Investigations into Music Composition in Surround Sound

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Master of Arts (Fine Art)
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Design and Social Context Portfolio
RMIT University Melbourne
August 2007
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TITLE
Investigations into Music Composition in Surround Sound

SUMMARY
This research project investigates the relationship between music composition, particularly electronic pop, and sound design (the editing/mixing of sound for cinema), with its main focus on Multi-channel (Surround Sound) techniques. It proposes new practices that extend music compositional tools into embracing spatial techniques employed by sound design. My research encompasses both the conceptual development (i.e., spatial techniques in creating narratives) and the practical issues relating to the production and technology needed for such works.
INCLUDED DVD

Disc Format: DVD Audio/Video Disc

Audio Format: Dolby 5.1

Body of work & track listing:

Work 1: Painting Monsters On Clouds

1. Output
2. Painting Monsters On Clouds
3. Devil Eyes
4. Watercolour

Work 2: Hybrid Works

5. Green Robin
6. Slow High Wide
7. 20 Minutes
8. Not On A Sunday
9. Maybe You Can Owe Me

The two bodies of work produced within this Masters program are presented on the same disc.

Playback requirements:

• DVD player with Dolby Surround playback.
• Amplifier with Dolby Surround decoding
• 6 speakers in the 5.1 configuration (Front Right, Centre, Front Left, Rear Left, Rear Right and a subwoofer for Low Frequency Effects).
INTRODUCTION

Surround Sound, using any more than two speakers in a configuration that surrounds the listener, is a technique that is most commonly found in cinema and theatre. Outside of the visual narrative, this technique is mainly used by composers practicing in experimental genres. Pop music has dabbled with these ideas, but using space as a compositional element, one that plays a role equal to melody, pitch, dynamics, tempo and rhythm, is quite rare. At present, pop music in surround sound is merely a token effort for many artists. Of the few pop artists who release music in a surround format, most are top 40 performers. These formats are: DVD video\(^1\), DVD-Audio\(^2\) and Super Audio Compact Disc\(^3\).

Many surround mixes follow a quick, rigid method and usually do not involve the artist or original producer. Due to surround mixes being merely afterthoughts, or as a chance to satisfy the audiophiles, these versions have little or no attachment to the narratives of the songs and have no real spatial rationale as to three dimensional placement or movement of sound. The outcome usually follows the standard procedure of using the surround speakers as an effect for vocals\(^4\) or expanding the stereo field from 180° to 360°\(^5\). Although these methods are technically in surround, they don’t take advantage of the extra four speakers to enhance the listener’s comprehension of the songs.

Technology and consumer pricing for surround sound systems has been very accessible for the past 4 years. With this in mind, I find it surprising how little investigation into this area has been undertaken and how few bodies of work have been produced.

The goal of my research was to investigate two main areas:

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\(^1\) The most popular consumer format used to store digital video and multiple sound formats (including surround) on a DVD.

\(^2\) A digital format for delivering very high fidelity, multi-channel audio on a DVD.

\(^3\) Also known as SACD is a digital format for delivering very high fidelity, multi-channel audio on a compact disc.

\(^4\) At the time of my initial investigation, two of the best selling surround disc’s were Destiny’s Child, Survivor, DVD Audio (2001), The Corrs, In Blue, DVD Audio (2000). Both use the surround channels for simple vocal enhancement and little for the music.

\(^5\) A technique where the extremities in a stereo mix are placed in the rear speakers and the centre (mono) image (usually vocals) is placed in the centre speaker. A slightly delayed centre image is then placed subtly in the rear speakers to give the vocals extra dimension. Examples include Bjork, Greatest Hits (2003), Britney Spears, In The Zone (2004).
How can space (Surround Sound) be used as a compositional element?

How does working with space change the compositional process, if at all?

The investigation lead to 2 collections of music in the form of a Multi-channel (surround sound) DVD Audio disc. The works investigate the relationship between music and space, using spatial techniques\(^6\) to explore/enhance compositional structures in music. Particular emphasis was given to electronic-pop music and its aesthetic links to contemporary, experimental, electronic music and sound.

The first phase of this program, titled “Electronic surround sound composition”, is purely concerned with researching techniques employed by both sides of my references – the compositional structures used by modern pop and instrumental music, and then the psycho-acoustic ideas used in contemporary Electronic Sound Art\(^7\) – in particular works in Surround. The outcome of this phase, lead to my first body of work, “Painting Monsters on Clouds”.

The second phase, purely a technical outcome, was exploring recording methods with a surround sound outcome. This phase, titled “Surround Sound recording” was a short but important stage with one practical outcome, a four-minute composition and recording.

The third phase, titled “Hybrid Techniques”, was a chance to consolidate all techniques learned and with a deeper knowledge, expand on these ideas. The outcome of this phase (as well as phase 2) became the body of work titled “Hybrid Works”.

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\(^6\) Most techniques originate from cinema. Michel Chion and Anahid Kassabian in their texts have referred to sound mix techniques and spatial ideas used in film, see Chion 1994, Kassabian 2001. Bruce Emery, as a spokesman for Dolby Laboratories, discussed the history and most common uses during a session at Cinesonic 3 (soundtrack Festival, Melbourne 2000) - later published in Cinesonic 3, see Brophy 2000.

\(^7\) Ideas regarding the human perception of sound explored by the loosely associated group of art practices that concern sound and listening as their focus, derived from non-musical origins.
The resulting two works of my Masters program represent the exploration of pop music compositions in space and incorporate experimentation with genres such as electronica, rock, folk music and abstract genres linked to the practice of music software manipulation and creation. It focuses on the digital manipulation of the recorded material to not only enhance the natural spatial environment but to also create new environments that have, until now, been impossible to create. With the use of software, specifically object orientated programming tools, coupled with three-dimensional recording techniques (multi microphone placement), my music was extruded into the three dimensional realm.

This document is to accompany the works on DVD Audio disc and is not to be taken as my Masters Project but rather an addition that explains my methods, concepts and understanding of the works produced. I have documented the making in a general manner, highlighting only key processes relevant to the project topic. Although I believe certain creative and technical methods may extend to other artists, I must make clear that all ideas and findings within in this document are relevant only to my work as an artist.
Spatial techniques in recorded music began simply as a way to create differences in volume and presence. The further an object is away from the listener, the quieter it is. The closer it is, the louder it will be perceived. Early mono, single-track (single take) recordings use this technique simply to put every instrument in its desired position. The Artist or Producer’s desired position for a voice or instrument is usually influenced by the nature and narrative of the song being recorded. The perfect example of how these simple ideas can be utilized is in the early work of Duke Ellington from 1927-1951. In these works, complex mixes are made purely from the positions of the performers within the recording space. A sad song would place the heart-broken and very delicately played muted trumpet very close to the mic, giving the listener a sense of being inside the “headspace” of the sad subject of the narrative. Other instruments that play a role of support but are external to the immediate “headspace” are placed further away.

