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Symbiosis in digital performance: the relationship between interactive technologies and improvisational choreography

Cover Page Footnote

An early version of this paper was first presented at the 2017 Australasian Association for Theatre, Drama and Performance Studies conference in Auckland, New Zealand.



Figure 1. A dancer performs with her pre-recorded digital double, using the movement of the projected imagery as stimulus for an improvised score. Gold Coast, Australia. December, 2013.

Introduction

Within Australian live performance, there is a rising number of works which rely on digital technologies to shape the scenographic environment. These “digital performances” are broadly understood as performance works which cast technology in a “key role rather than a subsidiary one in content, techniques, aesthetics or delivery” (Dixon, 2007, p. 3). A growing trend of Australian-made digital performances can be seen across all performance forms produced by professional companies, institutions and smaller collaborative creative processes. Within this field, the relationship between digital scenography and dance – specifically the subsets of interactive digital technologies and the choreographic method of improvisation – offers a rich area for investigation.

This paper examines the relationship between these two subsets through a critical discussion of existing theory related to scenography, digital performance, and dance practice. While a number of perspectives within this area consider the impact of digital technology, most are focused on the dancer. Not only is more consideration needed of the designer/technologist’s perspective, but an alternative framework is required to support new ways of understanding the relationship between dance and technology. Symbiosis will here be proposed as such a productive lens for scenographers,

technologists and dance practitioners. Symbiosis can be understood as a mutually beneficial relationship between two separate and different systems that come together to achieve a shared goal. The notion of symbiosis has the potential to strengthen the agency of the designer/technologist in their practice, as it shifts the role of technology from merely an addition to the performance, to that of mutual co-creator. While there is some use of the term in the existing literature, there is little consideration of the actual points of symbiosis between the two disciplines.

Drawing on an examination of relevant theory and two creative developments conducted in 2013 and 2014, this paper will offer three distinct points of symbiosis. Digital performance and their scenographies within Australia will be examined, including an exploration of interactive systems and the importance of real-time responsiveness. The argument will then turn to the relationship between dance and technology, and the unique digital practices which emerge from this field, specifically when improvisational choreographic methods drive the movement score. Based upon the critical discussion of these concepts and a reflection on practice, three points of symbiosis are proposed between interactive technologies and improvisational choreography: (1) open/closed scores and open/closed systems; (2) real-time interactivity and composition, and; (3) technology as performance. These ideas will be explored using illustrative examples which showcase the unique relationship between the two disciplines and the subsequent impact on the scenographer/technologist's practice.

Digital performance and scenography

Birringer applies the term "digital performance" to "performances that depend on the use of digital interfaces" to compose their scenographic environments (2008b, p. xii). The design of these digital performances sit within the broader scope and development of scenographic practice and theory. Scenography, which is understood here as the "manipulation and orchestration of the performance environment", has evolved with advances in technology throughout its history, and existing literature examines the impact – and potential disruption – of the digital on performance environments (Baugh, 2005; McKinney & Butterworth, 2009, p. 4; Wilson-Bokowiec, 2010). It is argued that digital performances "cross and blur the boundaries between dance, film, theatre, installation, sound and biotechnology" (Broadhurst & Machon, 2011, p. xvi), taking advantages of the rapid developments in technologies in other industries, so that now these works incorporate augmented and virtual reality systems, telematics, wearable technologies, motion capture systems, and more accessible motion-tracking technology such as infrared cameras available in the Microsoft Kinect (Birringer, 2008b; Brooks, 2010; Broadhurst & Machon, 2011, p. xvi; Kozel, 2014b; Delbridge, 2015).

However, it would be incorrect to assume that digital performance's sole concern is equipment. In his comprehensive examination of digital performance, Dixon warns against the "fetishizing of technology" within the practice, and encourages instead a focus on the artistic vision and content of the work (2007, p. 5). Rather than being a subsidiary addition, technology should be integrated to create new types of meanings, dramas, aesthetic impacts and audience-performer relationships (Dixon, 2007, p. 5). The digital should form a critical dramaturgical and scenographic element of the work. This is not without complication, as the incorporation of new media introduces a new and sometimes challenging language which can radically change the meaning or dynamics of a work (Oliszewski, Fine & Roth, 2018). Creatives must carefully consider the rationale for their adoption of technology, to avoid it being an unnecessary presence within the work. Recently, approaches such as Eckersall, Grehan and Scheer's "new media dramaturgy" (2017), or NMD, have been offered to understand the dramaturgical impacts of such technologised performances and enable more effective collaboration.

