Digital-Foley and Live Performance

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Abstract. Using a series of reflective case-studies, the role of the Foley artist is reconsidered alongside technological innovations in both digital sound-manipulation and physical computing. A variety of approaches to electronic sound-production and control are described along with first-hand reflections on the expressivity and control that are offered by each within a context of live drama. In redefining digital-Foley, design considerations are outlined that could enhance the connectivity between the sound-artist and the sonic-landscapes they create.

Keywords: Technology, theatre, drama, liveness, sound, music, Foley

1 Introduction

The term Foley is most commonly associated with its current modern application within the film industry. In this context it is the creation of sound effects for a film which takes place as part of the post-production process. As such, while the effect may be created 'live' in the studio, not only is it a response to pre-recorded material, the sounds themselves will ultimately be captured, edited, re-mixed, and synchronised with the visual stimuli. However, the role of creating sounds to accompany a dramatic work is not limited to the filmic medium, nor is it dependent on the ability to synchronise recorded sound with the moving image.

Although sound could not be separated from its source before the invention of sound recording, since the time of ancient Greece, theatre makers have created contraptions to simulate sounds. Heron of Alexandria invented a machine to replicate thunder which consisted of a metal box, containing a set of staggered metal shelves, and a trapdoor, above which a set of brass balls were placed. Opening the trapdoor released the balls, which would crash onto the shelves and come to rest on a tin sheet at the bottom of the box. The 'Onomastikon' also mentions that the sound of thunder was created by means of, 'bags full of pebble-stones poured into a brazen vessel' [1].

Another technique for making thunder was invented in 1708 by John Dennis who designed it for use in his play 'Appius and Virginia'. Dennis used a sheet of copper suspended by wires. The effect was created by holding the copper sheet at the edge and shaking it vigorously; the harder it is shaken the louder the effect. The thunder-sheet, like many other Foley devices, remained in use throughout the nineteenth and early twentieth century, and until the technology to record and replay sound was in-

vented their live manipulation was standard practice not only in the theatre, but also in the broadcast of radio drama.

As a blind medium, radio is entirely dependent on aural signs to communicate the setting in which the drama unfolds as well as the people who populate it and the objects they use. Because the Foley artist's contribution was central and essential in the performance of radio drama the medium is often credited with establishing the artistic credentials of this type of accompaniment. Mott asserts: 'The art of sound effects began when radio and film were first struggling for recognition…the use of sound effects has evolved from the early days of radio to the art form it is today' [2]. While Mott's assertion does not fully take into account the extent to which this evolution was initiated and maintained in the Theatre, the importance of the Foley artist in the production of Radio Drama is unquestionable. Mott then goes on to cite the benefits of late twentieth century recording technology:

"Therein lies the tremendous advantage that effects on tape have over effects that are done live. With taped effects, you will hear the same sound in the exact same manner every time it is played. With live effects, there are never any guarantees. This is especially true of creating sounds that require a certain amount of pressure or friction to produce a desired effect." (ibid, 121)

While the consistency of recorded sound over live sound is undeniable, the transition did carry some penalties. One of these was the loss of the live interaction between Foley artist and performer. Whereas the live creation of sounds allow the Foley artist to respond intuitively to the ebb, flow, and rhythm of the piece, when working with recorded sound during the live event the Foley artist is reduced to an operator who simply sets the volume and presses the play button at the correct cue. This was a small price to pay considering the benefits in terms of dependability and efficiency. Indeed as Mott points out '…manual effects require the use of hands or feet. Inasmuch as sound effects artists are merely human, he or she can perform just so many effects at a given time' (ibid, 124).

This description of the live Foley artist is an important reminder that they were performers, playing an orchestra of sound objects to create sonic response to actions or events. The notion of performance is key within this and analogies can be drawn between musicians (as performers) and Foley artists as performers. Both employ skill-based performance behaviours where the sound produced is directly related to the performers own actions with physical gestures mapping onto sonic outcomes. Both also operate with a certain level of uncertainty, the potential to miss-hit or under-play a particular note or sound but, equally, the facility to quickly adjust and fine-tune the outcome to make amends. In music, this offers the performer scope to react and adjust to the sound of other instruments within improvised music and in Foley it offers the performer similar scope to react and adjust to events unfolding in a live environment.

The following paper describes a practice-as-research based approach to understanding how interactive techniques can be used to more effectively open up the digital domain to the Foley artist. Based on personal experiences of using innovative technologies for sound control in theatre productions, three central case-studies are presented that demonstrate the potential for digital-Foley in live performance. In analyzing and reflecting upon these initial attempts, this paper outlines the principles and possibilities

of a process which allows forms of connectivity between the performer, the Foley artist, and the sounds they produce.

