IJCMR

Mmabolela – A hybrid approach to working with ambisonics

Nikki Sheth, *sound artist and composer*

Abstract

From the palm-strewn banks of the Limpopo River to the dark depths of the Hippo Pool, Mmabolela transports the listener through the soundscapes of this remote location in South Africa. A series of interweaving "snapshots" and constructed realities based upon the many recording locations visited during the 2017 Sonic Mmabolela residency transport the listener to this hyper-real time and place. This work has been composed using a combination of stereo and ambisonics A format recordings, requiring a hybrid approach to working with ambisonics.

The research statement addresses the aesthetics and workflow behind the composition, including the idea of soundscape composition and environmentalism within the work, recording in ambisonics, workflow and methodology (including a hybrid approach), aesthetic choices (including the idea of hyper-realism), the use of ambisonics to create a portable work that can be decoded to listen to on any loudspeaker system and the power of ambisonics to create an immersive listening experience.

Link to work: https://soundcloud.com/nikki_sheth/mmabolela

Introduction

From the palm-strewn banks of the Limpopo River to the dark depths of the Hippo Pool, Mmabolela transports the listener through the soundscapes of this remote location in South Africa. A series of interweaving "snapshots" and constructed realities based upon the many recording locations visited during the 2017 Sonic Mmabolela residency transport the listener to this hyper-real time and place. This work has been composed using a

combination of stereo and ambisonics A format recordings, requiring a hybrid approach to working with ambisonics.

The research statement addresses the aesthetics and workflow behind the composition, including the idea of soundscape composition and environmentalism within the work, recording in ambisonics, workflow and methodology (including a hybrid approach using both stereo and ambisonics A format recordings), aesthetic choices (including the idea of hyper-realism), the use of ambisonics to create a portable work that can be decoded to listen to on any loudspeaker system and the power of ambisonics to create an immersive listening experience.

Research Objectives

- To combine field recordings from different locations on the reserve that have similar characteristics to create a hyper-real listening experience of this place and create constructed "snapshots" of different sound worlds
- To investigate the use of ambisonics and stereo recordings to create a hybrid approach to immersive soundscape composition

Approach

Aesthetics

Mmabolela takes the listener on a journey through composed soundscapes of this specific South African terrain via snapshots of the different sound worlds visited.

The term 'snapshots' as referred to here, has been derived from discussions with Jonty Harrison surrounding his piece Going / Places (Sheth, 2021). It refers to the creation of individual scenes or sound-worlds based upon place.

The purpose of this piece was to investigate ideas of perspective and space to create a narrative and to create a set of scenes that successfully transition between constructed images of a place. Recordings from different locations and times were combined to create scenes, dependent on characteristics such as spectral range, soundmarks, location, recording time and ambience (see Figure 1). The scenes were created to represent the

different types of contrasting terrains, biophonies and ecologies in different locations on the reserve. Wide panoramic soundscapes that recreate the three-dimensional listening space of the ambisonic microphone have been combined and layered with close-up stereo recordings and subtle details to create each scene.

The process of 'reconstructing scenes; messing with sounds using studio techniques; organising sounds according to their spectral or rhythmical content and, developing and re-developing sounds creates a new hyper-location or –reality' (Harrison, 2018). The reality of the recordings has been intervened or "messed with" by the composer and a new version of these sounds or soundscapes has been created through human intervention that does not exist in the real world.

The composition goes 'beyond the mere re-presentation and representation of the places' (Harrison, 2018) which is traditional of field recording based composition, to a traditional acousmatic approach that relies on the abstraction of sounds, although the sound material remains tied very strongly to place. These soundscapes only exist through my intervention as a composer and can only be heard through the playback of this piece on a loudspeaker system (one of the characteristics of acousmatic music Harrison suggests), reiterating this idea of a hyper-reality.

The contouring, shape and sense of drama created in the piece helped to create narrative, transition between spaces, and move the listener on from one image of a place to the next. Many of these transitions are climactic points in the piece, following the natural shaping of a recording or are moments that create dramatic changes in the soundscape. Much of the placement of sounds is based upon the original recording, for example in scene 4 the spatialisation of the flocking birds follows their original circular movement but has been enhanced and exaggerated using ambisonic spatialisation plug-ins.

