audience. So that that phenomena I think can happen at a promenade performance. It can happen when you go shopping in Tesco. It can happen at my site sensitive performance. It can happen when I listen to an album. So immersive isn't like promenade performance is a model of performance. Sensitive performance is a model of performance. And on theatre is a is a model of performance that we kind of have ideas that they look like and we kind of know the rules and what kind of teams that will be involved in them but immersive to me is a consequence of those things.

Xiaojie:

Yes, like I kind of understand what you say like immersive theatre is like focusing more on the experience and yeah, the mind itself, but the other two terms about theatre is like for the physical world,

Nick John Williams:

focusing on like we could you and I could create a promenade performance with the intention of creating an immersive experience for the audience. So I guess immersive experiences where I sit and listen now, I think we both know that a lot of people think immersive is about the environment, right? A lot of immersive is about. I'm going to create an immersive sound art installation. And so when you walk in, I'm going to put speakers all around you. And I'm going to put a sub under the floor so that when the sound happens, it's going to vibrate your body physiologically, and I don't think that's wrong. It's just not how I think about immersion. I think I think when I think about creating immersive experiences, I definitely think about that's an experience that you have. And I get to do all these things to me if I want to make something immersive. I'm going to do all these things in my powers and with it with my skills as a sound designer, to take you to that immersive place. But you may find it repugnant, or it may anger you or it may make you fall in love, but it may make you immersed. So I guess I've got immersed with like love and anger and all these other things that you can that you can feel where it may scare you. You know scare immersion love anger. I think it's in that world for me. I think you frozen I think you froze it back you back. I lost you for a minute. If you asked a question I'm

Xiaojie:

Yes, like so the next question is like what's the difference? Do you think when you're doing the sound design for the tradition of theatre and the immersive one?

Nick John Williams:

Yeah. So like, so like. So

Xiaojie:

maybe you can say something from similarity, then you can? Yeah. What's the difference between that like, procedure or?

Nick John Williams:

Yeah, I mean, that's so different to if I just think about five sensitive performance and like the kind of fear I've been doing for the last 10 years, as a theatre sound designer. There's so different. It's like I don't know trying to think if there's ever I'm trying to think over the last 10 years or so. If I've done a site, what I would call a site sensitive performance with a fear of production, you know, like with a formal theatre production, I try I think if there is one I guess plenty of Promenade printing of things I'd call promenade. So why don't I start I'll start with promenade and theatre. And so when I'm saying theatre here, I'm thinking of a building with a stage and a proscenium arch and all the all the show happens on stage and when I take your promenade I think as we discussed it like there's some kind of like walkthrough or there's an external environment. I think sound design lies as a sound designer… The main thing if someone said to me, Oh, we're doing a promenade show, or we're doing a theatre show, the main thing that would jumped out to me is if I was doing a theatre show, I have a lot more technical resources at my disposal. Usually the theatre of course, it's a very controlled environment. It's like a studio. So I want to know, I know what I'm getting once I've, once I've been to the venue, I know what I'm getting at is very controlled promenade performance. I mean, again, though, these definitions are huge, because promenade films could be in an indoor space that's just not usually used as a theatre. I mean, you can do from a promenade performance in theatres so re-asked… I'm confusing myself in my answer. Re-ask me if you don't mind, re-ask me the question again so I can hear what you're getting. just asked me the question again, if you don't mind. Probably frozen. And they are your back. Do you mind asking me the question again, just so I can see if I can find the approach to it.

Xiaojie:

Look, the difference between you do this sound design in like traditional or formal theatre? That immersive performance may be specific or maybe from promenade theatre.

Nick John Williams:

Okay. I think I think the big difference is there's two big differences that jumps around this the technical one, which is I will feel more confident at least that the theatre is a much more controlled environment. And the second big difference is related to that which is in a promenade performance and definitely a site sensitive performance. I will expect to not be in control of a number of things like the weather or wind or the atmosphere the temperature or how I position technology and speakers. There's just like a, a lack of precision that maybe comes with promenade or sight sensitive performance in how I can technically approach it. Whereas which is also an opportunity, though, which is also a creative opportunity. So it's really nice to have like to know that, oh, I can't put speakers there because this object is there and the problem performance, so I'm going to have to find a way around it or how does that make me change the way I'm going to approach the sound design if I can't get sound? Coming from there, then maybe, maybe I'll have to find other solutions. And that's what's exciting to me about, you know, immersive or non-traditional theatre is it forces you to be creative and find different ways of doing things? Like traditional theatre is a is a known quantity to me I can I know I have a workflow for it. I know how the rehearsal process goes. I know how the team relationships go. Whereas promenade and say specific performance. I think the teams and the dynamics change. The technology changes the environment. changes. So it's a much more unknown quantity.

Xiaojie:

So you said there's many could be restriction when you do the immersive one. So do you think there's any like the role you play is changed when you do some design for the immersive theatre?

Nick John Williams:

Yeah, I think I think that sounds for us. Yeah, I think when you're when I'm asked to do sound design for theatre, just like if I'm asked to do sound design for film, there's a very clear idea in everybody's minds what the sound designer is going to do. And between film and theatre, they're quite different. But everybody in theatre knows kind of what the sound design is going to do. And everybody film knows what the sound design is going to do. If you're doing a promenade performance, and you hire a sound design, I think you're hiring someone. Often not only I think you're wrong. They there will be a more of a conversation about what you're going to do before you get hired. So it'll be like, can you do this and possibly some interactive stuff, can you can you make it so that when people walk past this point, sound triggers, you know, there'll be that kind of a contract, calm conversation, or, you know, have you ever done something outside before you know, that kind of thing, which doesn't come into the theatre conversation, the role is much more William Gray, they treat you more like a sound artist than a sound designer at that point. I think and a sound artist, I think encompasses like someone who can do what you and I do, which is create interactive systems. Or make a speaker that fits into a coconut and hide in a tree or you know, or create a path that when people walk on it will trigger sounds. We're sound artists when we're doing that stuff, I think in people's minds. So I think, yeah, that's a difference for sure. How others think about us.

Xiaojie:

Like, as a sound designer and for immersive theatre, yeah, we'll be doing more, more than designing sound effects.

Nick John Williams:

Yeah, and what's interesting is one of the reasons I got into sound as I got into sound design for traditional theatre accidentally, because I started talking where I did my PhD was cultural over Newcastle and that was opposite northern stage. Well, I would go and have drinks at Northern stage and I got talking to directors who couldn't believe the stuff that was happening in culture lab to do with sound. They couldn't believe that these improvising musicians were making instruments from scratch that were interactive, that triggered sounds that had many speakers, you know, that we did installations with many speakers. And so when I was talking to these directors, they were saying, Oh, I've been wanting to do that in my theatre show for years. I've been wanting to have this happen. I've wanted to be wanting to have sound come from the back of the auditorium for years and it's always just come from the speakers at the front. And I'm like, well, we've been doing that for years and improvise music and sound art and all this Why don't you talk to some sound artists and installation artists, and that's how I got into theatre because they didn't know they could do this stuff with sound they didn't know as possible. Theatre is quite behind when it comes to sound. They're only just getting into binaural sound the last like two or three years. They're just like discovering binaural sound which has been around since like the 70s You know, so yeah, that's always surprised me about theatre. So yes, they I think they like they want some sound artists in theatre, but they always hire sound designers. And I think they'd like sound artists really. Oh, he just froze

Xiaojie:

Okay. I think I learned a lot from your answer. Can I ask you the second part of questions like how do actors work with sound and music in your project during the rehearsal because some how they do so in the traditional one, but I have no ideas about how do you do rehearsal with the sound and music in promenade theatre and the size sensitive?

Nick John Williams:

Yeah, so and again, site sensitive and promenade I approach extremely different. So my experience was site sensitive performance. It's very much to do with improvisation. So there's there was no rehearsal there was just preparation. So and so we wouldn't rehearse but we would talk about visit the site. And we would talk about the site and the kind of things we'd like to

explore in the site. Can you hear me you frozen so I don't know if you can hear me. Oh, I can hear you. Can you hear me? Sorry, Cheryl, I've lost you. Okay, and you're back.

Xiaojie:

I'm thinking maybe if I close my camera.

Nick John Williams:

Yeah. How do I do this? Okay, okay. Yeah, that might work. Better. Let's see how we get on. So far. That's fine. Um, so we were talking about how the different prep or how you prepare the actors and rehearse and all that. And I was saying that with site sensitive. I don't rehearse anything. But we prepare so we will, we will talk about or discuss or prepare ourselves for exploring certain ideas in a certain environment. So that's site sensitive. With promenade though. Preparation might be preparation is much more traditional looking. So it might be preparation of sacks of any sound design elements. So for me, I might make some sound design here in my studio. I make might make some elements to be played along the route. I preparation will also be very technical in terms of I will draw up and share sound plots of where all the speakers and technology is going to go. If there are actors who need to, if we need any voiceovers from actors or any live if there's any live music Well if we need any voiceovers or pre-recorded things, or work with the actors in the studio, and I'll record all that material ahead of the event. If there's live music or live performance that needs to be miked up, then I'll draw up a sound plot for that and talk with the technicians. If there are technicians or I'll set it up myself or hire the gear and set it up, so I might create an equipment list so I can hire the equipment I need and then, you know on site on the day, I'll work with the hire company to set that equipment up and configure it and do sound checks. So it's much more traditional looking, I think, in terms of how the actors rehearse. I mean often with promenade performance. It's about pathways and routes. They might rehearse any scenes in a rehearsal room just as you would for a traditional show. But then they might go to the site and do a site visit where they where they determine the paths that they're going to work, the paths that they're going to walk and where they're going to move the work on. They're blocking on site. If they can't get access to the site, so say you're doing a promenade performance in a factory and you can't get access to the factory until the day that you're doing the show. And they might mark up what's called mark-up the the factory in a rehearsal room so you kind of put tape on the floor, and mark up where objects are so that the actors can rehearse or work out their blocking, which again, is a very traditional way of rehearsing a show. Whenever I rehearse a theatre show. We're in the rehearsal room and we mark up the set so that the actors know where they can and can't go. And we work on the blocking and we work on the script. So, so promenade and traditional theatre look quite similar in till you get to the site, I think. I think I think we've promenade performance are a much bigger part of the preparation, and much more time is spent on safe health and safety. So a lot more time a lot more of my time is spent on is it weatherproof, is it safe? Is anybody going to trip over the cables? If I put cables in a certain place? Where are the audience going to be at every moment? We have to do risk assessments. There's a lot more health and safety preparation involved with promenade performances.

Xiaojie:

Can I say in this type of performance like actors actually, the sound and music is like something assist, assist their performance so they don't need to really focus on like, like in some sometimes in traditional theatre the sound crews will fix their activity maybe like the phone rings and maybe we would like call on a phone. Like they will do some actions to the sound of the music was in the promenade and maybe side sensitive. They just like the sound and music is like for creating an atmosphere. There's not much sound cues so that's why there's not much rehearsal with sound admittedly, just like I don't know, I understanding.

Nick John Williams:

I'm not sure it's such there's so many different ways of doing it. That it's hard to say for sure. But I even on an even on a promenade performance, I will I will tend there are definitely promenade performances or you know immersive theatre performances where I will work separately and bring my elements to the performance on the day and that will be fine and it is like you say just like creating an atmosphere or something that they then work on moving. But it's also the case that you can do sound cues you know a phone ringing on a say a stage is a sound cue you know, and you can do those cues out in, on site and in promenade as well. So, they may not be as specific, you know, tied to an object but it may be you know, this sound happens over here. And so the whole focus of the performance shifts to over there. And it may be that I rehearse with the actors and we work that out together. So there's no hard there's no black and white kind of rule with regard to that. It's, especially with technology as it is today. Technology is so mobile technology is so weatherproof is so adaptable to different environments these days like speakers, you can get speakers for any environment, any size that you need. You can hide them, you can camouflage them, you know, interactive technologies like the Kinect, you can make things using Arduinos that can sit in trees or under bridges or a water with hydrophones and contact mics. You can do pretty much whatever you want. For an immersive show that's not in a theatre you can do you could create an a theatre show a traditional theatre show and make it more like non-traditional, immersive show. With the technology we have today, you know I think back in the day when I was doing site sensitive work, it was difficult to even get a PA into the places I was going, but now I think you can pretty much do what you like. We're not constrained by the technology anymore because the technology is cheap, affordable, mobile and weatherproof. Have you looked at Arduinos at all.

Nick John Williams:

okay. I was asking you have you looked at Arduinos?

Xiaojie:

Yes. Arduino I use the very similar treat the micro bit when I doing my master program.

Nick John Williams:

Cool. So I was just wondering like, for you like because the Connect is so outdated now. I was wondering if you could just build something better with Arduinos and PIR sensors or infrared sensors or ultrasound sensors to do what you need, you know, build your own Connect. It might be more given that you're technical and you do programming anyway. I imagined it might be more sustainable for you and probably easier to implement once you've got over the initial bit. Hello. Hello

Xiaojie:

I just I just said I use microbeads for my master program and I designed a workshop for teenagers to create their own like electronic instrument teenagers using Scratch and microbeads that is a workshop.

Nick John Williams:

Yeah, cuz I was thinking that. Like the Kinect seems like because it's so outdated the Kinect in you might get might cause you problems, more problems than it's worth, you know, like you might be better off just getting an Arduino or Raspberry Pi and building it from scratch with PIR sensors and ultrasound sensors and infrared because that's something you can then build on and work with for years and years. Like to get a connect working I was gonna use a Kinect in 2007 and I decided against it because it just wasn't worth my time trying to work out how to get it interact. I was using MaxMSP at the time and trying to get the connect to it with a MaxMSP I was like, there's better ways of doing this. You know, I wonder if you're, I don't know if you've tried it yet, but I would my hunch would be to rather than go the connector route to go the Arduino Raspberry Pi sensors route.

Xiaojie:

because I'm not sure whether there's like if I use like the Arduino for the performance because I want to mainly focus on audience experience like how it provides a how to how do I describe my idea, like provide a multiple user to like what you say I want to say there I joined a workshop in my undergraduate University and they're doing interactive shows with Kinect. Like they create something for audience with no many like training stuffs and they can walk in and do interaction and if you're using

Nick John Williams:

you're doing visual tracking them to connect your you're using the camera of the Kinect. Yes, yes. So I ended up I ended up using and this is a long time ago so I don't know how good this technology is anymore, but I used I ended up instead of the Kinect I ended up using a video camera and a piece of software called is a door. Now I don't I haven't used it as a door in years but at the time, that allowed me to turn the video camera into essentially a Kinect because I could do block tracking on it and you know record velocity of multiple actors. Yeah, I don't know. It's just it's just seems a shame to have to go back to back to a technology that is neglected now in order to do what you want to do you know?