Medieval and Renaissance sacred music relied heavily on the composers’ knowledge and understanding of the spaces that their music was performed in. The complex, natural reverberation and echoes that the churches and cathedrals have would effect music in particular ways. This resulted in composers writing songs specifically for their space. In this case, the space would effect the composition.

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8 This concept is called Volume constancy and is analogous to Size Constancy
9 Duke Ellington, 1899-1974, an American composer, pianist and band leader. He is one of the most influential composers of the 20th Century, as well as a pioneer in early music recording techniques.
10 Medieval Music encompasses European Music written during the Middle Ages, 476-1400 AD. It was mostly written and performed for church institutions.
11 Renaissance sacred music is European music written between 1400 – 1600 and the sacred music composed during this period was composed for the Roman Catholic Church.
Almost 60 years ago, Pierre Schaeffer opened up the possibility to composers that the sound material itself can shape its musical construction. This challenged the traditional western idea, that all music can be measured, notated and exist in the composer’s mind before any production. Schaeffer’s ideas also offered an organic approach that opens up the idea of composing to many other variables – and this is precisely what his movement, *musique concrète*, dealt with. Most of the composers working within the movement composed and/or performed in surround, diffusion setups. Most notably among these is Bernard Parmegiani, whose sophisticated spatial techniques lead to compositions never translated onto record or CD, as it’s shape was purely dependant on the 360° panorama.
TECHNICAL

Very early on in my research I had chosen my surround format to be Dolby 5.1\textsuperscript{12}. It is the most obvious choice as it meant my work could quickly be translated to DVD Video or Audio disc, thus making my mixes portable, and complying to a standard that could also translate to a commercial release. 5.1 setups are also common to public places and homes and can also be translated to listening environments such as cinemas without any problem, thus giving any outcome a possible audience that wouldn’t be available in another format.

Other formats investigated were Dolby 7.2, quadraphonic and specialized diffusion setups such as 16 to 32 speakers. Although an early experiment with a 16-speaker setup yielded very interesting results, it confined any musical outcome to a similar controlled setup, which contradicted my original plans of making surround sound pop more accessible.

Equipment used for the production of works through the course of this program is detailed in their respective phases, however the surround monitoring setup remained consistent throughout. This setup included:

Monitors (speakers):
2 x Genelec 1031 Bi-amplified Nearfield monitors (for Front Left and Right)
3 x Genelec 1029 Bi-amplified Nearfield monitors (for Centre, Rear Left and Right)
1 x Welling 12” powered Sub for Low Frequency effects.

Surround Monitor Controller:
SPL 5.1 Surround Controller Model 2489.

\textsuperscript{12} The configuration of Front Left, Front Right, Front Centre, Rear Left, Rear Right and LFE (Low Frequency Effects or Sub Bass Speaker).
PHASE 1: ELECTRONIC SURROUND SOUND COMPOSITION

Overview

Two questions seemed to encapsulate all issues with translating my music composition into surround. “What” and “why”? What would happen to my music if I were to write with 6 speakers? Would it change? And if so, why? While it’s quite easy to deal with the “what” and interpret the changes that can occur in my music when translated to the surround realm, it’s the “why” that I’m most interested in as it’s not only a difficult question to answer but it addresses the fundamental reason myself and other artists feel the urge to work in this medium.

Surround is mainly considered a “performance” technique that differs from compositional techniques. I feel this is simply one very narrow use and I shall challenge this belief by showing that composition can be inextricably linked to the space that it is composed in – in this case, a controlled environment based around Dolby 5.1. With this in mind I will look at how this “space” can extend the compositional structure.

Achieving this is a simple process of changing one variable in my writing processes – adding 4 more speakers to my stereo setup. As mentioned earlier, my preferred setup was Dolby 5.1. Using all six speakers at the time of writing and composing is essential, as I do not want to differentiate the mixing and composing process. This process is not new, musique concrète and other experimental movements dealt with this idea over 50 years ago, however the musical focus was the electroacoustic genre that didn’t deal with traditional methods of Western music, such as keys, modes, rhythm, tempo etc. I am very attracted to Pierre Schaeffer’s idea that the sound material itself shapes the composition, discounting the traditional Western idea that all music can be scored. I am certain that with the addition of this space, the possibilities of composition are extended in ways that cannot be described by typical notation, and composing in surround can directly influence the nature of the compositions.
**Technical**

Choosing a Digital Audio Workstation\(^{13}\) required a program that could work well in a compositional setting and have the ability to mix within surround. I chose Apple/Emagic Logic\(^{14}\). The standard use of Protools\(^{15}\) was another option for some time, but it’s lack of a modifiable midi environment and no real compositional tools (such as a scoring environment) made it difficult for me to write and produce the customizable midi routing needed for many of the more conceptual based surround effects. Logic has the ability to program one’s own environment and build objects that were useful for combining what, in most DAWS, are two very different functions.

I then also chose Plogue Bidule\(^{16}\) and Reaktor \(^{17}\) as spatial “assistants” as they can be programmed and used as plug-ins within Logic.

Microphones:

AKG C414 - multi pattern, large diaphragm condenser microphone. Good on all sources.

Røde – NT4 – XY stereo small diaphragm condenser. This mic was used for its pure ease and ability to be taken on portable trips. Good on all sources, especially good in large spaces.

The AD and DA conversion and preamps were handled by a MOTU 828mkII.

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\(^{13}\) Also referred to as DAW, is a software/hardware configuration designed to record, edit and playback digital audio.

\(^{14}\) Multi-track audio and Midi editing software. Acquired by Apple Inc, Cupertino CA, USA, in 2002, Logic is an Audio program originally developed by the German Company Emagic, Hamburg Germany, in 1990.

\(^{15}\) The Multitrack-Audio software produced by Digidesign, Daly City, CA USA, in 1991

\(^{16}\) A modular audio/midi programming environment based on patchable cables. Developed by Plogue, Montreal Qc Canada in 2001

\(^{17}\) A modular audio/midi programming environment based on patchable cables. Developed by Native Instruments, Berlin Germany in 1996.
Explorations & Findings

Like all new things, when first working in surround sound, I found myself exploring all obvious possibilities. Panning sounds in constant rotation in the 360° panorama, adding delay to the rear speakers and other simple tricks were employed to emphasize the immersive nature of this setup. After the novelty began to wear thin, the use of the surround speakers began to take on more sophisticated roles.

Although there is the panorama of 360° to work with, and the focal point can literally be anywhere, I found it hard to not work with the notion of “front” and “back”. Working with this duality allowed compositions to transcend some of the more literal structures I’ve worked with in the past. For example, I found in a lot of these songs that the front dealt with blatant ideas (those which have an obvious purpose within the compositional structure of the song) and the rear dealt with latent ideas (abstract and subconscious elements that have more of an emotional effect on the song rather than a direct influence on the structure). This idea surfaces in all the works to varying degrees and in the next two phases patterns begin to emerge. This is discussed further in the individual composition documentation and then summarized in the last chapter.