Although the piece is episodic, these transitions and the use of extended recordings that overlap into each scene create an overarching structure and natural flow. This was not merely a set of individually structured sound worlds; this was a journey through the different spaces. The transitions between scenes are described in Table 1 below.

Scene	1. Birds		2. Cicadas & wind		3. Hippo & water		4. Flocking birds		
Scene Transition	1 – 2 (01:20)		2 – 3 (02:52)		3 – 4 (05:20)		4 – 5 (08:25)		
Transition Description	Fade in of new material		Sudden cut to hippo call		Fade out Filter sweep in		Close up bird call recordings used as transitional material		
Scene	5. Birds		6. Hippo & water		7. Wind		8. Frogs & hippo		
Scene Transition	5 – 6 (09:30)		6 – 7 (10:10)		7 – 8 (11:04)		8 – 9 (12:05)		
Transition Description	Close up bird and fly flying past recordings used as transitional material		Fade in of wind as longer section of transitional material		Natural contour curve of wind fades out and leads into frogs		Hippo call cuts off frog calls		

Table 1: Transitional Points in Mmabolela, ã Nikki Sheth, 2021

The creation of this constructed or synthetic soundscape immerses the listener deeper into the sounds, reflecting the emotion, intent and composer's choices to draw upon certain meaningful sounds. Truax suggests that the abstraction of sounds and creation of a 'virtual synthetic soundscape' (Truax, 2012) takes the listener from the surface level of an environment to 'the mental world of psychological and cultural associations, memories and symbolism provoked by those sounds, and then to the unbounded world of the imagination' (Truax, 2012). This statement truly reflects the nature of this composition.
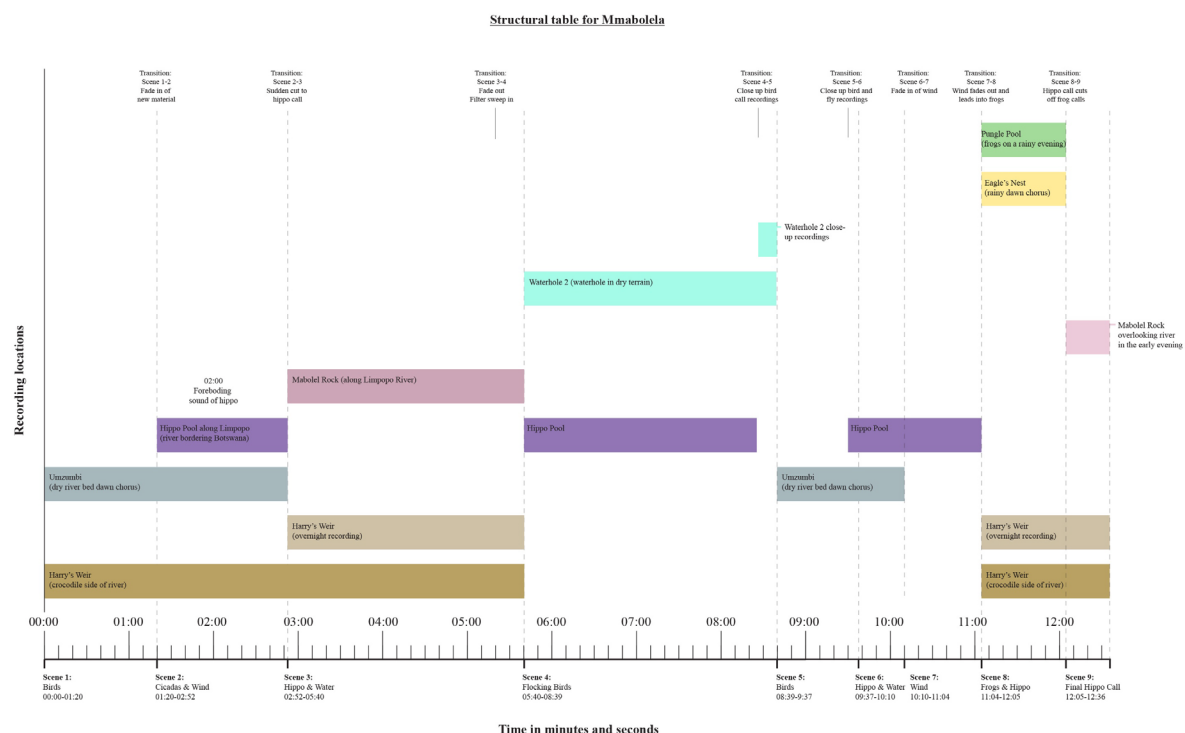
Figure 1: Structural Diagram for Mmabolela, ã Nikki Sheth, 2021