Xiaojie:

But I just like provide, list my source in my research, but I know currently the camera-based gesture recognition still have many problems. I think it just will just say there's many blocks in the in the in a scene they will create some progress on tracking bodies, gestures and motions. But like, I search some examples who are using the Kinect for performance and they use Kinect to track the actors bodies to create some visual effects on the stage. I'm just thinking that, maybe currently the technology is not working now for a multiple user. But maybe in the future they will be some progression of that technology and I don't think it will be a long time to improve to that improvement because currently there is already like multiple recognition technology.

Nick John Williams:

Obviously in the computer vision and especially with AI right with YOLO Lo and this GP tool texts in the bay YOLO I've just been looking at YOLO recently, this AI object tracking which is amazing, you know, incredible and

Xiaojie:

So I am thinking that if we use something like Arduinos I'm not sure but in my thoughts it will probably become a wearable device like grasping in the hand or something like that, but it's from my own experience when I join the immersive theatre that actually as an audience, I'm afraid to manipulate things because I don't know whether they can be touched or if I move the staff to another place where if something like that happened or there's call me they can find that stuff will help and I have no idea so I'm thinking that using like not it's a using a which is not a variable like policy. Realistic things Yeah. An object to manipulate. Yes, this like I can do some interactions with my, on my own like using like, hand gestures or body gestures, then I can get some experience and like from them. I think that is better for an audience when they join this performance.

Nick John Williams:

Yeah, that makes sense and I think I was thinking that you were doing triggering rather than visual detection. And I was thinking because with Arduino, you could you could set up like an ultra sound sensor so that and you could set it up in my doorway. So every time someone walks through the door, it triggers something so they don't necessarily have to touch something. There are sensors that can allow us to like cross the beam and trigger something. But actually what you want to do is motion detection, isn't it you want to

Xiaojie:

Yes, yeah. Like I am thinking maybe I can create a system for both actors and audience like you know, there are some interactions between actors that audience and if actors can be like a, say, a host or like literally invite audience to have some interactions together. Do something together with their body movements. Like I will have to say like I'm not sure whether it will create a more immersive experience for the audience. But in my mind, I think just like make audience themselves think they can be the role in the performance. that's why I'm thinking like, using no objects, but using cameras.

Nick John Williams:

And it's interesting when you when you describe that, and you talk about the actors as kind of hosts. How that could you know, when you're thinking about the audience's relations for technology, of course, you mustn't lose sight also of their relationship to those actors. Because if those actors get that relationship wrong, then that could destroy the whole immersive thing you know, that your technology might be super immersive like interacting with your technology might be super a super immersive experience. But if just like in public if you know when you're in a shop and someone's like, asking you if they need if you need help, or Tommy and I know I just want to go shopping, I'm cool. I think I've lost you. Yeah, like that relationship. So you've got the relationship you've got your relationship between the audience and your technology. But then you've also got the relationship between your audience and the actors. And both of those could mess up the immersion, you know, so, so you got to be aware of the Did I lose you again? I think I'll see you again. I can hear you. You got definitely paused. Hello. Yeah, I think oftentimes, with immersive with kind of immersive projects. People focus so much the makers can focus so much on the technology and forget these other relationships that are happening. So you got the relationship between the actor and the audience. You know, you've got the relationship between the actor, the audience and the technology and just, you know, always seeing that. When you're thinking about how to create this immersive experience. It's like, well, what are the actors? Doing? What are they saying? How are they how are they making it immersive? And that's as equally tricky as what you're going to now do with your technology. I think radio it's very interesting. And hopefully so I can see you Oh, but you frozen.

Xiaojie:

becoming worse than in the morning.

Nick John Williams:

It's so difficult isn't it? Especially if you're trying to do interviews as well.

Xiaojie:

I'm thinking to move to another place

Nick John Williams:

yeah see if another room helps

Xiaojie:

because of my, my internet I'm thinking maybe I can do a quick, quicker to short just shortly ask you something about technology performance and like have you used any technology similar to the Kinect or using Arduino? You're in your performance so far?

Nick John Williams:

Yeah. So I when I first started trying to do gesture and motion control, I would use Max MSP as software so I would use that to generate and I think you've frozen Oh, I can hear that. Now I'm wondering if I should carry on answering just for the recording. Or should I wait? At your back? It just sucks. Doesn't the internet just Yeah, I don't have a better way of you doing it though. That's the problem that you could phone people up but then how do you record it? That's such a pain. Yeah. Would it help if we both turned off the cameras or do you need my camera on?

Xiaojie:

Maybe turn off the cameras. It could help.

Nick John Williams:

both of us. Let's try that. There we go. Okay, are you there? Yes. Okay. That's the only problem is I don't know if you've gone. So this time. I'll just I'll just say my answer when I get to the end. I'll just check that you there. So, yeah, I've used all sorts of technologies. For a while the main brain of my any sound stuff I did was MaxMSP, which is a bit like pure data. So that was the software I'd use and then it was a case of how do I get gestural information into that so to get gestural information into MaxMSP I would use I've used I didn't ever use a connect but I did you use Wii controllers, if used all sorts of controllers actually like joypads and Xbox controllers and all different games controllers. But then I moved when I did the big environment sensing environment stuff. I used a video camera I was going to use a connect by ended up using a video camera which I fed into my laptop and took the visual signal into a soft piece of software called Isidora. And Isidor allow me to do block tracking and kind of create the I was kind of like a tracking middleware for me. And then all the tracking information so velocity acceleration, high colour, tone, whatever speed would go into MaxMSP then that's and then MaxMSP would create all the synthesis and all the sound. And then since then, that's kind of like pre PhD and PhD territory. And then since the PhD I've used primarily still used MaxMSP but primarily use Arduinos and different types of sensors to get the gestural or trigger data motion data into MaxMSP and I'm just now in the light in recent years moving on to self-contained kind of noise making objects. So I'm looking at actuators so I just created an interactive bell ringing exhibition, which actually didn't use a computer at all. It used an Arduino, which then triggered motors to ring bells and it was triggered by emotions. So people could walk through and hear the bells ringing as they triggered them. So yeah, that's pretty much off the top of my head. That's the technology I've used in terms of gestural

Xiaojie:

and do you find any like difficulties when you trying to apply this?

Nick John Williams:

Yes, yes. Lots. That's kind of the beauty of it. And the funny thing is, once you get it working the way you think you want it, you then realize that the real work is in the relationships between the technology and the gesture or the technology the movement is really like. Like it's pretty straightforward to create something there that if I raise my arm will create a sound that goes low, too high. Like a one to one relationship. But that's that can be really dull and get boring very, very quickly. So it's like how do you make the interaction interesting. So you have all these kind of technical like how do I how do I get my motion data to be usable? How do I how do I pass that data? You've got all these kind of technical problems. And then when once you've got your handle on okay, this the data is now usable. And you create a sound engine you go okay, well that sounds good. So now I've got usable data feeding sound engine that sounds good. But when people interact with it, is it interesting? Or is it just useful data creating nice sounds when someone moves their arm up and down? So it's like how the real trick the real magic and the real movement towards immersion. This immersive experience is to do with the relationship between what your user is doing and what the technology is seeing and doing. And that's the real so when we talk about problems, really, that's the only important problem, I think

Xiaojie:

My supervisor also asked me how to like maps the data to the sounds like how they make choices, like creative not and how to like relate land you and use like how do use the is there any rules to apply your data to the sounds?

Nick John Williams:

I don't think there's any rules I mean, making it usable. You will you will like for example, you might find that your acceleration data is completely unusable because it changes so fast. And so you might you might go well, okay, I'm going to slow down and smooth out that stream of data and that makes it usable. So that's more of a practical solution, practical problem you can solve. But when it comes to the relationship between the user and your technology or the audience and your technology, I think for me the answer at the time when I did my PhD was to move away from a one to one relationship. So I moved very quickly my first draft my first version, draft 1.0 You know, when the dancer moved the sound moved and went into a certain pitch or a certain volume. And it did that every time they did that movement, but actually what I ended up doing was giving my so I created the system, and then draft 2.0 I gave my system what I called the heart, which was essentially a measurement of how much energy had passed through the system. So if the numbers if the dancer moved into the space, for example, and was very, very slow and calm, then this this heart would pump very, very slowly. Whereas if they were very erratic, it would pump very, very fast. So the first layer of information I was dealing with was very literal one to one relationships of that dancer is moving to the left, and they're going very, very fast and they've just slowed down and now there's two dances. But the second layer was the overall quality of that movement is slow. The overall quality is quiet, the overall quality is fast and erratic. And that gave me another level to play with. So for me, it's about moving away from one to one relationships into more like, what's the dynamic of this performance? Like is your is your audience member moving angrily and fast? And can you create a way of monitoring that from the data that you're receiving? Does that make sense? I'm not sure if that makes sense the way I've described it, but

Xiaojie:

like I can get some ideas from the…

Nick John Williams:

But you you're about to do this and you will discover for yourself the different ways that you can create interesting relationships. Like another thing I did my PhD was called resistant environments. Another thing I did was at times my sensing environment, would just not behave would do the opposite of what you know, I programmed it so that sometimes it would go from low to high pitch when you raised your arm. But sometimes when you raised your arm it would go too low to medium pitched and then back again and not behave to force you to not to relearn it forced you to resist it resisted what you were doing so you never felt entirely in control of it. So there's different dynamics to play with is like, how much control does the audience have and how much do they think they have? And you can change that throughout the performance. It might be cool to give your audience complete control at first and then take away some of some of that control. So they only have control over certain elements of what what's happening or maybe one audience member controls the lights and one audience member controls the sound and halfway through the performance it switches over you know how what are the what are the relationship the dynamics of control that you're programming in? So that's the main problem, I think, with this kind of work.

Xiaojie:

So we've also been thinking about this as a big problems. We're not thinking the further step of my research and experiment, how to match those date and the sounds. And okay, I think all the questions we have covered in our chats, and thank you so much.

Nick John Williams:

It's been a pleasure. It's really nice to talk to you and to think about this again. It's been a while for me. So it's really interesting to think about it and good luck with all of your work. If there's anything more I can do then let me know. And if you do any public exhibitions, then let me know because I'd love to see what you're doing.

Xiaojie:

Thank you so much. Thank you so much. I think your information today is really helpful for me. Give me a lot of a lot like both advice and some more thoughts for me. So

Nick John Williams:

feel free to feel free to email me any more questions or if you want clarity on anything I've said then feel free to drop me a line if

Xiaojie:

I think I will have some technical problems on my future experiments because although I, I have a computer programming background, but my programming skills is not so good.

Nick John Williams:

Whenever you're making one of these kinds of things. You're making something new, entirely new right? So you're using a Kinect but you're doing something totally wasn't designed to do so it's gonna you're inventing stuff here. So you're gonna have problems. Everybody has problems doing this stuff. So just as long as you got enough time and enough patience, then you'll get to the bottom of it. But yeah, if there's anything I can help with, then drop me a line.

Xiaojie:

Thank you so much.

Nick John Williams:

Cool. All right.

Xiaojie:

Have a good day.

Nick John Williams:

Thank you. Thank you. Bye

Appendix J: Interview with Yaiza Varona

Xiaojie:

Okay. And yes, now the meeting is recording. Cool. So let me introduce myself first. And I'm Xie Xiaojie and that's my Chinese name and you can call me Cheryl. Cheryl is my English name and second year PhD student in the University of York and my research is about how to apply sonic interaction design on the like immersive performance and immersive theatre. And this interview aims to know like know, how do we know more about how immersive production created and how professional sound designer worked with, like directors and actors in those immersive theatre and maybe a traditional theatre, because my background is from computer science. So I have little knowledge about theatre itself. So that's why I want to have this interview and gain more knowledge from a professional people. So yeah, I have created these questions and today, I hope we can, like, have a chat. Maybe it might be not a very form of interview, but I think we can like talk, maybe a little bit more than questions. Anything that helps you thank you so much. And okay, I think How about would you like to briefly introduce yourself?

Yaiza Varona:

My name is Yaiza Varona. I'm a composer and sound designer. I've done a lot of theatre but not all the theatre. So I have I come from different formats as well. And some of the things that I do involve bring in the techniques that I use in different formats into the format that I'm currently working on. So hopefully that can be of any use. If you're looking onto knowing what the fundamentals maybe have some design or the way you can save how you can use sound in general, to either tell a story or elicit an emotion more often than not both at the same time in different formats.

Xiaojie:

So do you have any experience on working on immersive theatre or immersive performance?

Yaiza Varona:

Yes, it would depend on what the strict definition of immersive theatre or immersive performance is. On one hand, if it is something site specific or prominent theatre not directly, immersive experiences, yes, immersive theatre in the broad sense that it's more than that traditional theatre and the kind of theatre that uses usually take resources as to make you part or it really submerge you in the story that you're leaving something that makes use of the space not only just to set something which is not that doesn't have that distance between what's happening on stage, you know, like more cinematic more traditional, a more restricted approach where you our audience, and the stages, you know, just something that is very external to you. Yes, I do have experience in in that sense.

Xiaojie:

So, if I asked you, how would you define immersive theatre, this term, so how would you define it or you think it is a very, very broad?

Yaiza Varona:

For me, it is a broad definition and that might differ from because I've heard immersive theatre or immersive performance in a vast array of it for me, immersive always means that you're going in a way the audience is going to be put at the centre of the of the story, not necessarily that the fourth wall is going to break that they're going to be speaking into, not necessarily that but the fact that basically you make use of the space so that the audience is immersed, even if they are just you know, a passive, watching listening audience. The fact that the artistic event transcends let's say, a screen format and comes around you that is immersive. You could also for the sake of

argument, you could also think of immersive cinema for example, if you're considering the well 3d If you're considering the whole space of how these performance, this artistic intervention is going to be absorbed. So for me immersive is something that basically takes into consideration the space around you. But the main aim is that you're going to be part of the story in a way you're going to be submerged in that illusion in whatever way that takes form.

Xiaojie:

Okay, so, do you mean immersive theatre is mainly focused on the physical immersion, like using the installed stations and created environment for like, immerse audience physically. So that is the point, or, or do you think there's any other kind of way to create immersion, rather than the environments around people or something like that?