Composition: Output

My first composition in surround “Output” is about finding beauty in waste, and highlighted sounds that would otherwise be “ugly” by setting them up against more traditional sounds that have defined “musical” properties in a traditional sense. The composition begins with simple reorganization of sounds that began as byproducts from other sources, such as processed off-cuts of raw sound design sources from films I worked on, to distorted feedback accidents that occurred while writing other pieces. Over time, two very traditional instruments come in to contrast the “ugly” sounds - a baritone guitar and a Fender Rhodes electric piano. The contrast does the opposite to what one would expect, it gives the “ugly” sounds a purpose by giving them the role of the foundation of the
track until eventually these traditional instruments mimic themes expressed by the “ugly” sounds. The key is intentionally ambiguous. It weaves between a major and minor key highlighting the push and pull between the two groups of sounds.

Instinctively, the two groups of sounds felt good spatially separated. The “ugly” sounds sitting mostly in the rear speakers and the “nice” sounds sitting mostly in the front speakers. This duality feels quite good and sonically balances what would otherwise be unrelated sounds. The two groups sometimes cross-over and there are even points where the composition rises and dramatically peaks where the two reverse roles and play each other’s parts.

The surround/panning process of this song was executed mainly from stereo sources that were weighted to sit either at the front or the back. The programmed drum machine, that begins a third into the song, crosses this equator and challenges the dual stereo nature of the track. Its manic, jazz style shuffle begins to reach out across the 360° panorama where a random, distorted percussive sound will find itself positioned in the rear speakers. This random placement was performed with a joystick, mapping the X-Y coordinates, and it’s role was to draw attention to these sounds suggesting that the clean drum kit was actually created from the distorted, digitally manipulated “ugly” sounds. Eventually, a “bubbling soup”, a texture inherent to the manipulated sounds of the rear, engulfs the track. This “soup” eventually crosses over to the front and with a custom made patch in the program Plogue Bidule, the texture is randomly shuffled between each of the main quad speakers. Eventually the sound rises and completely obscures all others creating a quadraphonic effect that is extremely immersive.

Could this composition have been written in a stereo or mono realm? In comparison to my non-surround composed pieces, there is an obvious duality present where two groups of sound play with each other and engage in a conversation. This duality is very much separated into “front” and “back”, where “front” has taken on board the more traditional instruments and the “back” has embraced the

18 Front Left, Front Right, Rear Left, Rear Right
unconventional sounds. This concept finds itself in all of my works throughout the duration of this program and is explored further in both this and the third phase.

**Composition: Painting Monsters On Clouds**

This piece of music began a life far removed from the finished product. The chord progression was written and recorded on acoustic guitar to be used as a standalone song. Initially, this piece of music was not part of the surround project. Eager to use new patches I had written in Plogue Bidule, I started processing these acoustic guitar recordings. Instantly, these experiments lead the way to a new track.

The Bidule patches used in this track were my first attempts at using granular synthesis in surround. Granular synthesis is a technique that takes an incoming audio signal and splits the sound into very small pieces (1-60 milliseconds in length). These pieces, called grains, can then be re-arranged, layered and played back at different speeds, phase or volume. In this case, my patches were about spreading the grains across all 4 main speakers (Front Left / Right and Rear Left / Right) so at no point did the same grain play in anymore than one speaker. The effect is very immersive and certainly not subtle. After continued refining of the patch, the effect began taking on very ‘pastoral’ qualities for me. The longer I heard it, the more organic it became. Although it has a digital, distorted quality to it, its effect on me was similar to that of a string section. As I rearranged the guitar parts, I slowly began assembling a piece of music that resembled composers such as Webern and Stravinsky. This process was not intentional but rather an arrangement reaction to the spatial effect I was experiencing. The song slowly became anthemic and I began treating this processing like an orchestra, giving certain processed sounds roles, such as string sections, bass sections etc.

Feeling the need to expand on the “pastoral” qualities that song was taking on, I started playing along
to it with a dulcimer. The epic nature of the track, instantly lead to more instruments such as baritone guitar, sampled drums, acoustic guitar and many synthesizers. Rather than combining all elements, I kept the original granular guitar processing as a separate part, the introduction, which may also be called an Overture, as it contains all the movements that will then be expanded upon in the second, more developed section.

I felt the second section should develop the themes presented in the first with more conventional instruments but continue the immersive effect through surround placement rather than processing. The drums used in the track were from a stereo recording I made during a rehearsal of a band I was in a few years earlier. As I liked the lo-fidelity quality of the recording, but needed to bring it into the surround realm, I tried a simple technique of playing back the original recording in my studio and rerecordings this with 4 microphones in a standard quadraphonic placement, Front Left, Front Right, Rear Left, Rear Right all at equal distance. Placing the drums 1/3rd into mix meant placing the speakers 1/3rd back into the room. It was simple yet worked by giving the drums a three dimensional quality. Some more experiments in surround granular synthesis occurred mainly as a “distortion” effect, particularly on the drums and certain notes on the dulcimer. Instruments recorded with a Microphone were recorded in stereo and all directly recorded instruments, various synthesizers, were recorded in mono or stereo. These recording were then applied to the surround realm by giving them a space to occupy in the 360º panorama. Additional Bidule patches were applied to these recordings to add spatial depth. These included artificial techniques, such as the Doppler Effect and simple surround diffusion.

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19 A stringed instrument played with hammers
20 Frequencies (pitch) descending as objects move further away. Noticeable in a passing siren.
21 Spreading sounds over multiple speakers through use of movement, reverb, delay and other effects that cause sound to emanate from a number of sources.
**Composition: Devil Eyes**

With a patch written in Plogue Bidule, I created an instrument that allowed me to do real-time sound splicing, playback and spatial manipulation. The original idea behind this song was to create something quickly that wasn’t labored, giving myself 20 minutes to record the essence of the piece. Once again, a choice was made to write this track on one instrument. I used a steel string acoustic guitar. A 10-minute, mono, live improvised recording was fed into Plogue Bidule. The patch this was now sitting in allowed me to very quickly find parts of audio I liked by using a midi keyboard and 4 midi sliders. Slider one, controlled playback position. Two, controlled length. Three, controlled pitch and four, controlled angle (0-360° in the surround field). When a sound was chosen it was assigned to a key on the midi keyboard.