Workflow

For this work, recordings were taken in stereo and ambisonic formats, meaning the compositional approach took a hybrid approach. Ambisonics is the recording, manipulation and composition of naturally and artificially constructed three-dimensional sound-fields (Malham and Myatt, 1995). This recording technology allows high-definition recording of entire spherical information of soundscapes (Monnachi, 2016). Ambisonic encoding in B-format contains four channels, W, X, Y, Z which capture a 360-degree spherical image of the soundfield. This spatial information can then be decoded over loudspeaker arrays that fit into a dome making the piece portable over a range of speaker layouts. 'The higher the order of representation (high order ambisonics, or HOA), the greater the spatial resolution over a larger listening area' (Barrett, 2010).

Figure 2: Setting up the Sennheiser Ambeo VR Microphone, Umzumbi, South Africa, *Photo Credit: Alex Davies*

The Sennheiser Ambeo was used for ambisonic A format recordings. The Sennheiser Ambeo (a first order ambisonic microphone) has 4 cardioid microphones in the following A-format arrangement; 1: front-left-up [FLU], 2: front-right-down [FRD], 3: back-left-down [BLD], 4: back-right-up [BRU] (Sennheiser, 2020). Recordings were converted to B-format, converted to third order ambisonics and then decoded for 16 channels as this piece was composed in a 16-channel studio.

Figure 3: Recording in A Format with the Sennheiser Ambeo VR Microphone, Harry's Weir, South Africa, © *Nikki Sheth, 2017*

The stereo recordings for this piece were taken using two DPA microphones with the general approach being to position them 40cm away from each other in an AB stereo recording position (DPA Microphones, 2019) to get an accurate spatial image (also referred to as a spaced pair). The advantage of the DPA microphones is their flexibility when working in the field. The recordings were encoded, converted to third order ambisonics and decoded for 16 channels. The full workflow can be seen in Figure 4.
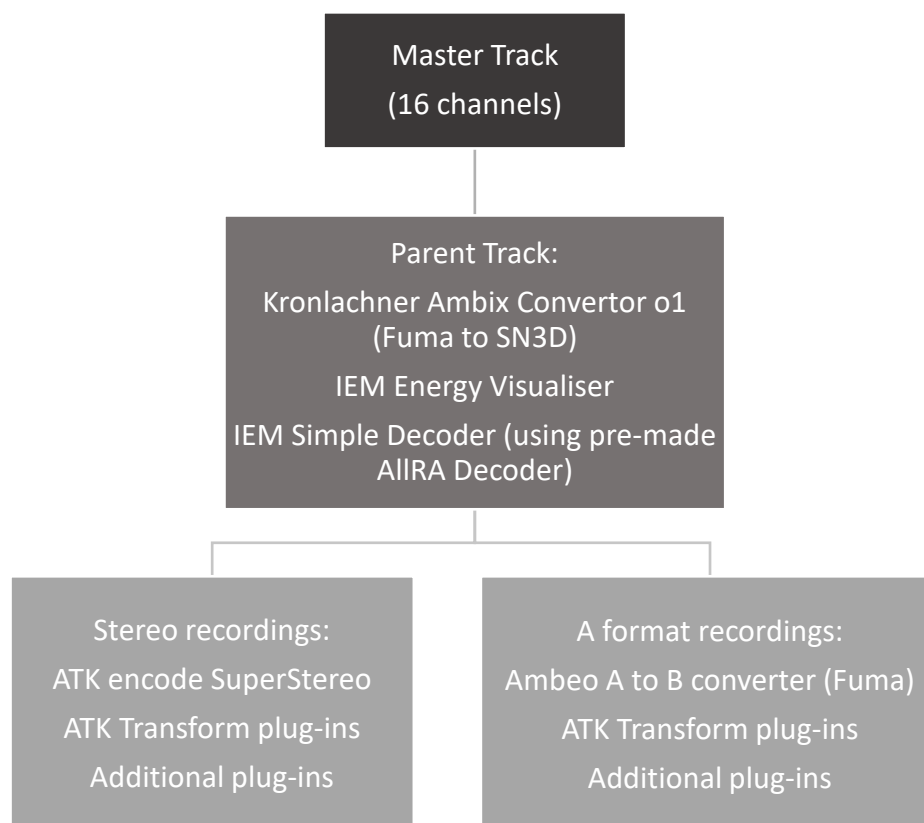
Figure 4: Ambisonic Workflow for Mmabolela 16 Channels, © *Nikki Sheth, 2021*