Yaiza Varona:

What depends because I think that there are different degrees on how immersive do you want something to be or how tech oriented because that's another thing you may have immersive theatre without any tech at all. You may have like, for example, there will be for the sake of argument you could say that a flashmob has an immersive experience because it is because you have actors that have nothing to do you know with some design or technology or anything and they're doing things by you and all of a sudden you as audience in a way or in the beginning. You are part of something bigger or you know, if you're walking through an art installation, you know a site specific that is totally immersive doesn't necessarily need to be tech oriented. Maybe just maybe some of them may be done even have a sound design. You walk in for sake of argument, you're walking through a very curated argument or, or exhibition that is immersive too. And in fact, it makes you move around and make to be part of it, submerges you in a story in a way in which you're going to be what you're going to be experiencing is by moving around a set by moving around a site. So that is something else and that is very immersive to in that respect, as I say, all formats, all resources for storytelling, they cross at some point. Some of them are theatre, some of them are done. Some of them are art installations. Some of them are site specific or have more to do with sets you know you know like with their structures that you have a round with the way you as a as a hurt as a physical person. Move your body around somewhere at some of them are just take oriented and you are you have like this dialogue in a way with the sounds that you have around you with the projections that you have around you with the with the light lighting design that you have around you. So in that respect, you have on one hand, different resources might be human might be site specific might be tech technical. And on the other hand, you have formats or you have different disciplines you have theatre you have art you have done so you have I don't know like a museum exhibition, whatever it is, and those resources and those formats at some point meet and the definition of what is immersive or not. My guess is or my personal understanding of this is that there is an intention of you being either really submerged in the for whatever reason in the experience, or you're going to be taking part in a way in the experience and my also anything which is interactive, for sure is immersive, because you become part of the of the exhibition itself. And the more you interact with something, the more immersed you are in it because you're literally part of it. I My guess is that it's something which is more immersive, takes the audience from a more passive point of view into a more not necessarily participative attitude, but at least more engaged in what is happening because it's more routed. Same happens for example, with virtual with VR with virtual reality. It is exactly the same sum of experience and the person going through that in that new world and everything. They have a passive approach. There's nothing for them to do other than explore what's being you know, exposed to them. In other occasions. They are attracted to the game they need to do something they need to discover something there is something that they need to do new is gestures there are things that there is a haptics right. So, there is those resources, but both experiences and mechanization are deeply immersive and same may happen in theatre the same may happen in dances they may happen.

Xiaojie:

Yes. So we just both mentioned about like site-specific and promenade theatre. So how do you like what do you think the difference is between these three words because three terms because immersive performance and site-specific and promenade theatre? I learned them from the book introducing about immersive theatre so I am quite confused about why they use these three different types of term to describe and do they have similarities or the or maybe they are totally like different terms. I mean, let me try to explain what I think because I have interviewed some sound designers, and one of them provided me a really, I think really useful information for me because he said, Actually immersive performance is a broader concept than size specific. So how do you think about this?

Yaiza Varona:

The way I understand it, which again, might not be exactly my point of expertise, the way I understand those the difference between those three terms. Anything which is any immersive performance is just a these wealth of happenings as well for performance as we were mentioning before, so anything where the audience is going to be involved in a more immersive, immersive, in a more... I tend to have matter because they are very submerged with experience and that takes many forms. Now something site specific means in my head, that it's going to be the narrative, whatever it's been told what if it's been offered to the audience is specifically determined by a specific location. Say it is a museum such as an exhibition, or Sadie's. For example, Stonehedge imagine that you want to do an immersive experience in Stonehenge, you walk around the stones you walk around, or you do it in VR, whatever it is, there is something geographically located that you're exploring. It is a building. It is an exhibition it is you are you are exploring a set in a way you're exploring a specific building maybe has to do with the architecture or maybe it is an imaginary such maybe it is like a you know Alice in Wonderland and apart you're very smaller, another part you're very big and you go through different you know, like a like a diorama or you know, like a model of things. So that is something where you are going to have a very well defined interaction with the set with the location with the with your environment, with your physical environment. Now, performance theatre as I understand it, it's a kind of a waste, not necessarily a site specific but they touch a lot because it's the kind of theatre where are the kind of performance for a broad term where you get the audience and you make them go hands the promenade turn, go literally, on a route and that route may take different may take you I don't know under a bridge that they gives you inside the theatre and it gives you on the stage when it gets to somewhere else. It's like a like a scavenger hunt or you know, a treasure hunt where you need to find something else. So in a way, you're making the audience not go around wherever they want. It's just like getting them on a quest and they need to go through different phases, that is part of experience that is part of the story thing. So a promenade performance in a way must be at some point site specific because you want to that audience into this breach that stage that garden, whatever you're taking them through. And maybe not necessarily those same location always because maybe your storytelling or your permanent theatre means a I get this person kidnapped, be I get them in a dark dodgy environment, see they get rescued by someone else do they need to go through mysterious forest whatever and these four points may if it is a performance edit story. You may find them you may find different dungeons, different forests different you don't want to be like so even if they're interacting with an occasion they there might be a number of different locations that serve that purpose for you to have that promenade performance. Whereas if something is site specific, it means it is that precise, museum garden stage, whatever it will be something tailored, say for the I don't know the pyramids of Egypt, those pyramids, not just any of those pyramids. So it has to do with them with that precise place. That precise building represents stage. I say they touch as you can see, because maybe part of your narrative. You may have both crossed as well. You may have Brahminy theatre that begins Of course I'm making this happen. It comes in the pyramids of Egypt that's very important for the story. So that needs to be there. But then maybe the other three points in your story that the audience are going to be visiting. Maybe those are interchangeable, because maybe you need to be maybe you need to take the audience to a bar and you have several bars, you know, to serve that function, and maybe they need to go through a garden so you can take just any garden. My point is that all these different areas have points in common and he depends very much on the project.

Xiaojie:

So from my learning recently, and I think like site-specifics, focusing more on the, the space and especially for one space or one place and the promenade theatre, focusing more about the it's like a journey for audiences. So in promenade theatre in my half include in my include several sites specific scenes or stage inside, but the key point is to make audience moving around moving from that route. So, so in, I think in these three, I think is let's move to the next questions. And we both mentioned about the interactions in immersive performance. So when I read some articles, they also mentioned about interactive performance. So what do you think about the difference between immersive one and interactive one, or they or maybe they could consider as just one type of performance or something like, what did How do you think about?

Yaiza Varona:

Well, if it is interactive, for sure, it's immersive, because there is no way you can be interacting with an actor a set a cue or something and the not being engaged in what you're doing because chances are that if someone's talking to you, you need to press a button you're not thinking about your you know, grocery shopping list or something is whereas and the same may have been the same level of attention engagement may happen if you're just in a regular immersive theatre, for example, performance and everything is just like so. Yeah, so immersive and I need to just, you know, like submerges you so much into the experience that you're all 100% There you know, with everything that's been offered to you. So you may reach the same level of attention, but for sure, if something is interactive, you are there. You must be because you're part of the you're another actor.

Xiaojie:

So maybe, maybe I can think that interactive performances also have non immersion in it, but maybe the interactivity level is higher than immersion one because sometimes learn the way they interact could be different.

Yaiza Varona:

Yeah, also it depends as well because it very often you will hear the word in person associated to a high level of technical resources in used in that performance. So chances are when someone tells you that something is very immersive, it's because you're going to have very immersive lighting design, very immersive projection design or do you know digital design and of course something is going around you and that is, it means that pretty much a world is being created for you around you. You also may have the kind of interaction in a very technically strict performance where just an actor is talking to you and engaging with the audience that is interactive. It's not necessarily immersive in the tech aspect of it is in what it could be considered immersive. Conceptually, because you are paying attention you have you have been made part of the story, but very often, I'd argue more often than not when you when someone employs the word and immersive chances are that they are meaning that there's going to be a considerable technical investment in that creation in something immersive. And of course, you have both. You may have all the technical you know, deployment of resources being used to make you part of the story. And at the same time, you may have to interact with something, whether it's part of the side you need to something whether it's an actor, you need to talk to someone whether it's full on VR, you need to you know, do something with haptics and whatnot. And they both work very, very well.

Xiaojie:

So in your experience, somewhat are difference in sound design aspect, sound design strategies between when you do the works for traditional theatre and immersive theatre, like do you use different techniques? Do you use different methods of sound design when you are working on these two types of theatre performances?

Yaiza Varona:

I would say that they're very similar with certain with certain differences, but pretty similar in the sense that no matter the story, you're telling, whether it is super traditional, you know, like almost screen format to people having a conversation around a table on the stage, very detached audience you know, like very traditional theatre, even like so. music, sound design, etc. Helps you tell the story. And you can use this basically always for two main or they may help you resolve two main aspects. One of them is anything that is, has to do with content through sound through recording voices through you may offer extra information that the narrative needs to go on. For example, you may hear you know, for the speaker's news announcement saying whatever context, you need to understand the narrative so basically sound through very different resources can always bring you factual information that you need for the narrative. And something that in that stage is missing, because you don't have precisely another actor saying that perfect bringing you that extra information. That's a very common resource, you know, the phone rings and that's when you know, that character receives whatever information but very often, you can use sound to provide with very specific information that helps the narrative. Go on, right. That is one of the things that's something that storytelling wise it works very well on the script to say like okay, sound is another character, and we will use it to fill in the gaps in whatever the other characters are doing. Speakers, it's a bit more difficult or it takes more imagination. It's not like in cinema where you just, you know, the next shot. You're in another country in another time in another theatre. You need to the sound helps you a lot to bring these extra factual information. And of course, the second the second item that the whole soundtrack addresses has to do with emotion. It will tell you what to feel even make you it'll interview it will make you at ease, it will make you whatever it is like there is always then there is always something you can do with sound to elicit emotion. So in this case, you have the combination of both and these core resources, both work in very traditional theatre and in very immersive theatre. Now, if theatre is very immersive experience in everything is very immersive. And if you have full say freedom within the language of that project, to use all your resources, yes, if something is immersive, the fact that you can make use of the sound of the space around you is it's really powerful because it's not the same hearing, say a ring in the stage and someone answers I should say in many phones are ringing and they're not just real estate. All of a sudden you hear a phone ringing, you know, on the back of your neck or right close to you. Or maybe there's a helicopter flying in circles just above your head and you can hear it just above your head. It's not happening at solely or it's not happening just to the people on stage. It's happening to you because it's there. Yeah. Now. As I say it, there needs to be a coherence and what kind of language do you want to establish whether performance and also if you want that language to evolve because at some point, if you have the kind of traditional theatre where at some point, that helicopter is flying over the heads of those characters on stage, if you do it so immersive, that that helicopter goes, feels like it's on top of your head in that moment where you have that doubt, like why is this happening to me, you have disconnected from what's happening on the stage. So if you're doing something very traditional, you want to keep everything traditional, so you understand that that is part of the illusion, and you're not missing a bit. You're always engaged in what's happening on stage. Now, if you have already established that things happen around you, and you know that's part of the stage, it's much more sensual. It's much more physical if the sound pretty much is in your face or very close all around you because it's going to make you feel much more powerfully everything that's been offered to you because you know, it's just it's you can feel it in your body. And that makes sense if the overall language is like so you couldn't have like super immersive sound in something which is more traditional, if everything else only has to do with the stage because there will be pulling in different directions for your attention. And as I say, once you have that language, maybe you can bring it maybe you can start with a with a project that the language is very traditional, everything is on the stage everything is happening as you would expect it to and little by little you begin to constructing that and things begin bringing you know begin advancing or conquering the space of the audience. But you may do that as well and it's very, maybe it's at some point you didn't expect it and an actor is talking to you so they're breaking the fourth wall maybe as well. You have someone you know you have that sound bleeding through or you have a projection on a side or something like that in something that you were expecting to be you know, like a just like a flat and happening pretty much on a screen so to speak in front of you pervades your space and that is something very powerful as well. So as I say that you have very inner core in the core of everything, the storytelling and the things you're going to be using that kind of sound, that sound going from this point to this order.

And this sound before this order, or you know the sequence in which you're going to be triggering that information that remains constants pretty much that you know, the psychoacoustic side of things like what now it's very what sounds you're going to be using and how to convey certain or support certain emotions certain monologue certain text that is more or less very stable throughout different formats. Now, what precise resources of sound you're going to use for delivering that information on to the audience that changes with the format.

Xiaojie:

The format so I can I can I think kind of consider that the sound design in traditional theatre is more served for the script and in the immersive one sound design is more like serve for creating immersion environment for audiences. I mean like, so sound design an immersive theatre are not only serve for the script but also like aims to create a create a feeling for audiences and make them feel they are in that story. I am not sure can you understand what I mean?

Yaiza Varona:

It depends they both in at any rate in whatever format in whatever whether it's theatre whether it is a movie, the soundtrack the use of a soundtrack it's to help deliver the story. Yeah, sometimes you do it by having it very much in your face and very declared and very bold at some times. It's a very subtle laid back overall support for something else. So, it has an adaptation to whatever language that project takes. But definitely you can you can amp it up you can have the emotion through sound as much as you want as much as the language or the director in this case that has the vision that you need to bring to life will allow you to sometimes you have traditional like super traditional theatre with very little music sometimes that music is more and sometimes you have like a full long soundtrack for that even if it is not necessarily moving you know all over the place with 3d technique and no need for that either. But it will still be very powerful you will notice it and sometimes it is sometimes even you may have 3d Sound resources that are very, I'm not gonna say laid back but very much in the background in such a way that you will only notice that the moment someone prays pause and you're faced with silence. Sometimes it's something very subtle, that gives a little bit of colour, a little bit of support to something that's been said. And it might be technically it might be something that's moving around you but it's just not so you know in your face that you will notice it unless it stops. And sometimes that's just like the tiny degree that you want because also in any project that you have, you have many different elements that are working together, and they are competing in a way for your attention. So maybe we have a very intense monologue by a character you know, like full on fantastic performance, someone given a very passionate delivery, and it may work very well like Gone With the Wind kind of moment, a full on soundtrack behind it or it may also work very well. Because you already have your focus there on everything that this person is saying. Maybe you just have like a moment of silence and maybe that is even more shocking. It depends on as I say on the project. You have the whole story and something that is very true that makes sound and script and the text work so really well or you know musicians and writers is that both storytelling, US time are time based art forms in a way it's not like picture is not like a light it's a you choose what you say first you choose what you say second you choose what you stop saying for a while, and then you choose what you resume at the very end. So that structure that develops through time that has to do both with writing and with sound which is something that develops with time and makes you have a huge array of ways in which you can tell things. Sometimes you tell things to the beginning that you don't say something else. And my point is that any sound event that you have in the soundtrack doesn't exist and doesn't have full sense just on its own. It's part of a chain. It's like a word in the script. It's not just something this sentence here because if there was no say design in a way on what we are going to tell how and you know these first days, this is going to make you feel like so these hear this and that order in things you may end up with something that sounds like patchwork like a playlist disconnected because there is you're not respecting it would be like having sentences here and there but not a story. So in that in that respect, as I say it depends a lot on when and what is being told I would say that more than the kind of language you're building, I would say the kind of project the kind of story you're having and the overall interaction with the other disciplines of that format. If I bring my son all the way up, am I helping or Am I intruding

in in you know, this am I masking these brilliant actor on stage that sometimes is wonderful because I can have full on you know, epic music and this is an epic monologue and the son of a very powerful actor delivery and very powerful soundtrack. It's more than the sum of its the end result is more than the sum of its parts. It's like really, you know, full Goosebumps on experience. Sometimes it's the other way around. Maybe the sound is too loud to bolt to something if you're doing something very subtle, and you need to bring it back so you're not drawing attention away from something else where you're so I would say that in general, it's more that you need to serve the story you need to serve the narrative, rather than serving if something is going to be more immersive or less immersive because the story will give you that sometimes you go so deep in the story and you're so absorbed for what you're being told. No, you can do the most crazy things, you know, tech wise factorial wise, you are already there and you are able to receive everything. Now if you choose to have a full on deployment of really in your face elements in a moment where you're not prepared to it. You're going to be overwhelmed with information and the sound being too loud will not allow you to fully understand what's happening with the actors and then you know the light. So it's I would say that it's more about finding the right combination or the best coordination of efforts between the different disciplines in the project. Rather than thinking this must be more immersive that can be because sometimes even in the same project, it may begin of something very traditional and very stripped of you know, fireworks and special effects and another kind of thing and maybe grows and he convinces you and the story pulls you to a moment where he's like super immersive and you go full down the rabbit hole, you know, into Fantasyland, or whatever, or the other way around. And my point is that I would argue everything that we're discussing is subject to serving the story, serving the narrative and whatever language we choose to convey that must be tailored. So the user of the story best.