Up until this point, surround use of the speakers was very fluid. The movement and positions of instruments was dependant on the effect off all four speakers indicating where a sound source is. Because, in this case, the source of sound was a mono recording of a guitar, all attempts at using spatialisation techniques employed in previous efforts lead to the guitar sounding very one dimensional in a three dimensional environment. So I set out to treat each speaker discreetly. Each sound would sit in only one speaker. This idea instantly made the compositional side exciting. Finding similarly performed guitar parts and placing them in different speakers was such a simple yet undiscovered effect for me. Although parts sounded similar the differences in the performance lead to dynamic spatialisation that all techniques at this stage hadn’t been able to do. Within the 20 minutes a rather dramatic piece of music was written.

Having the foundation there, other instruments, such as piano, synth, percussion and bass were recorded at a similar speed to support the guitar parts. These instruments were recorded in stereo and panned drastically to help with the dramatic effect of the song.

To break up the structure that the song was taking, I hoped to introduce a new sound that would
challenge the listener both sonically and spatially. I was interested in voice yet couldn’t find the right way to make it work, so using a synth with heavy Vowel filtering (or sometimes known as “formant”), I found an effect that fitted very nicely. This sound when placed in the front centre speaker has the effect of someone speaking directly to the listener. Yet being a completely synthetic sound, it contained an eeriness that somehow feels like a cry of pain. Up until this point, the centre speaker had not been used. Due to the “flat and direct” positioning of it, the sound pierces through the mix and can be quite shocking at first.

The narrative behind this piece was derived from a shared household, where I witnessed the disintegration of a couple’s relationship. As tension increased, a few uncharacteristic moments lead to violent outbursts. These events affected a sensitive pet of ours who developed quite a nervous reaction to any display of aggression.

The spatial adaptation of the narrative was taken fairly simply. Overall, I was looking for a spatial technique that put the listener in the middle of the action taking place (represented by the music), providing our pet's, perspective. This immersion would have to go through a few rounds, or movements of intense assault, where the technique builds and breaks down a number of times. Eventually, at a predictable moment where it feels it should peak again, a voice, in this case “the cat”, is introduced providing a melodic line that is one of pure reaction and sadness. Placing this in the front centre speaker gave it the right treatment, as it put the sound in the realm of the narrator, giving it a lot of weight and emphasized it’s vocal, yet very emotional quality.
**Composition: Watercolour**

The pastoral qualities explored in “Painting Monsters” began taking a life of their own. Many of the Plogue Bidule programs/patches developed for that track could easily be applied to anything I was working on to give the same immersive effect. For “Watercolour” I set out to explore the electronic, surround manipulation of acoustic instruments and field recordings using these patches as a foundation.

A recently acquired vintage wind organ became the source of much experimentation. Working with the granular synthesis technique used in “Painting Monsters on Clouds” I found using larger grains (50ms – 800ms audio chunks) to be quite useful in retaining the qualities of the instrument I liked whilst still allowing dramatic spatialisation of the sound. Much like the last few compositions, I set out on writing a piece of music on one instrument and then take that as a starting point to re-edit, process and layer with more instruments.

The title “Watercolour” was given very early on to the project as I found it a good way to describe the “bleeding” effect caused by the granular synthesis patch used a lot on this track. As layers began to build, a strong duality between the front and rear began to emerge. The front dealt with the cleaner, unprocessed sounds while the back held most of the processed, “bleeding” sounds. Although beginning as an unintentional method, it eventually gave me scope to explore these “bleeding”, processed methods without too much intrusion on the backbone of the song happening in the front speakers.

Personally, this song was a reaction to a particular event in my life and one of my goals for this piece was to create a “beautiful kind of tension”. It needed to be full of nervous energy but still have an underlying positive quality. The frantic acoustic drums hold a strong rhythm, providing the energy needed. I then built a patch in Plogue Bidule to change its 360º panoramic surround placement according to the volume of its performance. This gave dynamics to the surround aspect of the song,
which in turn multiplied the energy in that section. The acoustic guitars in this section sat fairly naturally in the front with two guitars occupying the Front Left and Right speakers. For the Rear speakers, these guitars were fed through a similar Plogue Bidule patch that was used on the Wind Organ but modified slightly so it had more of a constant delay effect with some random glitches. These glitches were a result of the delayed guitar playback being reversed very quickly and triggered at a random rate.

The song builds with this nervous energy until it eventually opens up into a dramatic movement where it then tries to reverse and speed up, jumps into double time (2 x tempo), transposes everything up seven semitones and then plays the chord progression backwards. A reverse in surround placement compliments this move with most objects shifting by 180° in the surround panorama. To add to the shift in sensation, some off the sounds such as wind organ and guitar are reversed and processed very heavily, making them distorted and unrecognisable. An additional instrument, a drum machine, is added to hold it all together until it eventually breaks down again. The track begins to rebuild itself with the original sonic elements used earlier within the song, but now it sits in between two keys and has a melody that seems confused. The song breaks down before it really had a chance to build to full capacity and the processed field recordings of vehicles speed off into the distance.

The spatial effect of the last 2 minutes, coupled with the dramatic composition, throws the listener back and forth, providing moments of progression followed abruptly by moments of regression. The phrase “Two steps forward and one step back” became the template for all spatial and arrangement decisions as the song is about the positive, yet sometimes, regressive nature of relationships.
PHASE 2: SURROUND SOUND RECORDING

Overview

Gaining experience and a chance to experiment in recording with surround sound techniques is simply the aim of this phase. A musical outcome, if any, was not a point of focus. Like stereo recording, surround recording uses multiple microphones in different placements. I wanted to explore both simple direction and position placement, through to advanced spatial recording methods such as ms (middle-side)\textsuperscript{22} techniques.

This is a purely technical phase.

Technical

With a list of microphones too big to mention, my own and borrowed resources slowly became narrowed down to a handful of mics, employed for their differentiating characteristics and many spatial uses:

- Microtech Gefell UMT70s, multi pattern, large diaphragm condenser microphone. This was chosen mainly for its amazing clarity and ability to describe distance in extreme detail. Good on all sources, especially useful for stringed instruments.

- AKG C414 - multi pattern, large diaphragm condenser microphone. Versatile but mainly chosen for it’s many patterns (shape and space of it’s recording field). This characteristic becomes very important when using more than 2 mics as I find out later. Good on all sources.

- Beyer Dynamic – M260 - Hypercardioid ribbon mic. Chosen mainly for its warmth, the M260 is a deep, organic sounding mic that was mainly chosen for its contrast to all the other “crisp” cardioids.

\textsuperscript{22} The MS microphone (Mid-Side) technique requires 2 microphones in the same position. One is a bidirectional microphone (Side Mic), facing sideways to the desired centre point of the recording and the other a cardioid, pointing towards the focal point. The left and right channels are produced through a simple matrix: Left = Mid + Side, Right = Mid - Side (the polarity-reversed side-signal).
Suitable on most sources but excels on voice and wind instruments.