Recordings were decoded using the AllRA Decoder plug-in which allows the creation of customised speaker layouts (Figure 5). This can then be imported into the IEM Simple Decoder which decodes the sound into the 3D space created. The decoder was created using the specifications for BEAST (Birmingham ElectroAcoustic Sound Theatre) studio 1 which is where the piece was composed. (See Figures 6, 7 and Table 2.) The IEM Energy Visualiser

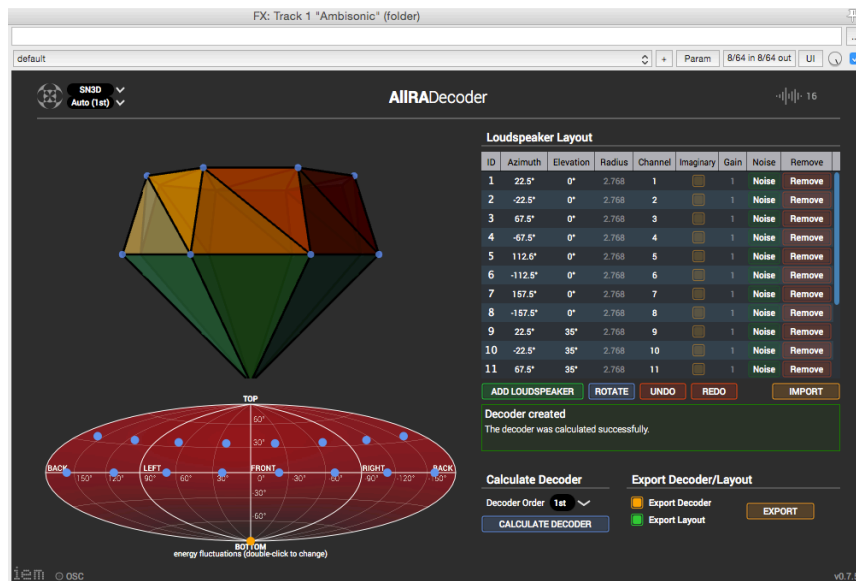was an essential tool in composing and fully visualising the 3D space when composing this piece.
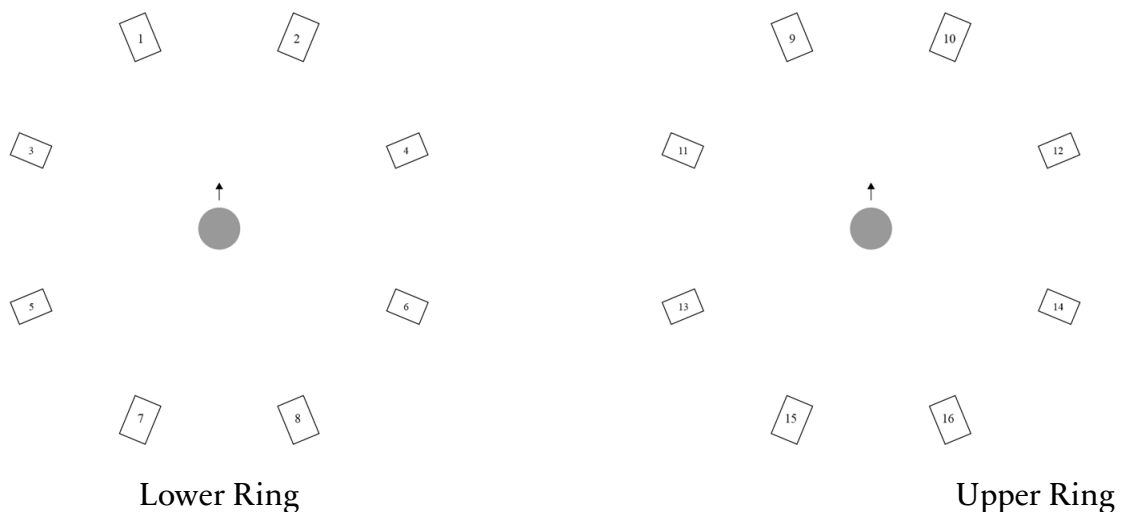