Xiaojie:

Yes, I understand. Now. So um it's like story will help audience to get immersed.

Yaiza Varona:

Exactly.

Xiaojie:

The most important one is to create a better storytelling, not considering about how you will get immersed or something

Yaiza Varona:

like just as a rule of thumb. When something that I asked very often to the directors, I asked them okay after this precise scene or after the overall you know, show my main question is how do you want the audience to walk out feeling like do you want them to be outraged? Do you want them to be absolutely entertained and whatever it is, because it's a sequence of efforts and depending on for example, are in a very specific scene like what are we looking for? Like how, what do you want the audience to feel by the end of this scene? And whatever they tell me I will think okay, in that case, because you know, we have this number of actors on stage they're saying this is the lightest doing that this is doing that. So I take all the elements and I think Okay, so in that case, the way helped us hurry the way sound can help the best is probably these are these are these and I give whatever number of options, see what works best. But for me, it's a matter of what do I want the audience to feel? Because maybe imagine that in that a very precise sim, you're delivering the information is a very emotional moment because it's when you discover that the murderer was the father all along. Imagine this is like a big shock, something like that and you need to labour that information may be and that is done through sound because there is a I don't know like a phone call that tells you that whatever results of whatever tests gives that information. It's not just a sentence that you will use for speakers because someone is telling you, you know, from a lab, it will be of course the delivery of the actor, but basically you can do that and if it's a moment that breaks your reality, maybe it can sound like a regular telephonic call and then it may

echo and it may distort and it may begin to sound absolutely lunatic with the same information. You may hear it in a loop. And what you're doing there is you're getting inside the head inside the head inside the mindset of that person that's receiving that absolutely destroying knew that it was the father that killed who whomever and it's an it's an you're getting a little bit of a moment of madness that stands out from a very regular, everyday kind of telephonic sound. And that might be something if you really want to say I want to shock the audience here it's just like it's so you know, unconceivable that the father was the murderer that I really want. So you may go full on crazy there maybe you know what, what sample My point is that anything you do with sound, at least the way I consider it has to help the story has to help the narrative has to help elicit that emotion that both the text and the director and the rest of the team are fighting for.

Xiaojie:

Okay, I see. There, like in some immersive performance, they will have some like technology like 3d audios and or the Ambisonics or something other technology. So immersive theatre's technology are quite different from the traditional theatre. One so do you think there's any like the role of sound designers do you think the road has changed when you are doing the immersive performance?

Yaiza Varona:

I don't think so at its core. So the tools you may use for your job may be different because it's not the same having to write something or having to conceive something in 5.1 and Ambisonics in full on 3d Or do it in just regular stereo or maybe you have like a full long eight have I don't know like 824 whatever number of speakers and then that will be on for sure at some point you need to help unless you are one of an engineer. You know like connecting everything properly so that because in the end, what we provide mainly is the content of that design. We are going to play this and we're going to play it like this and we're going to play it in in in this moment, beginning here and here. But it's not necessarily that you are the person doing the arranging of, you know, cables and the overall hardware and some people do both some, some people don't. But my point is that as designers, you have the conception of that and you deliver the content, and then that is implemented. Chances are that most of the times it's YOU the same person that implements that audio into specific structure. And as I say, the tools may change, how I bring that sound, how I make it happen. You have whatever wealth of different audio software's for the creation, and you have all the software for the implementation of that audio and you haven't theatre of course Q lab thing you have another one called Max which I don't use. Then if we were in VR, you have another middleware for implementing for example, you have wise or you have mod for implementing those sounds into the overall structure of into the overall gear that will be well the engine of that, for example, game or experience or whatever it is. So the tools may change. Your software that I'm using for this project might not be the same that I'm using for another project. But the overall concepts ideas, and because our brains and our ears still work the same. And we are going to keep on being shocked by the same resources and calm down but the same other resources. So my point is that the overall design chances are it's very stable in its conception from one project to the next in exits. It's all like acoustics and it's all human hearing and that doesn't change the audience and the how audiences react to sound doesn't change. What changes are the tools that you use for something? Yeah, but then again, if you come from computers exactly the same I guess. In five years, you have a full different torrent.

Xiaojie:

I understand like look basic knowledge for you for us using in sound design doesn't change. It's only like the implementation may have changed because they are using different kind of technology.

Yaiza Varona:

in a way there is there will be something nagging that if you have like full control of a space there are certain resources that you can use that if it's something very traditional just stereo you could use like for example you cannot have voices going around your head in stereo would be very difficult to pull off just in stereo wouldn't be full on convincing and the fact that you have that extra resource that you can have a sound you know maybe you maybe it's a play about ghosts and you can literally have a ghost going all around you and driving you a little bit crazy if it's very versatile, but you can pull that off if you can pull that off. That is an extra technology is allowing you an extra storytelling resource that you didn't have in a more traditional environment. And sometimes you just have something right in the middle because sometimes even with stereo, you may find a combination with very yeah with very basic tech you can design already. Virtually the sounds to sounds 3d. It's not as powerful as full on 3d with speakers and everything. But there is something that you can do in the middle as well. My point is that yes at some point, having an extra part of technology may afford you new storytelling resources, but the core of that storytelling is like saying yeah, the difference between TV in black and white and when we got Technicolor and onwards the fact that you already have that you have colours means that you can tell something else through colours and you couldn't do that in black and white, but chances are that it's not something that's going to revolutionize the way you tell stories because again, we humans tend to absorb the same information in very similar ways throughout our existence. So it's not something that you say like now we change dramatically the way we tell stories. No, it's just something extra is like a I don't know like for example when upon the when we first had slow-mo I mean it's something that humans couldn't do on no we cannot do on their own on our own right like until we have such machines that allow us to see things slow-mo and something you know, our grandparents or maybe you know just like 100 years back they didn't have that that's just like a or Oregon or microscope or something. So yes, that affords you something extra to tell but it doesn't mean that literature theatre or cinema or just general storytelling didn't happen before that

Xiaojie:

let's go to the second part of the questions. So I wonder how to actors work with sound and music when you create a sound effect for them. Like in during rehearsal time?

Yaiza Varona:

Well, for me, they are an integral part of the soundtrack and it's a huge privilege to be able to work with them and it's also a lot of fun because they are they have amazing voices and they have well they have the skills to portray things in in a way that sound. Can't always of course. So in that case, for example, it's not just the usual that I would record actors and you know, because you need this voiceover or whatever. It's just like their voices. You can do what you can do soundscapes with them. And they can portray characters they can with their physicality depends on how crazy you want to be. For example, I remember once in one of the projects that I did, summer nights, Dream summer night summer dream sorry, made my summer dreams when there is fairies right so it's a word of fantasy. And there is this magical forest or all the sounds of the of the forest we did with the actors we literally the set the sound of the wind gusting the not just the various beginning of the animals there and everything you know, crickets are they would be insects, they would be birds at night. They would be an ant in different moods. And we all we've all those layers, maybe adding another like true birding in layers or something. You would you could begin you could form build through soundscapes that are unique to that show and they are absolutely fantastic because they are so they give amazing material. You know someone is there is this character that is transforming sort of a man of donkey so you have tons of hilarious donkey sounds, and some of them are real and some of them come from the actor and it's

Xiaojie:

They all provide materials to performance.

Yaiza Varona:

Oh, yeah. Oh, yeah. And it's and it's a lot of fun. It's a lot of fun because it's a because otherwise also it is my opinion that because I can save sound as another character. I try to have everything that I can in shows as early as possible. So the actors as well have some time to get used to that precise sound. Because otherwise it's just like a you know, if you're in rehearsals and you hear someone like oh and hear phone rings or hear we will have we will have the sound of you know, a bomb dropping in the middle of somewhere. So they are expecting that and they're doing their best but if you only deliver the materials, five minutes before opening, that's gonna be a started that's like a that's pretty much distracting them because all of a sudden it's just like whoa, I didn't know this was going to be the sound like I knew something was happening. But of course it's I always compare it like if I only deliver the materials which I could do you know in tech rehearsal, I am driving in a way the project backwards because I it's like bringing an extra actor that nobody knows anything about and they interact in the stage and just as they see you know, another fellow actor coming in they know already this this actor or this moment is coming in through these, you know, side of the stage and everything the same happens with sound I want the sound to be ready as soon as possible even as a demo it doesn't need to be finished. But if it's understandable that that is the kind of sound sounds have their own personalities and they so that the actors if they have the sounds beforehand, you know as early as possible they manage to get used to it and have that fluidity of interaction and also if I see that and I say oh my god this this sound is just too long, you know for this so I by watching those interactions and having them early on, I can tailor those sounds for the best interaction or stay on stage. And as I say, working with actors is a huge bonus because they bring the soundtrack alive, and they interact with the soundtrack. And sometimes when was as I was saying before, when you want to do something really bold, but you have this super emotive, powerful passage and you have this super emotive music with it. The actor needs some time obviously to acclimate with that and to and sometimes as they tend to get a rhythm in the way they're going to be delivering that it's not always the same of course because every night is different, but there is always like a structure where they after negotiating, you know, with whatever they need to do. They tend to fall in a very in a quite stable structure for whatever monologue, which means that I can tailor that music better. So I hit the right points precisely and that makes a huge difference. That is just that is sound directly interacting with actors. You can as I say, it's if you can save sound like another character on stage. It makes all the sense in the world.

Xiaojie:

It's quite, quite interesting, I think. What kind of challenges when you're doing the rehearsal with actors do you have any challenges like? I mean, I don't know how to explain these questions. You're something that our actors and directors will provide any advice when you're doing rehearsal? They asked you to change something or others. Actually I list this part of questions I want to know more about when you're doing immersive performance because I have some experience on doing the traditional one. But I have no ideas about how les do rehearsal immersive work. And because the immersive theatre has a more flexible narrative and storytelling so I have no ideas about how to do rehearsal. In this type of performance and how they will like interact with your sound design.

Yaiza Varona:

Yeah, in this case, I will say that the main chat Yeah, of course, you need to change many things. There are many changes and not because things aren't working, but because maybe there is a better way of doing something else or because it's whatever you provide as a value doesn't maybe doesn't work well with something that's been changed and you need to adjust and everything but that's not every single discipline in the in the in the room. The actors need to change things. So does lighting so does digital also. So the sounds are that that's part of the job of course. I would say I would argue that when you do want to do things very immersive and when you want to be very detailed, why not? The main challenge that I encounter is the lack of silence that is inherent to working in a room with various people because the thing is that with sound when you want to hear the full long result, as I was saying before, it's an it's an time based art form. You need to hear everything from the beginning all the way through the end because it's not in terms even as

well for volumes and such. You may seem it's not maths aren't going to help you or you know, writing down volumes aren't going to help you because it works a little bit like temperature. It changes with the amount of people you have in the room. Sometimes you watch what is sounding very loud in the room. Once you have an audience it brings down everything because there we are, we are absorbing sound as well. Things like that, but also and especially it's because in real conditions as the show is going to be performed and you are going to be having a an audience and be that audience is going to be absolutely quiet because they are they're just watching and that is something that not very often will happen in in rehearsals. And sometimes and even if very often what I do is I go to the to the theatre very early in the morning when no one is there. So I can see. Sorry, so I can hear on my own in full silence, which is the ideal condition, the different layers that we are going to be having when I want to do something very subtle, because chances are that when the rest of the team is around, they're always talking to each other. They're always on and most of the times they're super respectful. respectful and everything but even if they're very respectful, sometimes you need for long silence to appreciate that very subtle work you were doing. And if they're talking to each other because they're doing whatever because they're discussing something that needs to be done or something like that, or people are just like in general you know, entering the room and leaving even if they are not talking about the fact that you know sound bleeds through from the outside comes in and everything that will never happen on the show. So that is the it's the yeah, that's that would I would say that's the only thing I also it's a that's a personal choice of mine tend to work or tend to Yeah, I tend to work through lunchtime, and then I go on lunchtime, when they are doing something else that sounds not required for because I benefit from having the most of time on my own in the room. Because also I do whatever I can, you know, my studio and in the room whenever we are rehearsing in you know, whatever room and yes, the contract is there but sometimes it needs some justing because he did everything sounds different when you change speakers when you change venue. So the more time I have in the room, tweaking and understanding the acoustics of the room and understanding how those sound speakers translate the sounds that I have created. For me to better and I will say that the only the main challenge I would encounter is that I would want always more quiet time to work and more time in the venue because I think that the more you see that more, the more at least I have access to that, the better and also when I am interacting with others. The fact that if I can bring already those materials I will say full on ready because we need to interact but if I can already bring them quite close to their final form it means that I am in a much better position to interact with others.