- Røde – NT4 – XY stereo small diaphragm condenser. Being and XY configuration means each mic has two capsules 90º apart. So simply, two NT4s can record in quadraphonic capturing 360º. This mic was used for its pure ease and ability to be taken on portable trips. It is good on all sources, especially good in large spaces.

- Shure – SM57 - dynamic, cardioid mic. Chosen for its flatness and richness when recording from sources that are amplified.

**Explorations & Findings**

Although only one musical outcome was conceived during this phase, much time was taken experimenting and listening. The exploration process and findings are present in the description of the composition of the song “Green Robin”.

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**Composition: Green Robin**

Although the first 20 seconds begins with very processed sounds, the song, except for two synth lines, was recorded entirely with acoustic instruments. All instruments were recorded in the same room and performed by either me, or musician Stina Thomas. I wanted the song to sound live and give the illusion that all the instruments were played simultaneously by a group of musicians. The obvious way to create a live room sound recording was to simply keep 4 or more microphones in static positions, and rather than move microphones around, move the instruments and musicians to position them as if they were all in the same room at once. Although these recordings sounded very spacious and very immersive, they somehow felt quite “staged”. Mid frequencies from 600Hz to 1.5kHz were heightened when all of these instruments were mixed together. Lowering these frequencies in the whole mix or individual instruments did not seem to solve the problem. The recordings sounded very bulky and uncomfortable. I then tried close-miking each instrument and placed them in the surround panorama later, by subtly raising or lowering the individual levels of the 4
microphones. Once again the effect felt quite false. Although the surround element was effective, my original idea of it sounding like a live recording was not conveyed through this method. Returning to the original static mic placement plan, I tried a different technique – two sets of MS pairs. Using one pair at the front of the room and another pair in line at the back, new recordings were made and when summed together the mid frequency accumulation I had with the other technique disappeared. The recording sounded very real when all tracks were combined and managed to describe the space it was recorded in very well.

With the recording technique set, the composition was to be completely based on the instruments that were available: flute, piano, acoustic guitar, violin, drum-kit, synthesizer, various percussion and a Fender Rhodes electric piano. Unlike previous recordings, the performance space played an integral role in the composition. The space was a basement that was approximately 5 metres by 5 metres that had acoustic treatment, giving the room a very dry, non-reflective quality, yet “live” enough to sound like a real space. The desirable sound of the flutes “swirling” around in the space, lead to them being the main instrument to build upon. The playful experience of taking such an approach effected the composition. Immediately, a sense of playfulness, through the chord progressions, played by guitar and piano, began to shape the composition. Eventually, many takes of all the instruments were recorded. Although the exact arrangement had not been determined, all possible parts were recorded and brought back into the studio. Performing different guitar parts, four in total, in different parts of the room, lead to interesting compositional tactics. What would usually be played by one guitar was divided into four guitar parts and then played in extremities of the room. This gave them a lot of distance from one another, placing them as much as possible in each of the four speakers. As this gradual build progressed, a strong tune emerged with the addition of each instrument.

Once all parts were recorded and taken back to my studio, a curiosity to do “harsh” editing and the
the use of “looping” techniques used in my previous electronic works got the better of me. Although this removed the work from the original “live” performance intended, it made the song fall more into the line of my aesthetic, whilst still retaining all the qualities of the recording technique. This ‘glitch’ post-production technique progressed a little further with the addition of an electronically processed introduction that took elements of the original guitar recordings and used them as a source to investigate how these multi-channel recordings can be manipulated. Another additional post-production technique was added to the ending, a recording of an old portable turntable and the EQ effect on one of the synths to make it sound as if it were coming from the turntable.
PHASE 3: HYBRID TECHNIQUES

Overview

With 18 months of experience working in surround, my practice, ideas and methods were becoming firmer and better articulated. Technically, my ability to program any kind of surround configuration, and my experience with programs such as Plogue Bidule, allowed me to feel confident in carrying out any spatialisation ideas conceivable with a six-speaker setup. Phase 3 began with the simple premise of fusing my studio recording technique with the digital manipulation and surround experiments learnt in Phase 1. This Phase was a culmination of all techniques used up until this point.

Although the backbone of this phase was based on previously executed techniques, experimentation an extension of these methods would allow my compositions to grow and explore new routes. A special consideration for traditional music theory allowed for advanced compositions that could extend the compositional confines of the previous two phases.

This phase resulted in over 10 pieces that totaled over an hour of music. When consolidating the pieces to present as one finished work, it became necessary not to include everything, but to focus on key explorations that detailed this process in a clear and musical way. With the inclusion of the piece “Green Robin” from phase 2, the second body of work for my MA research resulted in five pieces with a duration of 30 minutes.
**Technical**

The 5.1 setup was used again to carry out this phase. A combination of Logic and Ableton Live\(^{23}\) provided the perfect environment to extend my writing technique. Ableton Live is not generally capable of a surround output, but with extensive programming in Plogue Bidule, I was able to integrate a surround-mixing environment into the system. Advantages of using Live were felt quite strongly in this phase, mainly for it’s extreme ability to record and manipulate sound in a very quick and unique fashion.

The program, Plogue Bidule, became the backbone, once again, for all the complex and spatial manipulation.

The Microphone list used in this phase is identical to that of Phase 2 with the addition of:
- CAD 7000 Ribbon mic, a figure 8, Ribbon Mic. This was chosen mainly for warmth and it's "retro" qualities. It has the ability to sound 1960’s and is very good for taking the sheen off bright sources such as string instruments.

Another new addition was four new preamps. Preamps are electronic amplifiers that amplify low-level signals, such as microphones and the line level signal from computers. Preamps generally add “colour” to sound. In this case I was using Neve 1290 preamps from the 1970’s. These are very coloured sounding preamps i.e. they change the sound quality and frequency spectrum while adding warmth in the form of slight harmonic distortion. These preamps were used mainly to power microphones but in some cases, whole mixes were passed through them to take off the digital edge and imprint an analogue quality.

AD and DA conversion was handled by 2 units, a RME Fireface 800, in the studio and a RME Fireface 400, for location and portable recording.

\(^{23}\) A modular audio and midi program developed initially for live computer based musical performance by the company Ableton, Berlin Germany, in 2001
**Explorations & findings**

The main goals for this phase were to consolidate all techniques learned and extend upon them. My initial explorations began very simply by replicating past experiments in Phase 1 with the addition of multi-channel acoustic recordings learnt in Phase 2. Early during this phase, a shift to composing in the software package Ableton Live resulted in experimentation and techniques that had not been considered previous to this move. Most of this was due to the modular architecture of Live and the extreme manipulation possibilities that its sound engine offers\(^ {24}\).

The duality of Front and Back, first encountered in phase one, becomes even more evident in this phase. The method, once subconscious, now becomes the foundation for all of my pieces, informing more than just spatial manipulation. It affects the choice of instruments and sounds, the kind of roles they play, and most importantly, the character and themes for the piece.