Figure 5: AllRA Decoder for First Order Ambisonics in 16 Channels for BEAST Studio 1, © Nikki Sheth, 2021

Lower Ring   Upper Ring

Figure 6: 16 Channel Loudspeaker Layout, © *Nikki Sheth, 2021*

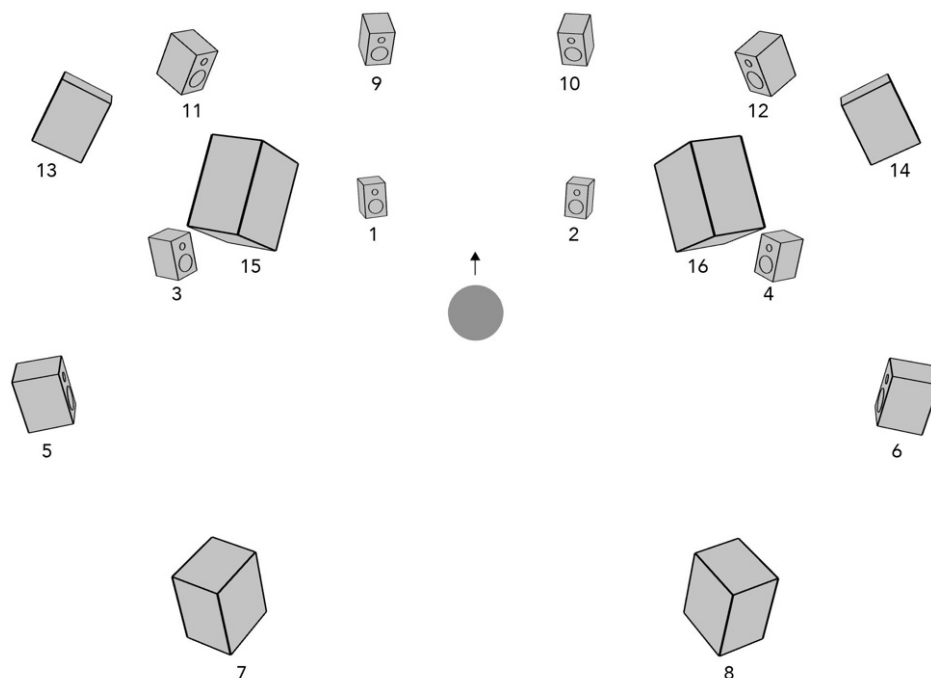| Speaker	Azimuth	Elevation
1	-22.5°	0°
2	22.5°	0°
3	-67.5°	0°
4	67.5°	0°
5	-112.5°	0°
6	112.5°	0°
7	-157.5°	0°
8	157.5°	0°
9	-22.5°	35°
10	22.5°	35°
11	-67.5°	35°
12	67.5°	35°
13	-112.5°	35°
14	112.5°	35°
15	-157.5°	35°
16	157.5°	35°