And also some of the things you do. You program them to do something else in this event or this event or this. So you need to go through a whole scene not just the last two sentences because something that is happening in sound on the last two sentences may have begun three minutes ago and you're playing with that. I'm going to do a crescendo here. So just doing those two sentences does nothing for sound, because I need I can't begin playing precisely that makes no sense. I need to cue it. I need to trigger those sounds and see the overall progression. So it's my point is that because of sometimes technical things and the way your sound is perceived, because even if the scene for them may start in those final two sentences, maybe they can divide that I cannot do that because the way I have conceived the scene brings this overall thing up of whatever, you know, sound in the background that all of a sudden, you realize is there but when you want to do things that are a little bit clever, or you want to do things that are a little bit subtle, there is something very powerful as well in working with materials that you don't know if they're there and all of a sudden you realize they're there. No, it's an it's all manipulation of your attention on the brain that's very satisfying, and it's very powerful in terms of the expression that you that you achieve with that. But that means that as I was saying before you need to have an eye an overall idea that that comes from somewhere else, or you're going to use it somewhere else, either in the past or in the future. Or my point is that sometimes because of the way both sound and sound tech works, you need to trigger things quite a bit in advance than then whenever they come to the final you know for…

Xiaojie:

that's quite interesting for me to hear about your challenge is needing silence. This is my first time you hear oh yes I saw okay, because I interviewed some people and I heard mainly from them is about how they use technology and the difficulties of using technology but this is my first time to hear about the silence is quite important. In the rehearsal stage for theatre. So,

Yaiza Varona:

I mean, technology is quite something but I would say that yeah, that comes that there is nothing you can do with that other than you know, sometimes this doesn't work something explodes I don't know what whatever update doesn't work but that's machines in general that happens to anything which is technical it's and chances are that if you are you know, like old enough, you have plan a plan B plan C for whatever it is explodes no problem I have something else I want that explodes we'll find something else before it explodes Yeah, that's nice.

Xiaojie:

I think that's because they do more work on like something like site specific. So yeah, the look how to say that. The hardware on that side specific theatre is quite hard because they can't image how the cameras sound. Yes. How they set the what's that word? The speakers Yeah, they said the speakers to a specific place. So that's quite challenging. And for her this time, I would say again, the first the first time we hear about the silence funny

Yaiza Varona:

I definitely my go to I go whenever we're going rehearsals the very thing and I see the chart for you know, tech rehearsals, how everything is a lot of it like Okay, the first thing is when do I have quiet, quiet time when can I go Where do the things

Xiaojie:

that's pretty cool because like, we're I think it's quite important if you are in the silence space and you can hear the details that you can't hear when you there are many people.

Yaiza Varona:

at least I can't maybe some other designers have that ability or are and bothered by that but for me I'm especially as I say I like it's a personal taste as well but I like to do sometimes things which are very subtle. There is no way I can perceive that if it's not on and more often than not as well. I will need depending on which scene it is the actors speaking on top of as well because that's an extra layer and in the overall soundtrack that is a so yeah, I definitely would go like a sound and silence need to go together if you want to have a productive session because otherwise, I mean, you will figure out what's not working or how you can improve it. But ideally, you won't find that out through previews you will know that before previews. So because otherwise that is the thing that you will only see your project, your soundtrack working full on when the show is on, you know with an audience and everything so it means that A, you want to arrive there in the best shape possible, because there's a lot to change otherwise, excuse me, and B, any changes that you want to do. You want to be quick about them because you won't be having that much time and as well. There is something else. There is another element. In this case once you finish the soundtrack and you deliver the session the key lab session to someone that's going to operate that you want to make sure that your instructions that you're providing with a stable and simple to use. Session. Some of the sessions that I use have, well hundreds of queues and I tend I try to automate as many of them as I can. So the operators not going to go crazy over time you know doing something because it's not just sound of course you know you have you will have the same chances. Are you have the same people sorry the same person operating certain things other than sound so you want to make their lives as easy as possible. And you also always need a good communication with the with the operator and that unfortunately you will only have it through having gone through the through the show or certain parts of the show for quite some time because you realize like okay, you know if this is going to change we trigger this here triggered is there and if you manage to

get some time with the with the person that's going to operate the show to explain a little bit what's happening or why do you want certain things happening in the same in the so what you want to achieve with this. And that also benefits the soundtrack because the soundtrack in itself even if you have you deliver everything but this is not film. It's not all you know it's not fixed in you know, minute, three seconds 22 This is happening every night is going to be slightly different. It's a video game in that in that respect. So you want the person you want to know how the person that operates. His show has their own rhythm. So you can adapt that soundtrack because ultimately, your design might be wonderful. Your sounds might be fantastic, absolutely phenomenal. But if the session that you provide is unstable gives the person that's operating it a headache, or you have not properly conveyed how that should be triggered. And it's a stressful situation like we all have tons of things to do and that person that operates the show needs to hear your story and everybody else's story. So they're really as well you know, like busy so you want to be efficient about your communications and you want to try and be as less of a hassle as possible for their for their part of the of the job. So in that case, my point is that you may have phenomenal sounds, but another layer is that they need to be conveyed you can't neglect that communication without other professional so that they make the best out of your soundtrack. Because you know you could do you could just deliver the sounds just throw in and then you know right into the sunset but it's detrimental for the project is detrimental for the people in your team and also detrimental for your soundtrack if you want to be selfish because there is in the end the whole soundtrack that's going to be perceived you have the person operating your session and you have the actors. So if you have built a relationship of understanding and trust and they know sound already they know what's going to happen and everything is as I was saying, if everything gels together your whole Sandrock was very well because otherwise as I say you may have the most convincing, although worldly good sound of I don't know a plane doing whatever but that makes nothing if it's not properly embedded in the story.

Xiaojie:

And I want to ask something about technology. But I want to ask all of the questions here in my sheet and like the first one, I want to ask the first one do you have used any technology like which is not frequently using in sound design in your immersive theatre?

Yaiza Varona:

For theatre? Have you something or one of the things that I say that came a little bit of a surprise in theatre is that I use VR simulators for some of the content that I use. In this case I use one call VR which is as I was saying you deliver something in stereo but it emulates 3d sensations. And sometimes that can be pretty confusing. It doesn't work always in any situation because it's very much file dependent but some of them works wonders and you couldn't tell it from true 3d. Moving around, but sometimes it has worked very well. So that that will be something but as I was mentioned in the beginning, I do sound for very different formats. So for me, it's just another tool. And maybe it's not very widely used, as I've been told, I don't know what other designers might tell you, but I use it as well for theatre.

Xiaojie:

Is that something very similar to those using game like VR game so well. And they use, the kind of like binaural audios.

Yaiza Varona:

Yeah, exactly. And in fact is when you can render it in binaural which is not useful unless your audience has headphones or you can do the same rendering in stereo in stereo, it loses a little bit, but you have the same I use as well this technology for example, I do reconstructions in virtual in virtual reconstructions of cultural heritage. So sometimes you just use stereo when you have a narrator and you have things around. And sometimes when you want to go full on in the action

and you're around the characters, you know, in 16th century or whatever they're talking around you. I use these names these pretty quick and that would be closer to VR than theatre.

Xiaojie:

So because I'm thinking to create sonic interactive system for performance. So I'm thinking to combine gestures, actors and audiences gestures, with the sound effects in that in my production. So if there is a system like this, would you like to apply it on your performance? Like I mean, the gesture is like when actors doing their acting, like point at something and wave their hands. There are some sound effects there. So would you think it's an interesting thought? And would you like to apply it into your performance?

Yaiza Varona:

Yeah, definitely. I mean, if it would depend on how do you use that for the story? Definitely. If it is something that is going to be very fast paced, or just something that's going to be audience based movies, sure, there will be a very good use for that. Now, having something read the an actor's hands if it is a one off. It wouldn't make much sense in my head because you have the operator knowing that just visually Okay, when the actor does this, it's when I cue this thing. So you have a human already doing that. Of course, if it's going to be something random if instead of the actor doing just this gesture, it's something that he wants to showcase his that he's an orchestral man, something like that. Yes, of course, an operator cannot do all of those at the same time or if you want to improvise. The operator cannot know that of course, that's when

Xiaojie:

these ideas came from my knowing about the immersive theatre called Sleep No More. Yes, that is a quite big performance in six-floor building and they have like, I think it has turned story inside the one performance so I'm thinking that if there's a more like sound interactions between actors and audiences, because as the audience is we chase the actors and to see what happens on that story. And different actors have a different storyline in a safe time. And so, so I'm thinking that maybe we can have more interactions on sound when audiences are invited by actors to do some like interactions, and sometimes the music and sound cool, have some response.

Yaiza Varona:

So definitely, definitely though I think

Xiaojie:

because they have so turn story lies in at the same time. So I actually am not sure how the operators works in that performance, but I think it's he has opportunities to give like, give it a chance for audiences and actors to trigger sound for themselves when they are performing.

Yaiza Varona:

It would be definitely. And then for what you're describing is even not that close to like traditional like theatre, to video games. Where you when you touch things, when you do things. You get sound rewards.

Xiaojie:

Yes. That's quite similar. So now I'm thinking using the game audio technology to implement my thoughts. So because in that, in Sleep No More this performances is, in my opinion, it's quite similar to a game.

Yaiza Varona:

it is for what you're describing it is

Xiaojie:

yeah, yeah. So because, as an audience, we can go into the building, and to choose which actors which stories, we want to see and watch and we can or even we can just, we don't choose to chase any actors. We just sit in the room and to watch the people are walking around and actors are running through the floor or something like that. So it has a lot of freedom and like a lot of choices for audiences. So I'm thinking that may be audiences care also like controlling something in that performance but that, but what I want our audience doing will not influence the whole stories but they can like make some differences small part, yeah,

Yaiza Varona:

yeah, like video games. Yeah, that should be that should be really useful. I find

Xiaojie:

it or maybe to do you hear any very similar cases like what I thought and

Yaiza Varona:

About installation that I saw 2015 I think I don't recall the name in the Barbican. That employed something similar, they had haces of light like beams of light projected to the floor and you would have something that was not in a room and the audience could walk in and they could kind of interact with these beams of light is the interrupted them, divided them they would create new beams of light. So essentially, it wasn't haptics because you weren't just interacting with light but whatever motion technology they had, gave you an idea or gave you the illusion that you were manipulating at and you were definitely manipulating that and it was it was it was definitely very satisfying to play with Adam very engaging to the audience and people like digital art, and definitely we it's in this case, it wasn't there was just like a general soundscape. I don't recall having Sonic rewards are you know, sound effects when you were doing a specific something? But I think in this case, it would definitely it would definitely if it's the same idea that instead of you with gestures, manipulating light you with gestures manipulation sound, you're definitely I know there are some especially in electronic music, you have some people that they do gesture and everything and maybe you can do something or you can use similar resources as they do. Because I don't know in the end is just like the one performer doing something visually rather than touching something. And you would it's also very similar to the same technology that you have now, with Ableton and everything that you can save music in terms of loops and you trigger your sampling that you trigger this here trigger these their trigger. So instead of touching a button if it is something that you can do with gestures, and as well you always have the or it overlaps the haptics and the glows, because some people as well just like an even if you're not in full VR gear, even if it's something that you have a globe and you have haptics and you can do those gestures, yeah, sure, like a sound is definitely a part of the reward, then you get the sensorial, sensory, sorry, reward that you get when you trigger something when you do something. In in a game and unexperienced Oh, for sure. There's applications on that.

Xiaojie:

Yes. And I want to ask, Do you have experience on designing games sound?

Yaiza Varona:

Oh, yes, I'm now strict strictly. I haven't done anything that ended up implemented a video games but I the way in which you do sound and music in general, like a soundtrack for video games. I have worked like that in several locations. Basically everything that I do in theatre I do with like

so because many of the things that I do is theatre. work like a like a video game in the sense that they are loopable tracks. Yes. And they hold it until the next event happens until the next event and none of us knows when that event is going to happen. It will happen with you know whenever the actor so it's always triggered by something external and you need to make it in such a way you know that they morph from one plane to the next smoothly and everything that you will need to consider when doing music for video games. Now, the way in which I implement this is in Cue lab instead of doing it in F mod or wise in this case for Unreal or unity in games, but the overall conception of the sound is exactly the same I also did it for roleplay game, I did a part of a soundtrack for a roleplay game. So it's it is always the same. It's something that you know that's going to be that has the same qualities that you can implement it in a way that's going to be triggered independently from you. Also that from time to time you'll have a different structure. So it's a no windows elements and how you're going to trigger them. So they are they interact with each other smoothly. Tech wise. The only difference between what I've done in the in theatre and something very we're doing games is that in games, sorry, in theatre. I don't know when things are going to happen. But chances are that is always something that's going to happen like the actor will always say the same line because it's not. I'm not giving a player two choices. So if I am doing the same thing or if I am working for video games, if they call me for whatever gig to work for video games, chances are that instead of having to loop a go into loop B, I will have loop a created to go either onto loop B or loop C depending on what the player chooses to do. But the idea sorry, yeah

Xiaojie:

I was just on the said in the game. It's not linear. how many branches…

Yaiza Varona:

Exactly. By the way you can see if the things are those different cells of sound. It's exactly the same variable in this kind of theatre that I do. Because it's that as I say that look may go into whatever number of directions and then you may go back but my point is that using things which are lockable and choose the things that will more well into one another it's an it's all the same skill.

Xiaojie:

Thank you so much. I think that's all my questions today. Hope you have a good day.

Appendix K: Interview with Chenzhong Hou

Xiaojie Xie

好的，我已经开了。因为现在我采访其实跟之前我申请的采访的稿件已经有点不一样了，这是一个我论文的这已经拿回了反馈之后，他们需要我增加的一个新的这样的一部分，所以我的采访的内容也跟之前的会有点不一样，然后也比较的简单这样子。

Yes, I've already started recording. Because now this interview is a little different from my previous interview questions. This is a new interview that is needed to add after I get the feedback of my thesis, so the content of my interview will be a little different from the previous one, and it will be relatively simpler.

然后但是还是有一点点就是那种小的流程想走一下，一个是我先大概的介绍一下我这课题原来是博士的课题，但是因为疫情期间进展太难了，我这边进展很不顺利，然后我就所以转成硕士，现在用一个硕士的水准来评估我的像课题项目了，所以你会看到我的文档上面写的是 doctoral research，但是我实际上是用于我的硕士毕业论文了现在。

Then there is still a little bit of a small process that I want to go through. One is that I will first briefly introduce my subject, which was originally a doctoral subject, but because it was too difficult to progress during the epidemic, my progress here was not smooth. Then I turned into a master's degree, and now I use a master's level to evaluate my project, so you will see that my document says doctoral research, but I actually use it for my master's thesis now.

然后我的项目主要是研究人体的姿态的识别，而且是用那种我们这种怎么说可以算是比较便宜的这种家庭的移动端的那种识别的设备，然后来进行一个姿势识别，然后将这个姿势识别的数据和声音设计结合起来，然后运用到一个沉浸式戏剧戏剧种类里面。

Then, my project mainly studied posture recognition of human body, using relatively cheap mobile recognition equipment, and then conducting a gesture recognition, and then combining the data of gesture recognition with sound design, and applying it to an immersive theatre.

我这个课题最初的设想是这个样子的，然后我的课题主要前大部分前面主要在研究曾经是戏剧到底是个什么样的东西，然后还有关于现在一些已经使用过这种交互系统，来进行声音音乐和声音创作的这种类型的东西。

My project is going to focus mostly on what theater used to be, and then on some of the interactive systems that have been used now for sound music and sound creation.