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**Composition: Slow High Wide**

With a strong experience in electronic/software processing and Surround, acoustic recording, I set out to write something that intrinsically relied on both. A strong fascination with irregular rhythms and unusual time signatures lead me to the composer Louis Hardin’s (also credited as Moondog) work. Throughout 50’s and 60’s Hardin worked with small ensembles that would sit in circles and work with repeated melodies that were traded in a clockwise fashion. Usually, each musician would enter soon after the last started, often playing exactly the same or variations of the previous part. The result would be similar to a canon with a very complex counterpoint. Exploring this idea in a surround sound environment would indeed take this idea one step further.

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\(^{24}\) A detailed description of Ableton Live’s sound engine features can be found here: http://www.ableton.com/live
The theme initially developed for this piece was working with fragments of a different nature to produce a whole. Emotionally, the tone of the song is quite sinister and pessimistic. This came from the original lyrics and ideas that were written for the piece. Lyrically, the song was a dire vision of our future by looking at fragments from past and present. At the risk of sounding too literal, I randomly removed parts of text and was left with fragments that became a small cycle of words that fit nicely to the canon/rounds themes mentioned earlier. Although the original meaning is lost, as the theme suggests, I wanted the fragments to create an overall emotional tone that embodied the original ideas.

Having access to a harpsichord was an opportunity I couldn’t pass and this song was the perfect testing ground for it. The harpsichord was recorded with the dual MS method (as used in “Green Robin”) with one pair behind the harpsichord and another directly in front, above the performer’s shoulder. Finding interlocking melodies took time. Working between a natural minor key and a harmonic minor key (a minor key with a sharp seventh note) had an interesting effect. I could swap between the two giving the listener a sense of surprise and playfulness whilst still retaining the sinister qualities of the minor key. This musical device also helped with creating interlocking melodies by providing a shifting counterpoint. Working in less popular time signatures gave more scope to the repeated pattern. In this case, I chose to work in 7/8 which naturally lead to interesting shapes and cycles where the pattern would repeat in factors of seven rather than the standard three or four. When placing these harpsichord lines in a surround environment, the spatial tension between the lines built a focal point that shifted harmonically, musically and spatially at different frequencies. The most notable method was placing the harpsichords on opposing sides. Front and back worked best.

The percussion was recorded next. I recorded them in stereo and filtered the signal so frequency bands were split between the main four. The filtering was programmed in Plogue Bidule. I split the signal, from 50Hz to 12kHz into 32 bands.

Band 1 (50Hz – 80Hz) played through speaker 1 (Front Left).
Band 2 (80Hz - 110Hz) sending to speaker 2 (Front Right).
Band 3 (110Hz – 140Hz) sending to speaker 3 (Rear Right).

Band 4 (140Hz – 170Hz) sending to speaker 4 (Rear Left).

The cycle then repeated with Band 5 (170Hz – 200Hz) sending to speaker 1.

The effect of this is very immersive, yet the sensation is hard to decipher.

Synthesizer and bass were recorded next. The bass was captured with the dual MS method and the synths were recorded directly in stereo. Careful note choice was used to not interfere with the harpsichord melody, but instead offer support and enhance the melodic interplay between the two harpsichords.

With the original lyrics of the song being broken into fragments, the words that were left served little meaning on their own. Philippa Jolliffe and I sung the lyrics separately, and after many takes I took the best 4 lines from of each of us. These were then sent discretely to each of the four speakers, so each speaker would have one take of each of us singing. This effect (slight performance variations of the same musical phrase) is similar to the guitar in “Devil Eyes” and is a surround technique that I find very successful in creating an immersive quality whilst being understated in its production. I then removed more fragments from the original lyrics and sung a line that was then processed through a vocoder\(^{25}\). This vocoder line was placed in the centre speaker (usually reserved for dialogue in film) creating a dramatic effect where the narration seems to be delivered from an inhuman source.

The combination of very well-recorded acoustic sources in surround and the electronic spatial manipulation lead to the most successful surround experience I had created.

\(^{25}\) An electronic effect that takes a vocal signal, analyses it’s spectral/frequency information and then re-applies this information by running a carrier signal, usually a simple oscillator signal, through a series of filters that replicate the frequency information found in the vocal signal.
**Composition: 20 minutes**

Composed mostly from off-cuts to other projects, most of this composition was formed in 20 minutes, just before a live performance in Sydney, mid 2006. Being a surround performance, the goal was to create something in 5.1 while only having stereo monitoring. This challenge was exciting and the opportunity to compose something without having the suitable listening capabilities made me rely on my surround knowledge more than ever before. Working blindly meant the performance was as exciting for me as it was the audience.

Earlier that week, I had recorded live improvisations that I had performed on drums, ukulele and recorder, to be used in a commercial project I was composing. All of these recordings were in surround. This material became my starting point for the track. Quickly scanning these long improvisations, I pulled out parts that I thought would work well with each-other. Using Ableton Live I was able to manipulate and “warp” these recordings to change their pitch and time in a fluid way that allowed me to recreate new lines of melody and rhythm. The frantic nature of composing so close to a deadline lead to an energy that, up until this point, had not come through in my music. Not having the luxury of a studio to create the desired spatialisation needed to place signals in a surround environment, I was able to send signals to the discreet speakers by sending a level to each independently. For example, sending drums to 3 o’clock meant sending even levels to speaker 2 and 3 (Front Right and Rear Right, respectively).

The “blind” spatialisation method lead to experiments that I had not explored before. One example was modifying a software synthesizer, which I had previously programmed, to pan in the surround panorama according to the velocity at which the key was hit. For example, hitting a key hard, producing a midi velocity signal of 127, places the synth at 12 o’clock yet a medium key press would put the signal at a flat plane that ran between 9 and 3 o’clock, and a light key-press would put the signal in the rear at 6 o’clock. Other experiments included applying different amounts of compression to each sound. This effect was particularly interesting on drums where you could weight the level of
the drums to a particular side by applying more compression rather than by just changing its volume.

Whilst the track was played live that night, the song was taken back into the studio the week after. Although I didn’t change any of the existing parts, I created more variations of the drum patterns, re-recorded the recorders and re-performed the guitar parts to sound less edited. The mix was subtly altered by slight level changes and equalisation to optimize the mix and to give it a sense of clarity.

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**Composition: Not On a Sunday**

On a tour through Japan in 2005-06, I was supported by an Indie-Rock, 3 piece, Miaou from Tokyo. We were an unlikely musical grouping but developed a friendship that resulted in this piece. Wanting to turn my project into a rock band for a song, I wrote a piece of music that I got Miaou to interpret. In Tokyo this was recorded in surround, according to my specifications and I was then given the parts back to remix.