2 Reflections on Practice

2.1 Case Study 1: Crash

In 2001 Dean worked as sound designer on an adaptation of J.G. Ballard's novel Crash (1973). In addition to triggering a range of pre-recorded sound clips, a number of more experimental approaches were adopted, three of which are of particular relevance to this paper. Firstly, the director (David Ian Rabey) made the decision to have Dean and his 'instruments' visible to the audience rather than placing him behind a screen or in the lighting box. This positioning not only enabled the audience to see the sound designer and his kit (a visual representation of turning conventions inside-out that chimed with the expressionistic production values of the play), it also allowed the sound designer a close, panoramic view of the audience and performers.

Secondly, as a way of rendering the sounds of car engines in a non-naturalistic way Dean experimented with a Theremin during rehearsals. The Theremin was connected to a guitar effects processor into which he programmed four effects that mimicked the growl and pulse of a car engine. The speeds of the oscillations were controlled by a 'wah-wah' pedal which Dean operated with his right hand while playing the Theremin with his left. In the citation below Rabey describes the effect this created and the performative interplay between Dean and the actors:

"The expressionistic choreography and physical 'score' of the production incorporated many careful actions (some mimed, some not) of sculpting, grooming, tracing, delineating, dancing, caressing, puppeteering, mirroring, [and] countertension... They were further developed in response to… non-musical sound cues… designed to follow, rather than dictate, performers' movements, extending the improvisatory dimension of the soundscape. Rob Dean introduced a Theremin into rehearsals, with which he could suggest the acceleration of cars into a non-naturalistic way, accompanying the performers' 'driving' movements by observing and mimicking their tempo of moves with movement of his own hand within the sonic orbit of the Theremin." [3]

Thirdly, Dean designed and built two Foley devices. One was a contraption which reproduced the sound and impact of a car crash by causing a mid-air collision between two oil drums suspended above the audience (for a full description of this see [3]). The other was a large sheet of plate iron hung from the ceiling by a thin wire like an inflexible thunder sheet. When the metal was struck with a timpani mallet it would make a sound like a dull gong, however Dean used it to create a more visceral sonic effect. He attached four long shards of aluminum to the fingers of a leather work glove. By delicately stroking these sharply tipped 'Kruegeresque' digits along the metal plate Dean created '...the sort of noise conventionally described as 'putting one's teeth on edge'' (ibid, 45). The sound was captured by a floor mic beneath the iron plate and played-back through four speakers arranged around the audience to create a quadraphonic effect.

When the actors performed physical representations of the character Vaughan inflicting harm on himself by scratching themselves and picking at imaginary scabs Dean would mimic the speed, trajectory, intensity, and rhythm of their movements with the aluminum scrapers. The sound had a clear physical effect on the audience, causing them to wince, groan, and cover their ears. While some of the performers could not bear the sound, others build up a certain degree of tolerance and through the rehearsal process intuitively learnt which movements produced the effects that caused the most discomfort to others. These performers became directly complicit in this act of sonic torture and would maintain direct eye contact with Dean in order to effectively play the metallic instrument by proxy.

2.2 Case Study 2: Dead by Dawn

In February 2009, Challis and Dean collaborated on Dead by Dawn; a stage play based on Sam Rami's 'Evil Dead' films. While performance techniques, lighting states, make-up and hidden trapdoors all contributed to the effectiveness of the production, the sonic material and the manner in which it was manipulated played a central role. The production was designed to include live sound manipulation by a small group of musicians/Foley artists with the aim of creating a cinematic soundtrack within a theatrical environment and combining performance elements of Foley with the digital manipulation of sounds.

The production required a complex palette of sonic events and landscapes that could reinforce the rapidly moving onstage action. After exploring different combinations of sounds and scenes in rehearsal the script was annotated with preliminary sound cues. In this rudimentary score each combination of sonic states was positioned within the narrative structure and given specific names; these included low-fear, mid-fear, full-on-fear, vortex, sinking stomach, slam, and chainsaw. On a practical level this enabled Challis and Dean to establish certain signals which would cue sounds to start, stop, build, peak and fade. However, these prompts were rarely indicated by a particular line of dialogue, instead they would often occur in quick succession during an action sequence and/or require subtle, often continuous variation. Consequently it was virtually impossible to cue them in the usual way as the timing and parameters of the sound depended upon a direct connection between performers and musicians. In order to facilitate and accelerate this interplay Dean assumed the role of a conductor. With a range of hand gestures moments of sustain, changes in volume, and specific sounds effects could all be cued and communicated.