然后 ok 通过阅读了一些文献这样子，然后今天这个目的是想说想邀请一个比较专业的人士来对我的这样的一个，因为我做我发一下图给您做了一个这样的简易的一个怎么说，我的系统的设想的一个流程图，我在微信发给您了。

After reading some literature, the purpose of today is to invite a professional person to make some comments and suggestions on a flow chart of my system, which I have sent to you on wechat.

然后现在需要一个怎么说，对这一块比较熟悉的专业人士，然后对我这样的一个系统的流程进行他是说进行一个反馈和一些建议这样子，然后但是我觉得好像因为我也知道我这个系统其实做的特别的流程图写得特别的粗略，要看也看不出什么东西，然后想说今天的采访能跟您稍微再聊一下，说现在这个 Wwise 用于这种表演类或者是舞台表演，或者是戏剧表演，或者是音乐表演这块，有没有什么已经应用过的东西？

Now it is necessary for professionals familiar with this area to give feedback and give some suggestions on the process of such a system. Because I know I wrote this system actually do special flow chart was especially rough, so want to say today can with you to talk to you a little

bit about the interview, said the Wwise for this class of acting now, or the stage performances, or drama, or is this piece of music performance, what has been applied?

Chenzhong Hou

今天之前我发给你一篇博客。

I sent you a blog post before today.

Xiaojie Xie

是。

Yes.

Chenzhong Hou

东京艺术大学的人做的，然后但是他其实也不算是一个舞台，可能更多还是一个简单的交互。

It was done by people from Tokyo University of the Arts, but he is not actually a stage, it may be more of a simple interaction.

然后他我记得是用 realsense 应该不是 Kinect。

Then I remember that he is using realsense, not Kinect.

Xiaojie Xie

对 Kinect 其实已经有点过时了，我之前采访一些声音设计师，他们就有这样的问题问我说为什么我要选择 Kinect……

The Kinect is actually a bit outdated. I interviewed some sound designers before, and they had this question and asked me why I chose the Kinect...

Chenzhong Hou

国内的话做交互设计的话，很多人他们就教只教 Kinect，因为他们可能还在用 open framework，然后它里边的 open c 都是针对 Kinect 的写，所以大家可能对他也比较熟。它特别便宜。

When it comes to interaction design in China, many people teach only Kinect, because they may still use Open-Framework, and the Open-c in it is written for Kinect, so everyone may be familiar with him. It's extra cheap.

Xiaojie Xie

是的，是的。

Yes, yes.

Chenzhong Hou

但是 realsense 的话，除非你自己的读文档能力比较强，你可能买一个过来，发现可能也没有什么太大差别了，

But with realsense, if your own document reading ability is relatively strong, you may buy one and find that there may not be much difference.

Xiaojie Xie

明白了。

I understand.

Chenzhong Hou

但是我自己也是一直做 sound design，然后我在游戏公司可能碰这种交互的机会，就不如我当时找工作那一段时间那么多，找工作的时候就是把自己变成六边形战士，就是你给别人看被 ability 说我啥都会，但是后来你就实际干之后你还是要有纵深的，然后但是我还是会有一些了解，然后因为我考虑到有一个问题，如果你是剧场的话，可能角色的语音是要实时录入的吗？

But I have always been doing sound design myself, and then I may encounter this kind of interaction opportUnity in a game company, not as much as when I was looking for a job. When I was looking for a job, I turned myself into a "hexagonal warrior". That is, if you show others the ability to be told that I can do anything, but then you have to do it, you still have to have depth, and then I will still have some understanding, and then because I consider there is a problem, if you are a theater, Maybe the character's voice is to be recorded in real time?

Xiaojie Xie

因为这种沉浸式的戏剧其实对于语音来说，就语音的扩声相当于是没有那么重要了，我去看过一两个这样的表演，他们几乎把人物的对白就是已经完全的取消，或者是削减得非常弱了，然后观众的主要的体验就是观看他们的肢体动作的表演，以及他们现场会制造出来的一些那种非常可以说是非常 physical 物理上的那种声音，而不是通过扩声的方式把这个音效去把它扩出来。

Because this kind of immersive drama is actually not that important for voice, the sound reinforcement of voice is not that important. I have seen one or two such performances, and they almost completely canceled the dialogue of the characters, or the amount of points being cut is very small. Then the main experience of the audience is to watch the performance of their body movements, and some of the very physical sounds that they will produce on the spot, rather than the sound effects through sound reinforcement.

对，然后在剩下的主体问题之前，我想说您能不能稍微介绍一下您自己，因为在我问论文里面就会稍微的介绍一下，我邀请采访的人物是他们做过一些什么样的经历，所以您看一下能稍微介绍一下。

Yes, then before the rest of the main question, I would like to ask if you can introduce yourself a little bit, because in the paper I ask you, you will introduce a little bit, and the people I invite to interview are what kind of experiences they have had. So, can you introduce yourself a bit?

Chenzhong Hou

我叫侯晨钟，我记得我们之前是 8082 的声音课见的，

My name is Hou Chenzhong, I remember we met in the sound class of 8082 studio before,

Xiaojie Xie

是的。

Yes

Chenzhong Hou

我是目前在 SIE 下面的一家子公司叫 audiokinetic，我相当于在大中华区担任 Wwise 的产品专家，然后负责的工作就是宣讲售前，然后还有一部分的技术支持以及社区的一些构建，相当于很多事都和我有关系。

I am currently working for a subsidiary company called audiokinetic under SIE. I work as a product specialist for Wwise in Greater China, and then I am responsible for the pre-sales promotion, and then there is a part of technical support and some community construction, which is equivalent to a lot of things have to do with me.

然后之前的话我是在育碧上海工作室，做了三年半的 audio designer，然后当时参与过像法块，然后还有 just dance 这种项目，然后再往前的话也是在国内的一些游戏公司也接触过，像莉莉丝还有游族网络，所以当时我是因为国内都在做手游，然后我因为从小玩游戏玩的也比较多，我觉得我有点厌倦了，然后后来就想去育碧看一下，然后就在育碧感觉还是稍微能做上一些自己喜欢做的事情，所以就一直走到现在。

Then I was in the Ubisoft Shanghai studio and worked as an audio designer for three and a half years. Then I participated in projects like Pharaoh Cube, and then there are projects like just dance. If I go further, I will also be in some domestic game companies. I have also been in contact with companies such as Lilith Games and Youzu Network, so at that time I was making mobile games in China, and then because I played more games since I was a child, I felt that I was a little tired, and then later I want to go to Ubisoft to have a look, and then I feel that I can still do some things I like to do at Ubisoft, so I have been going until now.

更早的话，其实我的背景我其实完全是自学的，因为我是那么我是同济大学第一年是电子信息工程，就相当于我的计算机基础是有一些高中的时候，但是进大学之后，我就觉得我可能想做的事情是游戏设计相关的一些东西，但是因为中国的大环境对电子游戏是有禁令的，所以我读大学的时候当时是别想了没有这种专业，我就去哲学系相当于补一些文科的东西，因为可能游戏设定里面会用到，然后同时我就跑了上音去旁听，基本上从那时候就开始自学，包括担任一些作曲，类似于微量性的作曲。

Earlier, in fact, my background was actually self-taught, because I was in Tongji University in the first year of electronic information engineering, which is equivalent to my computer foundation when I had some high school, but after entering university, I thought that what I might want to do is something related to game design, but because the Chinese environment has regulations on video games, when I was in college, I didn't think about it without this major, so I went to Philosophy is equivalent to supplementing some liberal arts, because it may be used in game design, and then at the same time I ran to audition, and basically started self-study from that time, including some composers.

没有你知道屁滚尿流的你也没什么基础，但是你就硬来。

You know you don't have any basics, but you have to be tough.

Xiaojie Xie

硬啃这个硬骨头。

It is hard and tough.

Chenzhong Hou

对有活就接，没活人家就继续学，所以说很多东西像对因为当时在上音接触的老师，他因为我在音乐科技系和作曲系，但是作曲系当时也已经很 Avant Garde 他们也会搞一些很先锋的东西，所以就让我感觉一些新媒体的东西好像就不得不学，然后就什么 Max 啊 pd 这些东西就多少就都碰了一点，然后所以我说找工作的时候我就想要炫耀那些东西，实际上尤其公司说我们这么其实并没有那么 care 这些。

If I have a job, I will take it, and I will continue to study if I don't. So many things are like the teacher I met at the Shanghai Conservatory of Music, because I was in the music technology department and the composition department, but the composition department was also very Avant Garde at that time, They also do some very avant-garde things, so I feel that some new media things seem to have to be learned, and then I touch a little bit of Max, PD and these things, and then I said that when looking for a job I just want to show off that stuff, especially when the company says we don't really care about it.

Xiaojie Xie

对，他们原来还是看重比较基础的那种。

Yes, they originally valued the more basic kind of knowledge.

Chenzhong Hou

他们其实可能看中的是一个你的那种游戏开发的通识教育，就是你怎么样去跟其他部门人配合，你真的说要去做 motion capture，不用你做。

In fact, they may be interested in a general education of your kind of game development, which is how you cooperate with other departments. If you say you want to do motion capture, you don't actually need to do it.

Xiaojie Xie

确实对。

Yes.

Chenzhong Hou

当然你说你是想做新媒体艺术家，你做艺术技术总监无所谓了，你所有的活都是你的，但是对，所以说后面就有纵深了，但是我其实自己还是有兴趣说，你说以后也可以什么做美术馆的项目，但是目前我没有这个打算可能。

Of course you say you want to be a new media artist, it doesn't matter if you are an art technical director, all your work is yours, but yes, so there is depth in the back, but I am actually still interested in saying that, you say In the future, I can also do any art museum projects, but I have no plans to do so at the moment.

Xiaojie Xie

对好，然后我稍微的说一下我这个系统的一个设想，为什么流程图是这样写的，因为我自己也是数字媒体技术的本科背景，所以我之前也是稍微学过一些这方面的编程或者什么玩意儿的这些东西，然后以我的设想是我为什么使用 Kinect，当然还是 Kinect，因为从国内他们确实动作捕捉，还有做这种交互是最容易获取到的一个设备，所以我在这个系统里边的设想使用 Kinect 的去捕获这个就是人物的姿姿势，而且 Kinect 本身它的 SDK 里面就有自带一些那种固定的，他们已经设定好的那种枚举里面的那些姿势的一些设定好的东西，所以我就想说使用 Kinect 去识别到一些特定的这种挥舞的手势，或者是一些特

定的身体姿态，然后将这个数据去通过相当于 Unity 这个东西就是一个连接的平台，然后把这个数据传到 Unity 上之后，Unity 和 Wwise 这边进行一个连接之后，就是使用这样的一个身体的姿态的数据，去调控 Wwise 里面的声音的这些参数，不管是音量或者是 paning 声像还有滤波器这一块的这些各种各样的插件什么的，然后将就是说经过处理之后和身体姿势有关的这种音效处理之后，然后通过扩声的系统就是送到表演的现场，因为沉浸式戏剧其实不一定是在剧院里面演，他可能是一些别的环境，有可能是户外的，也有可能是室内的，就是说通过这样的一个课程的系统，然后把这一部分的这个东西再给他送出去，然后给听众就给观众有一个这样的声音的反馈，然后我的系统的设想，它的用户其实就不只在于演员，演员是相当于是经过训练受过训练的这样一个用户，然后他还这样的系统，我希望我如果说能够这样做出来的话，它也是能够支持这种没有怎么经过训练，然后可以通过演员进行一些简单的指导，就可以来进行一些声音的交互的就是这种观众，然后也能够参与到这样的一个表演里面来。

Right, and then I will briefly talk about an idea of my system, why the flow chart is written like this. Because I myself have an undergraduate background in digital media technology, I have also learned a little bit of programming or something in this area before. Then my assumption is why I use Kinect, because they do motion capture from China, and it is the easiest device to obtain this kind of interaction, so my assumption in this system is to use Kinect to capture this is the character posture. And Kinect itself has some fixed ones in its SDK, those poses in the enumeration that they have set, some set things, so I want to say use Kinect to recognize some Specific waving gestures, or some specific gestures, and then passing this data through the equivalent of using Unity is a connected platform. After transferring this data to Unity, Unity and Wwise make a connection, which is to use the data of such a body posture to control the parameters of the sound in Wwise, whether it is volume or panning sound image and filtering. These various plug-ins in this part of the device or something. Then, after processing the sound effects related to the body posture, it will be sent to the scene of the performance through the sound reinforcement system. Because immersive drama is not necessarily performed in a theater, it may be in some other environment, it may be outdoors, or it may be indoors, that is to say, through such a system of courses, and then put this part of this thing Send it out to him and give the audience a feedback of such a voice. Then the assumption of my system is that its users are not just actors. Actors are equivalent to such users who have been trained and trained. I hope that if I can do this, it can also support this kind of system. Without much training, it is this audience that can interact with some voices through some simple guidance from the actors, and can also participate in such a performance.

然后这个系统的目的就是为了增强观众的在这样的一个沉浸式戏剧里面的一个交互的感受和沉静的感受，提升一个这样的体验，对，然后这个是我的系统的一个设计，这个系统的目标，是这样子的。

Then the purpose of this system is to enhance the audience's interactive feeling and quiet feeling in such an immersive drama, and enhance such an experience. Yes, this is a design of my system, the goal of this system is like this.

Chenzhong Hou

明白。

I understand.

Xiaojie Xie

然后然后如果说仅从我这样的一个流程图这样的一个介绍，您觉得说这样就这样的一个怎么说，系统在运用在这种稍微复杂一点的戏剧表演的这种环境里面，它的可行性和它比如说它的上面会遇到很多什么样的障碍，您觉得说有什么样的问题？

Then, if only from an introduction such as a flow chart like mine, do you think that such a system is used in this kind of environment of a slightly more complicated theatrical performance, its feasibility and its possible What kind of obstacles will be encountered, and what kind of problems do you think there are?

又或者说之前有没有听说过有一些艺术表演戏是艺术家或者是戏剧表演家，他们在尝试着使用 Wwise 去代替他们戏剧表演经常用的那种线性的操作怎么说？到了个点播一个音效，到了点播一个音效这样子的感觉。

Or have you ever heard of some artistic performances being artists or drama performers who are trying to use Wwise to replace the linear operation that they often use in their theatrical performances? When you reach a plot point, play a sound effect, and when you reach the plot point, play a sound effect like this.