From techniques explored in the song “20 minutes”, I took to editing the recorded band parts in Ableton Live. This program offered significant manipulation options to these recorded parts. A function called “warp” allowed very extreme shaping. Warping allows for the arbitrary adjustment of sounds, where a number of Warp Markers can be introduced and moved in any sound to create an “elastic audio” effect. This technique can stretch and compress the temporal qualities of a sound allowing the ability to create vastly new performances from a recording.

Keeping the lead guitar line as a main melody, I manipulated other guitar and bass recordings to create new chord progressions that could sit underneath the existing material. Moments within the recorded performances that I thought were interesting, particularly the mistakes, became the foundation of this manipulation. Using a hardware effect, a Moog MURF, I was able to automate a
sequence of filtered patterns that the guitar signals were fed through. The MURF is basically an analogue filter, with the ability to move between a series of 8 filter positions at any rate desired. The effect is very warm, rhythmic and unusual. It has stereo outputs that alternate the filtered sequence to between left and right. With a fairly simple modification I was able to have the effect move in a clockwise fashion between the main four speakers, so it would rotate two times per sequence on the MURF 26. This effect is heard best in the opening bars of the song. This surround, swirling effect began to change the nature of the composition by giving it a real sense of movement. I then created non-musical sound effects from the original guitar recordings, processed in Ableton Live and Plogue Bidule, that continued the swirling character while also adding movement with “Doppler Effect” processing. These fragments were panned in the surround environment, by a program made in Plogue Bidule that would pan randomly chosen frequency bands at different rates. This effect heightened the movement that was already existed and propelled the song in a new direction.

With a new energetic path in mind, I started mixing the drums in surround. Fortunately I was given the drum recordings as 16 separate audio files, including 8 room microphones set up in circle around the kit. From all these recordings, I mixed the drums so it would feel like the listener moved from standing in front of the kit to being surrounded by it (during dramatic points). This spatial movement worked very well. It heightened dramatic moments and filled the role that would usually be performed by increasing loudness or pitch.

Adding a few key instruments at the end (classical guitar, cello and synthesizer) backed up the melodies and gave me a chance to cement a few sounds in space by giving them a static placement.

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26 For example, I have a sequence where the band-pass filter cutoff frequency changes to these frequencies every 500 milliseconds: 300Hz (plays in the front right), 3kHz (plays in the rear right), 1kHz (plays in the rear left), 2.5kHz (plays in the front left), 650Hz (front right), 3kHz (rear right), 200Hz (rear left), 1kHz (front left).
Composition: Maybe You Can Owe Me

The initial idea behind this song was to write something that I could perform with many of the “exotic” instruments that I have collected over the years. I began a composition that was based around an Egyptian reed instrument, the double mijwiz, and various percussion instruments from Africa and South East Asia.

Not wanting to use these instruments in their traditional musical environments, I began by recording the percussion elements one by one. Setting a metronome at the desired tempo of the song, I randomly performed sparse percussion, one instrument at a time, over a period of eight bars, with each new instrument filing the “gaps” of the last. Eventually, after doing this with every instrument, I had built up a rhythm track, which, whilst fragmented, sounded interesting. These percussive instruments, recorded in stereo, were scattered randomly around the 360º panorama. This effect is very spatially challenging, as it follows no real pattern. With the percussion tracks in place, I wrote an eight bar line on the double mijwiz that reacted directly to the percussion. I placed this line in the centre speaker as it had the quality of a human voice, common to reed instruments. I then performed two harmony lines on the double mijwiz and recorded them in mono placing each one either side of the centre at the front. This effect felt similar to standing in front of three musicians – very simple, yet very effective. Bringing the sound back into familiar territory and aligning it with my other material, I added a synthesizer line to provide bass and mid frequencies. Using a Minimoog, I played the same phrase four times, each with a slightly different filter cutoff and resonance setting, then placed them discreetly in each of the four main speakers.

A simple four-bar arpeggio on a classical guitar was added underneath. This employed a different recording approach. I wanted it to sit in the middle of the listening environment, but instead of focusing it’s space in the stereo realm, left and right, I wanted it to highlight the front and back. This was recorded with one mic about 50 cm from the sound-hole (at the front) and one mic about 20 cm behind my right arm (at the back of the guitar). The front mic was placed in the Front Left and Right
and at the rear mic in the Rear Left and Right speakers. The effect was very realistic, spatially and, although it was mono in front and back, the depth created by the two polar sides was quite impressive. I then added three guitar harmonies recorded in a similar fashion. These four recordings, when played together, put the audience in a strange, impossible space, where it appears as if the listener is occupying exactly the same position as the guitar itself. With a program made in Plogue Bidule, I rotated each of the four recordings so that they each occupied their own linear plane in the 360° panorama.

Next, bass and electric guitar were added. I wanted these instruments to make the song sound like the Brazilian movement “MCB” (Creative Music of Brazil), in particular, the music of artists Joyce Silveira Palhano de Jesus. With lots of swirling and reverse-delay infused guitars, mixed with a jazz-fusion like bass line, it was obvious that I had all the parts needed to expand this song over a longer time period.

At this stage, I was approached by Architecture in Helsinki to remix a song called “Maybe You Can Owe Me”, from their album “In Case We Die”. I began working on the remix while still mixing this song. Whilst going back and forth between the two pieces, I realized that they were in the same key. With some quick modification, time stretching and editing, it was obvious that the vocal melody would work with my track. Keen to add the vocals and throw away my original remix ideas, I invited Cameron and Kellie to re-perform their vocals to the new track. being placed within a very different palette of sounds, the new vocal performances were subtler, with much more detail in the words. The song took on a very different meaning to the original and became a very personal and emotional song. With careful attention to the lyrics I wanted to mix the vocals in a way that would work with the narrative element of the words. I felt the song could become more of a duet, as the lyrics are quite an emotional journey between two people. Although the two lines sung were the same phrasing and melody, their performances were totally different. Kellie’s voice, the female, had moments of frailty

\[27\text{ The combination of simultaneously sounded musical notes producing chords that generally have a pleasing effect.}\]
and uncertainty and then towards the end, felt sure and strong. Cameron’s voice felt decisive but then, in certain spots felt weak and insecure. These positive and negatives were translated into front and back, respectively and subtly, while listening to the song, I panned these vocals between front and back in accordance to my positive or negative impressions. Although the effect is understated, its presence adds weight to the lyrics and emotional delivery.

As the song progressed, so did the arrangement. The original direction of the song was lost but interestingly what emerged was far different to anything I had done before this. The origins of the song, the Double Mijwiz, the Egyptian reed instrument, was placed in the middle of the arrangement at a special moment meant to symbolise the common ground between the two narrators. In this position it takes on a very festive feel and becomes the high point in the song.