In the Australian context, there is a growing body of literature examining digital performance (Davis, 2012; Mullis, 2013; Jordan, 2014; McNeilly, 2014; O'Dwyer, 2015) and, in keeping with the broader discussion, Australian practitioners are noticeably more interested in the ideas that can be explored through technology rather than the technology itself (Kersten et al., 2014, pp. 109, 121). Outside of the academic conversation, professional companies across multiple performance forms are producing work that fits within the definition of digital performance. Physical theatre company Stalker Theatre's *Encoded* (2012) utilised interactive technologies to shape a projected digital environment that responded in real-time to the performer. Sydney Theatre Company's production of Brecht's *The Resistible Rise of Arturo Ui* (2018) relied on live camera feeds controlled by mobile camera operators and projected into the space in real-time, to give new perspective on the characters and also to break the audience's suspension of disbelief, in true Brechtian fashion. *Blackie Blackie Brown* (2018), written by Nakkiah Lui and co-produced by Sydney Theatre Company and Malthouse, used projection to shape the stage space and enhance the narrative. In opera, the Victorian Opera in partnership with the Deakin Motion.Lab incorporated 3D digital projections into the scenography of multiple works, including *The Flying Dutchman* (2015) and *The Snow Queen* (2017). In their discussion of three digitally enhanced productions of Mozart's *The Magic Flute*, Vincent, Vincent, Vincs, and Johanson (2017, p. 156) argue that "digitally enhanced theatrical productions" such as these are on the rise.

Interactive systems

In digital performance, the relationship between the human performer/user and the machine is of critical concern. This relationship is often interactive in nature, with an exchange of data between the two systems. Birringer understands an interactive

system to be one that “allows performers or audience members (users) to generate, synthesise and process digital objects within a shared real-time environment experienced through sensory engagement” (2008b, p. 110). Academic and digital choreographer Sarah Rubidge (2009, p. 376) further suggests that interactivity “refers to multi-stranded interactive systems which use performers/participants to activate them and the imagery to which they give rise”. This paper argues interactivity can be understood as not simply to “activate” or “trigger” a response from the system, but as a process that uses the body as source material – data – to actively compose the visual and aural space. Interactive systems, therefore, refer to performance environments that co-compose the scenography of the space through interaction with the human form. Such a design, which relies on the presence of the human interactor, is inherently unstable in its openness (Birringer, 2008b, p. xxv). Despite the uneasiness that comes from this shift, interactivity has arguably become a critical characteristic of digital performance systems, as to be interactive allows the machine to ‘compete’ with the unique liveness of the human performance/participant. As Vincent, Vincent, Vincs, and McCormick (2016, p. 52) suggest: “Without the capacity for improvisatory and interactive responses, video media/projected media continues to be perceived as fundamentally unequal to, and incompatible with, live performance, particularly within the context of transmedia dance”.

Real-time responsiveness is a core feature of interactive systems, as instant feedback is required to understand and control the machine, as well as allow it to be compatible with the human performer. Real-time interactivity opens up the means of exchange between the body and the machine, where the human body becomes a “determining interface of communication”, while the system is still able to “retain its own autonomy and intelligence” (Birringer, 2008b, p. 118). Such interactivity is a central characteristic of the control program *Isadora*, and, as will be discussed in what follows, was used to drive the design for the 2013 and 2014 developments. Created by Mark Coniglio, co-founder of dance/theatre company Troika Ranch, *Isadora* is an interactive media playback platform that allows for control over visual and aural design elements, and is compatible with a range of input protocols including OSC and MIDI. Real-time interactivity is key to its operation. In his paper *The Importance of Being Interactive* (2004, pp. 10, 19), Coniglio argues that interactivity allows the performers – specifically the dancer – to become a “real time creator” in the process of shaping the performance environment, as well as giving them the means of “imposing the chaos of the organic onto the fixed nature of the electronic”. While the software is now used across multiple forms of live performance, its initial application was for dance. Indeed, most of the authors quoted here – Vincent et al., Rubidge, Coniglio – are specifically discussing dance. This is due to the intertwining of dance and digital practices that arose at the end of the 20th century and continued into the 21st.