Chenzhong Hou

我觉得线性的话它肯定是有它一定的好处，它比较稳，然后就不太容易出事故，我觉得像 sleep no more，然后他其实也是几个部分，然后来回可能上一轮没演完，下一轮就接着演了，他肯定是严格控制的，所以你以游戏开发为例，游戏其实也是一个线性和非线性结合的东西，就是你总是要跟 play 一会，然后过一段 cinematic，cinematic 是现行，然后再引导别人近一段跟 play 它相对来说会比较放一点，就没有那么收。

I think linearity must have certain advantages. It is more stable and less prone to accidents. I think it is like Sleep No More, and he actually has several parts. It may not be finished in the last part, and the next round may start. The round went on, and he(sound designer) must have strictly controlled it. So, if you take game development as an example, the game is actually a combination of linearity and non-linearity, that is, you always have to play with play for a while, then go through a cinematic, which is linear, and then guide others to play it for a short while. It would be a bit more open, but not so much.

所以说这种混乱你其实也是可以预估到的，那么就是说你其实要有一个清晰的意识，比方说我要把比较收的地方和放的地方要区分开，放的地方就彻底让它放，你对这种结果你要采取不同的控制方法，所以这样的话其实就能规避掉一些就是不必要的一些问题，就是我之前遇到的一些人最大的问题主要是在于他们带着一种线性的思维方式，然后又希望他们的所有的这些方案都能提供一个非常准的 cue 的识别，但是它的 cue 的识别可能就没有那么准。

So, you can actually predict this kind of confusion, which means you actually have to have a clear consciousness. For example, I want to separate the place for comparison from the place where should be controlled, and let it be less controlled in the place where should be less controlled. You have to take different control methods for this result, so in this way, you can actually avoid some questions which are not necessary. That is, the biggest problem of some people I have met before is that they have a linear way of thinking, and then they hope that all of their solutions can provide a very accurate cue recognition, but the recognition maybe not so accurate.

Xiaojie Xie

你的意思就是说 cue 的相当于标志性的一些东西，它其实在识别的时候识别并不用那么到位，所以说像这样的一个反馈就不一定能够就是说按照想象中的时机去出现这样。

What you mean is that the cue is equivalent to something iconic. In fact, it does not need to be recognized so well when it is recognized, so a feedback like this may not necessarily mean that it will appear at the time you imagined.

Chenzhong Hou

对，你比方说像你写曲子，如果你写曲子的话，你应该。知道是主副歌，然后有 break down 或者是之类的这些段落。通常的话大家会把一些比较 chill 的东西安排在 break down，因为很明确的那种有叙事性和有指向性，比方说一定是副歌完事以后进那主歌完事进副歌，这种有很方向性的事情，你就没必要用交互的方法去推动它，因为它这样的话就很容易你达不到你的目标，但是如果你进了 break down 之后，它就是处于一种很 ambient 或者是很 chill 或者是很随机的状态，这种情况下你用交互的方法你能让观众沉浸其中，同时能识别到他的行为会对结果产生影响，这样固然会增加沉浸感。

Yes, you say like you write music, if you write music, you should. Know it's the main chorus, and then there's a break down or something like that. Usually, people will arrange some more chill things in break down, because it is very narrative and directional. Directional things, you don't need to use interactive methods to push it, because it is easy for you to fail to achieve your goal, but if you enter the break down, it is in a very ambient or It is a very chill or very random state. In this case, you can immerse the audience in the interactive method, and at the same time, you can recognize that his behavior will affect the result, which will certainly increase the sense of immersion.

所以其实我认为就是说你就需要知道你的非线性是应该被安插在什么地方。很多的这种沉浸式的东西，其实大家都想想像 sleep no more 的话受控的非线性，就是你非线性的时候其实也是它有一个主线一直会推着你往前走。

So actually, I think it means that you need to know where your nonlinearity should be placed. A lot of such immersive things, in fact, everyone thinks about the controlled nonlinearity of Sleep No More, that is, when you are nonlinear, it actually has a main thing that will always push you forward.

对，所以我觉得首先要把叙事上面你的工具如何使用考虑进去，你这样的话有一些目标就不会定错掉。

Yes, so I think the first thing you need to do is to take into account how your tools are used in the narrative, so that if you have some goals like this, you will not be wrong.

然后你要是说工具方面的话，因为自己我对 Wwise 比较熟，我觉得问题不大，无论是你的 sound cue 也好，或者是你的不规则扬声器的部署，这些东西 Wwise 的 auxiliary 里面其实都是有工具的，你是有办法的。

Then if you talk about tools, because I am familiar with Wwise, I don't think it is a big problem, whether it is your sound cue or the deployment of your irregular speakers, these things are actually in the auxiliary of Wwise. If you have tools, you have a way.

哪怕是那种有些人之前会说也是做扩声，然后做出来那种不是什么 7.1.4，是那种很复杂的扬声器，他们在 Unity 里边直接把做一大堆的 listener，明白吧？

Even the kind of loudspeaker that some people used to say is to do sound reinforcement, and then they made the kind of loudspeaker that is not 7.1.4, but a very complicated kind of speaker. They directly made a lot of listeners in Unity, understand?

Xiaojie Xie

也就是说对然后。

That is to say, then

Chenzhong Hou

他每一个类似那去连到一个 speaker 上面，相当于就是说他的那种 timing，它就相当于是让一个 emitter 然后去备 n 个 listener 去听，那么每一个 listener 的声音其实就会传到一个空间当中对应的一个 speaker 上面，它就形成了一个无论你的空间是多么不规则的，都可以非常准确的去做判定的一个方法，就这种东西都是可以实现的。

Each of his similar things is connected to a speaker, which is equivalent to his kind of timing. It is equivalent to letting an emitter and then preparing several listeners to listen to, then the voice of each listener will actually be transmitted to a on the corresponding speaker in the space, it forms a method that can be very accurate no matter how irregular your space is, and this kind of thing can be realized.

所以没啥问题，然后还有一些要注意的可能是你像 Wwise 里面的话，比方说如果你的 cue 产生的特别频繁，对你识别的时候可能产生特别频繁，这时候就是说我不需要那么频繁，你可能会采取一些像 trigger 不是 trigger rate，就能采取一些 slow rate，你要让它平滑的过渡到这边，从 0~1 的时候它是平滑的过渡过去的，但是你一定是它的值大于 0.5 的时候，你才会切换一个状态，所以你就可以通过这种类似于连续变离散的这种方式去控制他的一个行为，来避免一些不必要的结果，总之工具上面都没什么问题。

So, there is no problem, and then there are some things to pay attention to. You may be like in Wwise. For example, if your cues are generated very frequently, they may be generated very frequently when you recognize them. At this time, it means that I don't need to be so frequent. You may take some slow rates like trigger instead of trigger rate. You want it to smoothly transition to this side, from 0 to 1, it transitions smoothly, but you must switch a state when its value is greater than 0.5. So, you can control one of his behaviors in a way similar to continuous becoming discrete to avoid some unnecessary results. In short, there is no problem with the tools.

Xiaojie Xie

明白。我觉得您刚刚真的提了一个很重要的一点是，因为我对 Wwise 确实就不是特别的熟，所以我不太清楚原来他在一个很复杂的扩声系统上面，Wwise 是完全可以支持得了的。

clear. I think you really mentioned a very important point just now, because I am really not very familiar with Wwise, so I don't know that he is on a very complicated sound reinforcement system, and Wwise can fully support it.

Chenzhong Hou

确实。很多人会说很多人会说你就是一个做光环做 5.1 做突突突（枪声）的游戏的一个引擎，其实其实你要用 creative 方法去看它的话，其实都一样的，就是无非一个类似它就是一个麦克风，你把这个麦克风的声音送到就可以了。

Really. Many people will say that many people will say that you are an engine for games that make halo, 5.1, and guns. In fact, if you use a creative method to look at it, it is actually the same, it is nothing more than one, similar to it is A microphone, you can send the sound of this microphone to it.

Xiaojie Xie

也就是说其实像这种沉浸式戏剧这种非常的将这些扩声的系统就是扩声又很复杂，然后就场景很复杂，这种时候让他们去完全去用一种游戏开发的那种游戏声音开发的那种模式去进行一个这样的怎么说去制作，其实可能是一个我确实在这方面我也不是很清楚，像 sleep no more，他们扩声到底是怎么做的。

In other words, like this immersive drama, very, very, the sound reinforcement system is very complicated, and then the scene is very complicated. At this time, let them use a game to develop it completely. That kind of game sound development mode to make such a how to make it, in fact, it may be that I do not know very well in this regard, such as sleep no more, how they do sound reinforcement.

Chenzhong Hou

Sleep No More 的话，从我的理解是首先他们的 sound designer 在那是一个非常喜欢 Herman，布纳赫尔曼的一个人，他特别喜欢希区柯克的音乐是的，所以说里边相当于所有的音乐都是用的希区柯克，然后他就很聪明，他刚才我说的关于什么时候用线性，什么时候用非线性，他想得很清楚，比方说你剧你看了对吧？

For Sleep No More, from my understanding, first of all, their sound designer is a person who likes Herman very much, Buna Herman, and he especially likes Hitchcock's music. Yes, so it is equivalent to all Hitchcock's music is all used, and he is very smart. He just said what I said about when to use linear and when to use non-linear, he thought very clearly, for example, you watched the play, right?

Xiaojie Xie

对我去看了。

Yes, I went to see it.

Chenzhong Hou

你应该刷了不止一轮，反正总的大家都一样，就一开始你进去的时候，你肯定会经过一个 blackout 的过程，就是把你送到一个一个通道里边，但是他当时放的是哪一步来着，总之放了一个非常的像斯特拉温斯基那种很复杂很宏大的东西，但是他进去之后，他的音乐用的是惊魂记里边的悬疑的片段，那个片段其实是可以无限的循环的，就是他其实就很 ambient，所以说但那个时候一般都是观众会不断的去到处搜寻，他就是沉浸的那种很 airy 的氛围里边，他也不知道要干什么，所以我觉得就是说他对于整个的那些不同的区域的人进入不同阶段的人的情绪的把握是很正确的。

You should have seen it more than once. Anyway, everyone is the same. When you first enter, you will definitely go through a process of blackout, that is, you will be sent to the passage one by one. But what did he do at that time? In short, he put a very complicated and grand thing like Stravinsky. But after he went in, his music used the suspenseful clip from Psycho, and that clip could actually be looped indefinitely. That is, he is actually very ambient, so at that time, the audience would usually search everywhere, and he was immersed in that airy atmosphere, and he didn't know what to do. So I think it means that his grasp of the emotions of people in different areas entering different stages is quite correct.

但是他也会埋一些声音的梗，就是因为每一个扬声器在那种环境下面，他的声音的扩声范围其实是有限的，但这个方法它可能你只有进到这个区域里面，你才能会听到这个声音是的。

But he will also use some classic music and sound, because each speaker is in that kind of environment, and the sound reinforcement range of his voice is actually limited. But with this method, you may only hear this sound when you enter this area.

Xiaojie Xie

区域性很明显。

Regionality is obvious.

Chenzhong Hou

对，但其实这个方法的话，很多的剧场其实都是这样做，就是他可能也不一定用 Wwise，就是有些人可能就直接是 reaper 线性的然后分喇叭，然后他会考虑的非常清楚，说 1 号 3 号喇叭是哪个声音，然后 2 号 4 号喇叭是哪个声音，他可能会去这样考虑，然后其实这个方法你也可以去看一下迪斯尼，迪斯尼有那个叫就是他们的梦想工程师，他们在游乐场里面做，包括你坐过山车经过一系列的东西的时候，他的音乐如何保证那种切换，其实也是用这种不同的扬声器的同步播放，但是它衔接不同的状态的方法去做的。

Yes, but in fact, in this way, many theaters actually do this. Even he may not necessarily use Wwise, that is, some people may directly use linear design in Reaper and then split the speakers. Then he will think very clearly and say which sound is the speaker number 1 and number 3, and then which sound is the speaker number 2 and number 4. He might think so. In fact, you can also go to Disney for this method. Disney has that name, which is their dream engineer. They do it in the playground, including when you ride a roller coaster through a series of things, how does his music ensure that kind of switching, in fact, it also uses this kind of synchronous playback of different speakers, but it is done by connecting different states. of.

然后还有一个要考虑的点是因为它会有很多扬声器，你在这个空间当中播放的声音的相位就会产生，要么竖状滤波器，我们相位抵消。你可能在百位上面就稍微要考虑一下播放的内容，他们的一个关系我印象比较清楚的是什么？上海迪士尼乐园有一个红桃皇后的花园，你进花园的时候它会有一条路，然后有很多的声音就是左播一下右播一下，他肯定就是故意的错开它的相位，它是不同的内容放在不同的一个位置。

And then another point to consider is because it will have a lot of speakers, the phase of the sound you play in this space will be generated, or the vertical filter, we will phase cancel. You may have to think a little about the content of the broadcast, a relationship between them. What is the clearest impression to me? Shanghai Disneyland has a garden of the Queen of Hearts. When you enter the garden, it will have a path, and then there are a lot of voices, just play left and right, he must be deliberately staggering its phase, it is different content in a different location.

对，可能这个是纯声音上面的一个考虑，然后但是如果用 reaper 线性的，当然你想做成什么样，但非线性的。

Yes, maybe this is a consideration above pure sound, but if you use reaper linear, of course, what do you want to make, but non-linear (is harder).

Xiaojie Xie

对在从非线性那种东西上来说，reaper 能做东西就比较有限。

For things that are non-linear, the reaper is limited in what it can do.

Chenzhong Hou

对，然后这是一个。

Yes, then this is one.

另外一个刚才我还想说的是，你不是说这个方案是基于 Kinect 的吗？Kinect 的话它又有另外一个问题是它的造价，比如说 Sleep No More 5 层楼你包下来那么多房间，你的交互要多少 Kinect？首先这个就有一点大炮打蚊子，因为一个 Kinect 也不便宜，而且其实它很多的手法其实并用不着 Kinect 对吧？

Another thing I want to say just now is, didn't you say that this solution is based on Kinect? For Kinect, another problem is its cost. For example, if you pack so many rooms on the 5th floor of Sleep No More, how much Kinect does your interaction cost? First of all, this is like hitting a mosquito with a cannon, because a Kinect is not cheap, and in fact, many of its methods don't actually require a Kinect, right?

它的艺术效果用 Kinect 也是成立的，但是具体还是要看你如何去设计这个系统。

Its artistic effect is also established with Kinect, but it depends on how you design the system.