Because the lyrics are a quite cryptic, I decided to read between the lines and work with fragments of Kellie’s performance to extract what I thought was the essence of her delivery and construct an introduction to the song. Once found, these moments were stretched, warped and modulated until what was left had little resemblance to her voice, yet somehow contained the qualities I liked. These six moments were layered and placed intuitively within the 360° panorama.
CONCLUSION

**Surround Sound and its Effects on Composition**

A comparison between my works composed in surround and those composed in a standard stereo, or mono environment, suggests there are fundamental differences. The three areas that stand out as the most identifiable are:

**Density** – the amount of sound or voices at any one point in time

**Internal dialogue between musical events.** – Interplay between voices in a song (voices that have a direct relationship between one another).

**Abstract content** – Abstract and experimental uses of sound, sound processing and arrangement.

**Density** is the most obvious difference and has the most logical reason. Having six speakers, as opposed to two, impacts on the music by offering four additional discreet points for sound to be placed. When working in stereo or mono, mixing an ensemble of sounds usually requires the use of frequency equalization and dynamic processing, such as compression or gating, to create separation by adding presence to the voices performing simultaneously. A simple example is two voices, such as electric guitar and human-voice that share similar frequencies. At a similar volume they can become hard to isolate but applying Equalisation to both and emphasizing different focal frequencies can create a separation. This method can sometimes be accomplished with the use of dynamics, in particular the effect of compression. Another method of separation is altering the volumes by having one louder than the other. Then there is spatial separation. A simple example is placing a guitar in one speaker and voice in another. This separates the two without changing the natural recorded characteristics, the way that EQ or compression does. But introducing 4 more discreet speakers allows many more voices to be introduced to a piece of music without them competing against one another.
Another interesting observation occurs when mixing the surround compositions down to a stereo format. In the case for phase 1, which later became my album “Painting Monsters on Clouds”28, a stereo mix of everything was produced for its release in the stereo Compact Disc Audio format. The stereo down-mix required lot of work and involved a lot of detailed mixing techniques (such as Equalization and Compression) to create a clear, defined mix. In quite a few cases, I left out whole sections or instruments entirely as the translation into the stereo realm felt way too dense and no amount of Equalisation would save these moments.

**Internal dialogue between musical events.** As mentioned previously, the concept of duality in my surround compositions existed in varying degrees in all pieces. Often, this duality was presented through interplay between two or more voices. For example, the track “Slow, High, Wide” is based around two Harpsichord lines that work simultaneously, pushing and pulling the other, transferring tension between front and rear. At times, they finish each other’s lines. Sometimes they feel like they’re inhibiting each other. But it’s this relationship between the two that is the main focus. Another track, “Output”, sees the drums and percussion playfully weaving between front and back, creating tension and anticipation by a considered call and response between the polar, Front and Rear planes. This interplay exists all throughout this project and although it is not a new technique, I find it interesting how often this seems to subconsciously happen when working in surround. The main reason for this dialogue seems to be the subconscious division of the 360º panorama into two hemispheres, Front and Rear. What causes this division in the compositional process is discussed in the next section.

**Abstract content.** This observation concerns itself with the increased experimentation and abstraction of sound and music that is found largely in the rear speakers. Once again, this theme is a result of the “duality”. This has been discussed heavily within the individual songs and, to varying degrees, every piece in this project shows significant amount of "abstract" content in the rear speakers. This is explained in greater detail in “The Subconscious Sound of Song”.

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**Space as a Compositional Element**

There are some firm examples in my work where the spatial techniques in surround act as a compositional tool. For example, the track “Watercolour” has a middle section that transposes all spatial positions by 180°. The song is about the positive, yet sometimes, regressive nature of relationships. The phrase “Two steps forward and one step back” is a compositional concept for this piece and at a pivotal, dramatic point, the song reverses the spatial position of all elements suggesting a step backwards. Another strong example of where it is used in a narrative way is the song “Devil Eyes”. Towards the end of the piece, a synthetic, voice-like sound cut’s through the composition and reacts to the rest of the music in a fairly emotional manner by providing a musical line, that is not only very sad but also sounds like a human cry. Placing this in the centre front speaker, that had been empty up until this point, and mixing it quite loud, made this feel quite spatially important. Its centre positioning and volume suggests it is not just another instrument but something more. It adopts the role of a narrator.

During the phase “Hybrid Techniques”, the surround sound treatment was considered at the conception stage of the works. Unlike the previous phases, I dealt consciously with compositional gestures through surround sound. This usually informed what instruments would be utilized, the kind of role they would play, as well as suggesting the nature and direction of the song. In the song “Slow, High, Wide”, the idea of spatial fragmentation, lead to a fragmented writing method, which globally affected the nature and sound of the song. Writing and producing with space in mind throughout the process extended ideas through quite calculated ways but it is the uncalculated, more instinctive results that seemed to dominate my findings.
**Subconscious Sound of Song**

In daily life, sound shapes interpretation of the environment we are in, particularly informing the visual. Sound therefore has a visceral effect. Loud sounds can capture our attention and increase our heart rate. Sound can also inform us of a threat that may be outside our field of vision. When processing the many sounds around us, a survival-based, instinctive filter pays more attention to sounds that are not in our vision. Within cinema, the use of rear speakers is used sparingly as constant activity can cause unwanted tension for the viewer/listener. Since the inclusion of surround in film, rear speakers have generally been used for creating depth in the atmosphere and usually, all sound directly relating to the narrative is placed in the front speakers.

As seen throughout all the works presented here, the concept of duality, Front and Rear, Positive and Negative etc emerged time and time again and never as a conscious execution. These themes were independent of any of the preconceived spatial treatments. Although there is the panorama of 360º to work with, I found it hard to not work with the notion of “front” and “back”. As mentioned in the outlines of both phase 1 and 2, the duality when working with Front and Rear manifested itself in a very interesting way. I found that in a lot of my works, the front dealt with **blatant** ideas, those which have an obvious purpose within the narrative structure of the song, and the rear dealt with **latent** ideas, abstract and subconscious elements that have more of an emotional effect on the song rather than a direct influence on the structure.

The music that resided in the rear speakers (including: choice of instruments, electronic processing and arrangement), is far more abstract and experimental than what is placed in the front. The musical themes explored here, that alone would be considered fragmented and quite unmusical, seem to sit unnoticed when balanced out with the more pleasing sounds in the front. Although these parts seemed to have less of a relationship to the overall tone and dramatic shape of the song, it’s presence and effect act as the subconscious of the song, conveying feelings and ideas that aren’t obvious at first.
The idea of the subconscious sound of song is not easily defined or obvious. Neither was it clear at first, but on consecutive listens, I became aware of structures, shapes and sounds that are unfamiliar to my previous writing aesthetic. Over many listens, these elements seem to have more emotional power than my conscious attempts. It appears as though the duality of front and rear has allowed my compositions to transcend the more literal structures I’ve worked with in the past.
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