Dance and technology

Towards the end of the 1990s, a new genre of dance performance emerged which sought to adopt emergent technological tools in an attempt to “reinvent the perceptual and ontological role of dance” within a new digital context (Salter, 2010, p. 261). Dubbed “dance and technology”, this new genre employed interactive, real-time systems to shape scenographies. Sharing similar concerns with the field of digital performance, dance technology practitioners and theorists fold in the unique perspective of the dancing body in time and space. An example is seen in practitioner-researchers’ investigations of embodiment, which often draw on Merleau-Ponty’s notion of phenomenology (Kozel, 2014a), and the subsequent “reconfiguration of [the] embodied experience” in the technically charged digital performance space (Broadhurst, 2007, p. 23). Within the Australian dance technology space, there are some notable examples: Gary Stewart’s Australian Dance Theatre and works such as *Multiverse* (2014); and before this the works of Chunky Move under the artistic direction of Gideon Obarzanek, notably *Mortal Engine* (2007) and *Glow* (2006), each featuring real-time, responsive, projected imagery driven by infrared cameras and motion-tracking software.

Naturally there are challenges inherent in this inclusion of technology into the dance discipline. One of which, as Popat discusses, is a “deep suspicion” of technology in the live performance space, due to the view that “technology is seen by some as anti-artistic, and those who use it can appear more concerned with the mechanics than its creative contribution to the performance” (2006, pp. 31,146). The digital has also impacted choreographic technique and practice (Birringer, 2008a), where choreography is understood as both the process of “writing” dance, in preparation for performance, and the embodied dance itself (Franko 2011, p. 321). One area of choreographic practice which is more readily able to adapt naturally to this digital impact is improvisational choreography. While once used as a method of devising a work in the rehearsal space, improvisation as a choreographic method is recognised now by many contemporary choreographers (Kloppenberg, 2010, p. 180). Kloppenberg posits there are two schools of thought regarding improvisation and its role in dance. The first:

considers improvisation to be the act of freeing the unconscious mind, channelling a deep, internal source to “speak” through the improvised form without submitting what emerges to the imperious control of the conscious mind. The other sees it as the ultimate act of consciousness, one of expanding awareness and making careful, often immediate compositional choices that carve and follow an emergent trajectory. (Kloppenberg, 2010, p. 186)

Improvisation as discussed here falls into the second camp: improvisation exercises, based upon scores, which require complete awareness in the moment of enaction,

with the intention of generating new movement which could not be devised in the mind of a choreographer alone.

Existing literature on improvisational choreography suggests there is a natural link between the method's careful awareness of the present moment – of the dancer's movement and choice – and interactive technology (Hawksley & Biggs, 2006; Santana, 2017). Rubidge suggests that this may be because interactive environments are by their nature improvisational (2002, p. 5). This is not always an easy relationship however, as de Spain argues, for within these improvisations with responsive technology “the process of creativity collapses in on itself. The relatively leisurely challenge of creating over time becomes a welter of multitasking, a potentially frantic journey where every action is simultaneously both problem and solution” (2012, p. 26). This frantic relationship between interactive technology and improvisational choreography necessitates a conversation around the relationship between the two. Several dance practitioner-researchers have suggested approaches for the performer to understand this relationship, such as Broadhurst's (2006, p. 138) process of “incorporating the instrument into the body”; Kozel's (2014b, p. 38) “dwelling in the space, becoming familiar” with the system; and Lycouris's (2009, p. 348) “interdisciplinary choreography” concept, which offers a method of approaching every element within the environment – from human beings to digital technology – as objects that can be choreographed.

Symbiosis

However, while offering insight into how the choreographer or dancer may come to perform with and control the technology, these approaches do not offer much assistance to the scenographer/technologist seeking to find equal footing in the collaborative process. Others have considered new ways to approach this process, notably Popat and Palmer, who call for common ground and language between the two forms (2005). The concept of symbiosis offers another useful framework to approach the collaboration between these two artforms. Symbiosis can be understood here as a mutually beneficial relationship between two separate and different systems that come together to achieve a shared goal. Symbiosis is therefore a useful counterargument to the deep suspicion of technology observed by Popat, as symbiosis as a conceptual approach to technology and dance – from both a scenographic, technical and choreographic standpoint – refocuses the discussion onto the similarities between the two disciplines.