Xiaojie Xie

我觉得是这样的，就是因为 sleep no more 本身由于题材确实它的题材本身就是限制，有一点限制，然后就限制在了那样一个怎么说复古的时代，所以说使用这种交互性的东西，就是我觉得本身能够应用的地方就比较少，然后以我的设想就是也是通过我之前对一些其他的声音设计师采访之后，有稍微的得出来一些的设想，像如果有这样的一个系统，就特别适合在相当于戏剧领域去开发一些更多的题材的，比如说魔幻科幻或者是一些童话类这种比较天马行空的想象的这种类型的东西的，有在这个方面这种题材上的话，我们这样的一个声音的交互系统，它的怎么可应用的范围就变得广了很多，然后包括昨天我和我一个也是做音效技术音频的朋友聊的时候，他就提到说，比如说哈利波特拿来做戏剧，也可以说我们就可以邀请观众上来，我们魔法老师然后教他们观众魔法棒一挥，那边就出现了一个什么样的那种出现的声音，或者是根据的魔法棒的动态去调控这些声音的效果。

I think this is the case, because sleep no more itself is a bit limited because of the subject matter, and then it is limited to such an era of retro, so using this kind of interactive thing is what I think There are very few places where it can be applied. And then in my assumptions, and also through my previous interviews with some other sound designers, I came up with some assumptions. If there is such a system, it is especially suitable for developing some more themes in the field of drama, such as fantasy science fiction or some fairy tales, which are more imaginative and imaginative. If there is a subject in this aspect, how can a sound interaction system like ours have a wider range of applications, including when I chatted with a friend of mine who is also a sound technology audio maker yesterday, He mentioned that, for example, if Harry Potter is used as a play, we can invite the audience to come up, and the magic teacher will teach them to wave the magic wand, and there will be some kind of sound effect, or It is based on the dynamics of the magic wand to control the effects of these sounds.

Chenzhong Hou

做 gesture，就是说我刚才就偏题了，主要就是说肯定是有用的，但是就是说你比方说你要把它放在一个什么样的整个的更大的范围之内，比方我所了解的直到星球大战最近在做一个非常大的酒店项目，就是在然后那个项目的话就相当于你进去住三天三夜，然后你看到的，天空都是星空，然后它里边它里边有一个叫 Jedi training center，就是让你进去以后把你训练成绝地武士，然后用 Wwise 做的，然后前面就放了 Kinect，然后你这样拿刀这样给 win win (挥剑)，然后他就会因为它相当于 Kinect 肯定是 c++或者是它的图像要怎么做，它直接就是 c++去触发 Wwise，所以这一套系统就是非常的稳定，然后他们也是这样实现的，已经有现成的例子或者你可以直接写。

Doing gesture... It means that I just went off topic just now, mainly to say that it is definitely useful, but it means that for example, you want to put it in a larger scope, such as what I know , Star Wars is working on a very large hotel project recently, and then that project is equivalent to you going in and staying for three days and three nights, and then what you see, the sky is full of stars, and inside it there is a man named Jedi training center is to let you go in and train you to become a Jedi Knight, and they do it with Wwise, and they put a Kinect in front of it, and then you hold a knife like this and swing a sword like this, and then he will definitely be c++ or c++

because it is equivalent to Kinect It is how to do its image, it is directly C++ to trigger Wwise, so this system is very stable, and then they are also implemented in this way, there are already ready-made examples, or you can write directly.

Xiaojie Xie

确实我有了解过，因为之前说到底是不是一定要使用 Unity，其实 Unity 它在我这边想法也只是一个相当于中间交换数据的工具，然后除了用例题之外，其实还有很多别的东西，像也是可以直接从 Kinect 里面获取数信息流直接传到 Wwise 里面，做一个直接的交互，对就是唉也是因为这个方面了解的不是特别深，所以还没有了解到这一块，然后对觉得还挺好的。

Indeed, I have understood, because I have to use Unity in the end, in fact, Unity is just a tool equivalent to the intermediate exchange of data on my side, and in addition to use cases, there are actually many other things. For example, you can directly get the data flow from Kinect and pass it directly to Wwise to make a direct interaction. Yes, it's because I don't know much about this aspect, so I haven't understood this one yet, and then I think it's pretty good.

Chenzhong Hou

然后我还想说的是我注意到刚才你说到里边有一个 change position。

Then I also want to say that I noticed that you mentioned that there is a change position in it.

Xiaojie Xie

然后对。

Yes.

Chenzhong Hou

Change position 的话，因为我开会之前我看到这一点之后，我也是专门去搜了一下，但是你刚才一给我提到说你希望成本不要太高，然后我就把我搜到的东西给摁住了，因为通常的就是啊叫虚拟拍摄，还不是说 production，他们其实就是用的叫 optic track，你知道吗？

In the case of changing position, because I saw this before the meeting, I also searched for it, but you mentioned to me just now that you hope the cost is not too high, and then I did not mention that I found it. The thing is called virtual shooting, not production, but what they use is actually called optic track, you know?

Xiaojie Xie

光学那种检测的感觉。

It is the technology of optical detection.

Chenzhong Hou

就是非常昂贵的那种摄像头，然后你要在一个棚里边搭一个圆形的，然后上面都要买好多只，然后围成一个圈，然后在这个圈里边人人不用穿动捕服装人仍旧可以在里边动了之后就可以直接把你的人物的动作就变成动画，然后那个就算是一个非常好，我之前也是有朋友说问我做这种舞台项目有没有什么动捕的方法，说那个是最好的，一查价格非常贵。一只好像几万，然后你还要你还得买十几只，你要是换个场地是的。

It is a very expensive kind of camera, and then you have to build a circular one in a studio, and then you have to buy a lot of them, and then form a circle, and then in this circle, people don't need to wear motion capture costumes, people can still Move in it, and then you can directly turn your character's movements into animations. Then, even if it is a very good one, a friend of mine asked me if there is any way to do this kind of stage project, and said that it is the best, and the price is very expensive. One seems to be tens of thousands, and then you have to buy more than a dozen. If you change the venue...

Xiaojie Xie

对这成本非常的高，因为为什么会说关于一个 change position，就是关于这个位置，因为我在读文献的时候有看到，大概不过文献也确实有点年头了，5 年 6 年以前有人使用这个 Kinect，然后它的用法是把 Kinect 装在天花板上，然后它这个时候检测的动态就不是人的姿势的动态，而是人的走位的点。

The cost of this is very high. Why do I say about a change position? It is about this position, because I saw it when I was reading the literature, but the literature is indeed a bit old, 5 years and 6 years ago, someone used this Kinect, and then its usage is to put the Kinect It is installed on the ceiling, and then the dynamic detected at this time is not the dynamic of the person's posture, but the point of the person's movement.

然后对他通过这个人在舞台上一个固定的范围内，他走的点走到了某个点，然后对应到系统里面，然后相当于使用一个 trigger 一样的去触发的。

Then he passed the person within a fixed range on the stage, the point he walked to a certain point, and then corresponded to the system, and then it was equivalent to using a trigger.

包括视效也包括音效这样，因为他的视效是在舞台上有一个放映机，然后放了一个背景图片一样的，当人从为放映机面前走过去的时候，他就会根据这个人物的位置去切换背景图片，然后换成一个新的场景，对他对 Kinect 的用法是这样子的，所以我觉得说怎么说，使用 Kinect 它就是相当于是多了一种使用方法，一个是检测人物的走位，甚至还有包括数量，也因为 Kinect 是可以好像上限是 5 个还是 6 个用户这样子，也就是说它根据数量的不同，数量也相当于是一个控制声音的数据，然后位置也可以是控制声音的数据，然后人体的姿势也可以是控制声音的数据。

Including visual effects and sound effects, because his visual effects are that there is a projector on the stage, and then a background image is placed. When a person walks past the projector, he will go according to the position of the character. Switching the background image, and then changing it to a new scene, this is how he uses Kinect, so I think how to say it, using Kinect is equivalent to one more method of use, one is to detect the movement of characters , and even include the number, because Kinect can detect whether the upper limit is 5 or 6 users, that is to say, depending on the number, the number is also equivalent to a data that controls the sound, and then the position can also be used to control the sound. data, and then the posture of the human body can also be data that controls the sound.

对我的设想是这样子的，当然然后我也在我的论文里面提到过，说 Kinect 只是目前我这个项目它能够最快速的我就能够获取到这样的一个设备，然后去进行试验最方便的一个设备，但是并不代表说我将来就只会用 Kinect 才去继续这样的一个研究计划因为，因为我的论文的标题主要还是叫人体的姿态识别，而不是说使用 Kinect 去做什么。

The idea for me is like this. Of course, I also mentioned it in my thesis, saying that Kinect is just the fastest device I can get for my current project, and it is the most convenient for me to test it. It does not mean that I will only use Kinect to continue such a research project in the future, because the title of my paper is mainly called gesture recognition, not what to do with Kinect.

也就是说将来如果有更发展的更完善的这种，然后造价也更便宜的这种姿态识别的一些设备，就是说会转移到使用那些去来做这样子。

That is to say, if there are more developed and more perfect gesture recognition devices in the future, and the cost is also cheaper, it will be transferred to use those to do this.

Chenzhong Hou

明白，其实我觉得都没啥问题， position 的话就是说你还可以就是说在 Wwise 里面去做声音的摆位，检测到的方向，创建一个 game object 来播声音，这个都很简单。

Understand, in fact, I don't think it's a problem. In terms of position, you can also say that you can place the sound in the Wwise, detect the direction, and create a game object to play the sound. This is very simple.

Xiaojie Xie

是这样子，我觉得今天确实感觉都已经有聊到我所有的想要聊的问题了。

It's like this, I think I really feel like I've talked about all the issues I want to talk about today.

您看还有说您还有了解到什么别的，就是说比如说现在已经有在使用，除了刚刚星球大战在使用 Wwise 就 Wwise 在设计这样的东西之外，还有没有什么别的类似的项目，然后我也可以去了解一下。

Do you still want to say that you have learned anything else?For example, it is already in use, except that Star Wars is using Wwise and Wwise is designing things like this, is there anything similar project, and then I can also go and learn about it.

Chenzhong Hou

Wwise 的话有一个是那个英特尔然后他们和一个设计师是用 Wwise 加虚幻引擎，然后我们其实也有一篇博客，然后他们是这样做了一个项目，还有一个是 radio head 它不是有一个虚拟的美术展，然后相当于那个项目是虚幻引擎放在官网上宣传，然后然后我在虚幻的朋友就很不高兴，他说居然用了 Wwise。

One of the Wwise words is that Intel and then they and a designer are using Wwise and Unreal Engine, and then we actually have a blog, and then they do a project, and one is the radio head, it doesn't have a virtual art Exhibition, and then it is equivalent to that the project was promoted by Unreal Engine on the official website, and then my friend in Unreal was very unhappy, he said that Wwise was actually used.

Xiaojie Xie

居然用 Wwise。

They use Wwise.

Chenzhong Hou

对，但是我比较理解是因为他们的互动音乐做得非常复杂，所以可能设计师实在是不想再虚幻里面去折腾 Max 或者是那些东西，所以他干脆就在 Wwise 里做了，我觉得也没什么问题，人也方便，那个项目做的挺好的，其他的没什么，其他的还是刚才看到 position 的话，关于一个扩声的东西就是 object and base audio，以前的时候都是你 5.1 或者怎么样他，现在有 object 之后就可以把声音的定位做得更准，那就是这样。

Yes, but I understand it because their interactive music is very complicated, so maybe the designer really doesn't want to mess with Max or those things in Unreal, so he just did it in Wwise, I don't think there is any problem, it is also convenient for people, that project is well done, the other is nothing, the other is the position I just saw, the thing about a sound reinforcement is the object and base audio. In the past, it was your 5.1 or something. Now that there is an object, the positioning of the sound can be made more accurate, and that's it.

Xiaojie Xie

然后对其实关于当 Wwise 在戏剧上的应用，我查到一个不是，我不记得您公司就什么，对，他在海外版的博客里面，2017 年有一个声音设计师把它运用在了他的戏剧表演上，好像是一个法国的戏剧设计在 2017 年的时候，然后他主要也是用 Wwise 去做了那种 adaptive music and adaptive audio，这个方面就是自适应性的。

Then, about the application of Wwise in drama, I found one that is not. I don't remember your company. Yes, in his overseas version of the blog, a sound designer used it in his blog in 2017. In terms of theatrical performance, it seems that a French theatrical design was made in 2017, and then he mainly used Wwise to do the adaptive music and adaptive audio. This aspect is adaptive.

Chenzhong Hou

文章标题是什么，文章标题是什么？

What is the title of the article, what is the title of the article?

Xiaojie Xie

我还记得他的名字。作品的名字我老是忘记。

I still remember his name. I keep forgetting the name of the work.

Chenzhong Hou

他那作者名字是叫 Alex 吗？Alex 这两天在这。

Is his author's name Alex? Alex has been here for two days.

Xiaojie Xie

就是他的戏是好像是叫,还是什么，我得去看一下我的文章，我去拿一下我另外一台电脑等我一下。

It's like his play is called or something, I have to read my article, I'll go get another computer of mine and wait for me.

Chenzhong Hou

这也 2017 我看到了，if you're using wise for theatre，adaptive soundscape for play the list and 还没有翻译，它在 ubisoft 说我找一下。

This is also 2017 I saw, if you're using wise for theatre, adaptive soundscape for play the list and haven't translated yet. He's in ubisoft, I'll look for it.

Xiaojie Xie

我找到了。

I found it.

Chenzhong Hou

这个人是在育碧的对吧？然后他之前是放了一堆椅子，然后用是的 sound caster 然后去做很多东西的触发。

This guy is at Ubisoft, right? Then he put a bunch of chairs and used yes sound caster and did a lot of triggers.

我再仔细看一下，但是我感觉它用法应该相对来说比较简单，然后他可能是用的 Rtpc 去驱动布莱布兰德布莱斯坦德，然后是驱动了好几个 container，它可能更多还是一个交互控制上的东西。

I will take a closer look, but I feel that its usage should be relatively simple, and then he may use Rtpc to drive Brebrand Blastander, and then drive several containers, it may be more or more An interactive control thing.

Xiaojie Xie

对它使用的方式主要还是相当于是替代 QLab 去使用了一个咱们戏剧那边经常用 QLab 来做音乐声音的播放，然后他是拿这个 Wwise 去替代的软件，相当于是一个尝试这样子。

The way to use it is mainly equivalent to replacing QLab to use a QLab that we often use to play music and sound in the theater, and then he uses Wwise to replace the software, which is equivalent to an attempt like this.

Chenzhong Hou

对个人就是 QLab 也是就各种 cue Wwise 就是用 sound caster 那个叫我已经。

For individuals, QLab also uses sound caster for various cues.

对叫 Pierre。

The name is Pierre.

Xiaojie Xie

他叫 Pierre。

His name is Pierre.

Chenzhong Hou

姓名。

Name.

Xiaojie Xie

对。

Yes.

Xiaojie Xie

好的。太感谢您了，然后对可能需要您把刚发的有一个 word 的打个勾，然后把您的名字写上去，就把英文拼音就可以了。然后对剩下的就完全 ok 没问题，好谢谢您，谢谢，太感谢了。

OK Thank you very much, and then tick the one that may require you to have a word document just sent, then write your name on it, and just put the English pinyin. Then it's totally ok for the rest, so thank you, thank you so much.