The musicians were positioned on a balcony from which they could see both the stage and the conductor. This viewpoint enabled them to quickly become familiar with the dialogue, movements and effects that prompted certain sounds and sonic states. Once these visual markers had been learnt the musicians were able to mould their sonic accompaniment around them. As such the action on stage was not shackled to a fixed sonic composition thereby granting the performers' a level of autonomy as the musicians could respond to variations in duration and delivery. During some moments a kind of emotive circuit was created; the sound of an evil force approaching produced a response of terror from a performer, this caused the musicians to intensify

the sound, which in turn prompted the performer to heighten their response and so on. This relationship continued to evolve throughout the rehearsals and performances. In a sense it is the inevitable result of having two live elements existing within the same frame. With each run, the connection between the events on stage and the sonic accompaniment became stronger. However, due to the improvised nature of the sound this never became entirely standardized and the more familiar the musicians were with the parameters the freer they were to experiment within them. Two examples which illustrate the opportunities this approach created were a chainsaw attack and the suggestion of evil voices plaguing the main character.

Rather than using conventional control methods Challis adopted an alternative approach to sound control thereby enhancing his ability to match and react to the characters' actions. A sound-controller designed by Challis [4] was adapted and reconfigured to work with specific sound-sets. The Octonic is an array of eight infra-red sensors that allows the performer to trigger a sound by breaking one or more of the beams. Moving within a beam can alter the parameters of the sound depending on how the system is set up. For both the chainsaw effect and the random voices, the sound set was placed within a specifically designed software 'instrument'. Six of the beams triggered the individual sounds, with movement within a beam controlling volume for expressive control; the remaining two beams controlled overall pitch and granularity. The chainsaw sequence was performed using backlighting to create an action sequence in silhouette. The sound for the chainsaw was derived from recordings of two motorbike engines and various mechanical grinders to simulate the chainsaw hitting flesh and bone. By placing a hand into one of the motorbike beams, an idling state could be suggested with a motor simply ticking over. Natural movements of the hand trying to stay still contributed to this undulating state through constant but subtle volume changes. A rapid gesture down into the beam instantly increased volume. Using another hand in the pitch-beam gave the impression of revving the chainsaw. This could be done subtly with minor hand adjustments or dramatically at the point of attack at which point 'sliding' into the adjacent beams provided various grinding impact sounds.

The sequence was particularly effective from the audience's perspective who responded with clear enthusiasm for the onstage horror. From the musicians' perspective, being connected to every component of the sound made the overall experience closer to that of playing an instrument. From the start of the sound to its conclusion, they needed to exercise judgment and skill in terms of adjusting the sound-state to complete the intended illusion. Having proximity sensors contributed greatly to this effect by picking up even the slightest movement. Another key benefit was the ability to quickly 'slide' between and across multiples beams, creating complex blends and textures. Similarly, the flexible connection between actors' bodies and the musicians' performance allowed the sonic and the visual to interact. Or to put it another way a two way relationship was created; the actor did not just respond to the sounds, the sounds also responded to the actor.

The same system was used to control the off-stage voices experienced by the main character as he struggles with his own state of mind. In contrast to the chainsaw which was a continuous sound effect for the duration of the sequence, the off-stage

voices were intermittent. Processed animal sounds were placed across a stereo field such that each of the six beams corresponded to spatial locations. This allowed Challis to trigger a sound in a particular location with one hand whilst altering its pitch, dynamic level and granularity with the other. The sequences were semi-improvised; Challis would 'place' a voice and the actor would spin round to look towards that location, however this 'placement' and the order of sounds changed each performance. This cat-and-mouse sequence would become more and more frenetic until the actor was ultimately overwhelmed by the voices now coming from all around him. As with the previous chainsaw sequence, it was clear that ability to move rapidly between sounds by sliding between beams was a very powerful technique. Again, the constant monitoring of the hand's motion afforded great subtlety and variation in a most intuitive way, allowing delicate 'twittering' between voices at the beams' extremities whilst offering dramatic bursts across voices in much closer proximity.