Table 2: 16 Channel Loudspeaker Positions

Figure 7: 3D Visualisation of 16 Channel Loudspeaker Layout, © Nikki Sheth, 2021

Conclusion

Aesthetically, *Mmabolela* has been a key work in my artistic journey. It was at the end of composing this work that I felt satisfied that I had found my voice as a composer and my original aesthetic, thus my unique contribution to the field. Through a balance between soundscape representation and musical abstraction, a hyper-reality is created which conveys a 'spirit of place' (Watson, 2020). The piece fits equally into acousmatic and soundscape traditions due to the dualities of these traditions that are apparent in the work.

This was my first work composed using third order ambisonics and by utilizing a hybrid approach to working with ambisonics I was able to explore the use of different perspectives as a compositional methodology. Ambisonic recording techniques were used to capture a wide panorama of a soundscape alongside the subtle layering of different perspectives heard through other microphones. These show the juxtaposition of perspectives through micro and macro worlds, internal and external sound worlds, and the use of ambient and detailed close-up spaces, allowing for a more engaging listening experience. This hybrid approach is one used very often in my work but is a compositional methodology that has

not been fully documented in the field. This documentation of my workflow for *Mmabolela* can be used as a compositional framework for other composers and artists.

The power of ambisonics is the creation of a fully immersive sound experience which has the potential for higher emotional impact and more compelling listening experiences. As Barrett states, 'A 3D acousmatic experience allows the listener to immediately enter the sound world as a tangible and real entity' (Barrett, 2010). Through this immersive listening experience, the listener engages with sounds of the natural world, and my wider aim of bringing a voice to the environment and using sound as a tool for ecological change through immersive listening experiences is realised. Having this hybrid approach to working with ambisonic and stereo recordings means there are no limits to presenting the work. It is portable and can be decoded to listen to on any system, leading to wider engagement with audiences.

In more universal terms I believe that the composition of this piece led to three main findings:

1) The use of mono, stereo and ambisonics in combination to create an immersive listening experience
2) Technical skills and understanding of ambisonics
3) Confidence in following my instincts and working with field recordings intuitively.

References

Barrett, N. 2010. *Ambisonics spatialisation and spatial ontology in an acousmatic context.* Proceedings from the Electroacoustic Music Studios conference. Shanghai, China.
DPA Microphones. 2019. *Stereo Recording Techniques and Setups.*
https://www.dpamicrophones.com/mic-university/stereo-recording-techniques-and-setups
Harrison, Jonty. 2018. *Interview with Jonty Harrison.* Interview by Niketa Sheth. In Sheth, Niketa. A Portfolio of Electroacoustic Compositions: Blurring the lines between Field Recording, Soundscape Composition and Acousmatic Music. PhD thesis, University of Birmingham, 2021.

Malham, David G. and Myatt, Anthony. 1995. *3-D Sound Spatialization using Ambisonic Techniques.* Computer Music Journal 19 (4): 58–70.

Monnachi, David. 2016. *A Philosophy of Eco-Acoustics in the Interdisciplinary Project "Fragments of Extinction".* In Bianchi, Frederick. Manzo, V.J. (Eds.). Environmental Sound Artists: In Their Own Words. New York, NY: Oxford University Press. pp. 159 – 168.

Sennheiser. 2020. *AMBEO VR Mic*. https://en-uk.sennheiser.com/microphone-3d-audio-ambeo-vr-mic

Sheth, Niketa. 2021. *A Portfolio of Electroacoustic Compositions: Blurring the lines between Field Recording, Soundscape Composition and Acousmatic Music.* PhD thesis, University of Birmingham.

Truax, Barry. 2012. *From soundscape documentation to soundscape composition*. Acoustics 2012 Nantes Conference, May 2012. Nantes, France.

Watson, Chris. 2020. *Chris Watson Website*. https://chriswatson.net/gallery/