The notion of symbiosis has existed in the discussion about dance and technology for years, but no actual points of symbiosis have been proposed. Over twenty years ago, Povall (1998, p.1) argued that interactive technology is able to exist “only in an integral relationship with the performer, or perhaps even in *symbiosis* with the performer, the choreographer, the sound sources and so forth”. Discourse around symbiosis in

performance repeats in a handful of other sources. Birringer offers the term “symbiotic improvisation” in his discussion of interaction between interface design based on real-time wireless feedback, but does not investigate in depth its meaning or usefulness as a concept (Birringer, 2008b, p. xxv). Symbiosis is commonly linked to the relationship between collaborators, as well as to technology and performance. Narstedt et al. proposed that the interdependence between technology and performance produces a “symbiotic creative system” in which all practitioners feed off each other in a process of creation (2007, p. 2). Such a system allows for effective collaboration of interdisciplinary practices. The notion of ‘feeding off’ one another applies to both the persons involved in the process, and also the mediums of technology and body. As such, symbiosis has two levels. This paper focuses on the latter, yet acknowledges that more discussion must be had regarding the symbiosis between interdisciplinary collaborators. In a similar vein, Santana (2006, p. 158) also adopted a discourse of symbiosis in the discussion of collaboration within her dance practice, and the search for an “organic interactivity” with her collaborators. Santana presents the idea of symbiosis as especially useful in interdisciplinary collaborations, as neither discipline is seen “as an addition of one term plus another, but as a symbiotic process of biological and technological instances” (2006, p. 158). Drawing on Santana, I suggest that symbiosis in collaborative processes can also allow technology to be seen not only as an ‘addition’, simply servicing the performance or performer, but also as an equal component in the performance process.

There are several unanswered questions from the existing discussion of symbiosis between technology and performance: how can we understand symbiosis between interactive technology and the act of improvisational choreography?, and, at what points – in theory and practice – do we find this symbiosis? The following critical reflection on creative practice will speak to this notion of symbiosis, and suggest three points at which it can be found.

The Practice

In 2013 and 2014 my collaborator, choreographer-researcher Courtney Scheu, and I, as scenographer/technologist, ran two creative developments at The Arts Centre Gold Coast¹, Australia, with the intent to create a toolkit of dance/technology combinations to use in future performances. While the technical scope of digital performance is extensive, our creative practice limited the system to projection and interactive technologies. The impetus for the practice stemmed from research into brain psychology, and brain function/dysfunction as it presents in Alzheimer’s and schizophrenia patients. This research provided a starting point or provocation for our investigations. The two developments continued research into how interactive real-time performance systems can be integrated into performance, and how such

¹ Renamed HOTA (Home of The Arts) in 2018

technology alters both the compositional process and the relationship of the audience to the performing digital stage machine (Smallhorn, 2013).

Each development began with an independent development of ideas, followed by a shared process of testing combinations to find interesting interactions. I designed a series of generative patches using *Isadora* with my own body as the input data, while Courtney devised a series of improvisational scores based upon our research and her own practice. We then worked with a team of dancers to test out the dance/technology combinations. Almost every configuration relied on a movement-based, real-time interactive relationship between the system and the dancer. Systems included some variation of a projector, Microsoft Kinect infrared camera, standard digital video camera, Wacom digital drawing tablet, laptop running *Isadora* for vision and sound, clear plastic drop sheeting as a moveable projection surface, and basic lighting and sound. By the end of these two creative developments, over twenty combinations of dance and technology were added to our 'toolkit' for future collaboration².



Figure 2. Two dancers respond to projected imagery of brain scans, which in turn are morphing and adapting in shape and pace to pre-recorded sounds. Gold Coast, Australia. December, 2014

Three Points of Symbiosis

Through reflection on this practice and investigation of existing literature in the fields of scenography, digital performance and improvisational choreographic practice, three points of symbiosis were identified. These are the shared notions of open/closed

² It is not possible to detail all combinations in this paper. For more video and photographic documentation of the creative developments please visit <https://vimeo.com/album/5272493>.

scores and open/closed systems, real-time interactivity and composition, and technology as performance. What follows offers some insight into these shared notions, and as we develop our understanding of these similarities, the potential for meaningful investigation will increase.

Open/closed scores, open/closed systems

Dance scores bear their own history and systems. There are scores that act as both record of the creation process of a new work, and allow for future restaging of the same performance – “a dance in preparation or a dance remembered” as Franko suggests (2011, p. 321). Labanotation, the system of recording movement originated by Rudolf Laban in the 1920s, is one of the most recognisable systems of notation, and is described as the dance equivalent to music notation (Hutchinson Guest, 2011, p. 5). Like a theatrical text, the score is meant to be performed, and each performance “requires an active reanimation of the knowledge encoded” within it (Watts, 2010, p. 14). Scores can also be spoken instructions, open to interpretation by the dancer, as well as images or diagrams transposed onto the floor of the space. Both techniques – patterns and drawings, and spoken instruction – were adopted in our practice, including the use of human nerve cell patterns transposed on the studio floor as a starting point for improvisation (see Fig. 3). As compared to the formulaic style of Labanotation, this approach to scores well suited our improvisational method and provided a flexibility and openness necessary for creative development.