2.3 Case Study 3: An Evening with the Grand Guignol

A suite of three short horror plays, An evening with the Grand Guignol was directed by Richard Hand and performed to a theatre audience at the Aberystwyth Horror Film Festival in 2009. As with Dead by Dawn, live sound-design was employed to create a 'cinematic' soundtrack with sound performers working in close partnership with the cast. In contrast, there was less requirement for spot-effects and more requirement for ambient soundscapes which would often blur the boundaries between music and eerie stage atmosphere. The performers had previously worked with Hand on similar productions for live radio and were familiar with the way in which sound and music might need to cycle round for unset periods of time whilst still reacting subtly to onstage action. Again, use was made of pre-prepared sound-sets that would belong to key sequences but these generally required sounds to be gradually layered to create an organically changing soundscape. It was not envisaged that complex technologies would be required as it was entirely possible to support the onstage actions using conventional triggers (such as buttons and faders). However, there were clear opportunities where the introduction of uncertainty into the interaction would have sharpened the relationship between the onstage actions and matching sounds. Most notably within these was the production of a heart-beat pulse in the opening sequences which was achieved by sliding a fader rapidly up and down. This method did work but the physical action did not map well onto the resultant sound which was heavily amplified through a sub-woofer such that the audience could feel the sound. In hindsight a more effective approach could have been achieved using a force-sensitive device such that squeezing an object in a clenched fist would control the sound. The sound set for An evening with the Grand Guignol has been revisited to test out this alternate approach and the relationship between performer and sound object is much more connected using this alternate method of triggering and control. A similar pressure-based approach to interaction was also retested on some of the sound sets that were used to create the organic eerie atmospheres. In the original version, drones and sound effects were controlled using buttons and faders whilst in the retest the same sounds were controlled using force-sensors thereby enabling triggering and expressivity to be

achieved using the same device. As with the heart-beat test, the overall control of the sound was more apparent with the performer feeling more involved with the emerging soundscape.

3 Design

The three case studies suggest ways in which interactive and novel technologies might be used to harness physical movement for the purposes of digital-Foley. In the same way that contrasting performance behaviours can be seen as significant in the design of digital instruments [5], [6] they can be seen as equally significant within a context of digital-Foley. At one extreme, there are model-based behaviours that have deterministic outcomes where sounds are triggered and allowed to run their course (for instance, the sound designer who edits and applies sound to prerecorded imagery). Further across the continuum there are rule-based behaviours where the triggered sounds have scope for some level of change. This introduces a degree of random uncertainty within the sound in the way that computer games often require. Lastly there are skill-based behaviours. Smalley [7] suggests that sounds can be described by their spectromorphology or how the spectrum changes over time. With this in mind, skill-based performance behaviours will enable the performer to have more comprehensive control over the spectromorphic shape of the sounds they are creating. As such, technology that offers skill-based performance behaviours will be of significant value within a context of digital-Foley. How might this work in practice though? What would make for a more immersive interactive environment within a context of digital-Foley?

The basic remit of the next work-in-progress builds upon the techniques and technologies explored in previous theatrical productions and collaborations. However, for this project Challis and Dean are producing a live radio drama that incorporates digital sound effects and music, the parameters of which will be manipulated by the performers and Foley artists. In order to further explore the possibilities created by the integration of digital technology, this production will experiment with a range of sonic triggers (such as accelerometers, gyroscopes, tilt switches, proximity sensors, and micro controllers). By bending, stretching, hitting, and squeezing parts of the body the actors and Foley artists can trigger sounds and manipulate sonic parameters through direct physical contact or via more intuitive interactions.

It was observed that freedom to move quickly across numerous sound sources can be of great use, particularly if this can be achieved by intuitive and instinctive gestures. It was also identified that the natural uncertainty of small movement introduced subtle degrees of variation to certain sounds thereby adding further nuance to the skill-based performance interaction. Added to this, it was also identified that a multi-parametric approach to sound manipulation can be used to achieve complex sound transformations. Also, Norman [8] would encourage designers to consider the affordances that the interaction might offer us, such that the action required has an intuitive mapping to the sonic outcomes being achieved.

Of the technologies explored within the case studies, those that offered touch-free interaction appeared to bring an engaging dynamic into the performance element; the lack of haptic feedback introducing levels of uncertainty that appeared to feed into the delicacy of the performance. Though infra-red technology was used in the case studies, the same effect could be achieved in a number of different ways. Indeed alternate approaches could also effectively free the performer from being tied to a specific location by the physical apparatus. As identified earlier though, there will also be occasions where sudden triggering of sounds will still be required. Touch-free approaches are less effective in these contexts than physical buttons and switches where the natural haptic feedback of the device offers confirmation of closure. Force sensors make a useful alternative to conventional switches enabling sudden triggering of sounds (with tactile feedback confirming the action) but with the added benefit of velocity sensitivity.

4 Conclusion

As technology develops, established practices, procedures, and skills become redundant once they are superseded by more efficient processes. Sometimes these changes are so sudden and significant they earn the title 'Revolution'. Like the Industrial Revolution before it the digital revolution has transfigured the way in which we 'work' sonic material, reducing the level of manual interaction required and opening new possibilities for the physical manipulation of sound. In this respect, physical computing can enable the Foley artist to work with digitised 'concrete' sounds whilst also maintaining a sense of tangibility, but the way in which these relationships can be most effectively exploited is still unclear. It is the exploration of these possibilities that lies at the heart of the project we have termed 'digital-Foley and live performance'.

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