This approach drew on the techniques of contemporary improvisational choreographers, especially influential post-modern dance practitioner Anna Halprin, known for her improvisational choreographic technique and scores. Halprin’s scores are distinctly verbal and descriptive. Early improvisations were driven by patterns and drawings on the floor and developed further into spoken instruction, such as the following for *Paper dance*:

Make ten single sounds on the paper. Crumple the paper for sixty counts, then tear continuously, listening to your sounds. When you have had enough, collect as large a bundle of paper as you can, and exit. (Halprin, 1995, p. 102)

Halprin’s scores sit on a spectrum between *Open* and *Closed*. Open scores allow “dancers to make choices in their actions”, while closed scores mean that actions are predetermined, repeatable but not predictable, much as Halprin’s closed scores tell you “what to do, but not how to do it” (as cited in Morgenroth, 2004, p. 29). An open Halprin score may instruct you to “Relax your eyes”, whereas a closed score will read: “Lie down on your back; cup the palms of your hands over your eyeballs; fingertips separated and touching crown of head; heel of hand resting under cheekbone until your eyes are quiet; and visualise a void” (Halprin, 1995, p. 50). Halprin’s spectrum was reflected in the scores used in our practice, which ranged from open instructions

- A series of MRI scans will be projected on you. Respond³ – and closed instructions
- Place these numbered dots on your body. When you hear a number, touch those dots together. Move along the pattern on the floor (Fig. 3).



Figure 3. Example of pattern-based improvisation score. Gold Coast, Australia. December, 2013

This notion of openness in scores reflects a larger, ongoing discussion of the openness of a work of art (Eco, 1989). It also mirrors Birringer's discussion of the "openness" of works of art in interactive performance spaces (2008), and the openness of the technology present in our creative developments. Birringer argues that digital performance environments which rely on real-time interactivity are inherently "open, unstable systems" which not only invite but inherently depend on collaboration which is open-ended and precarious: "To program interfaces between performers and the computer implies the creation of an unstable, open system where control parameters can be continually negotiated if collaborative interaction is the desired effect" (Birringer, 2008b, p. xxv). The opposite of an open system would be a closed loop, commonly seen in standard production systems: for example, in most QLab systems, the operator hits the spacebar, the music plays; they hit the spacebar again, the music stops. Repeatable, reliable, and necessary in many circumstances where the output of the system *must* be predictable. Therefore, based on the processes employed in our creative development and this review of theory, I propose a dual spectrum of open to

³ Still images of this combination can be viewed with others at <https://vimeo.com/281901626>.

closed scores and open to closed systems (see Fig. 4). This is the first point of symbiosis.

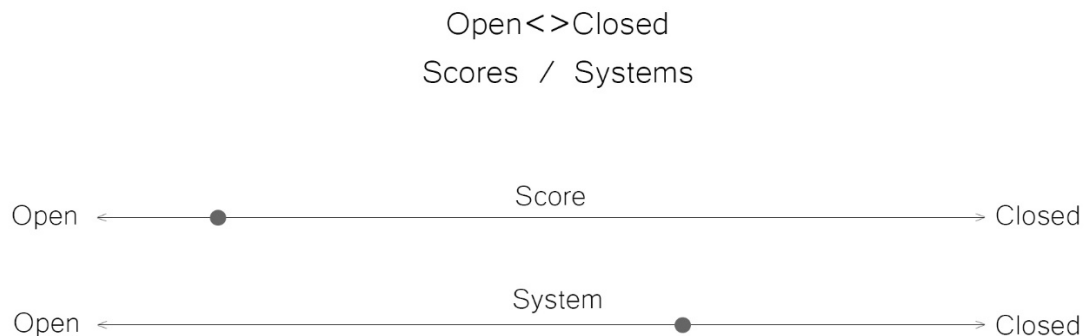


Figure 4. Open/closed scores, open/closed systems. The combination shown here would involve a more open score with a more closed interactive system.

In our practice we shifted along this dual spectrum between open and closed as needed. Sometimes the score was more closed: *Place these numbered dots on your body; when directed, touch numbers together*⁴, where the dancer was told what to do, but not how to do it, as Halprin would say. Sometimes it was more open: *You will see a body on the screen. Respond* (Fig. 5). At times the digital interactivity was more open: *An infrared camera watches the space, the body moves, the movement acts as input data in an Isadora generative patch, which reacts randomly, altering the outputted projected image*⁵. At other times it was a closed loop: *MRI images are projected onto clear plastic. They do not respond to any movement in the space*⁶

The openness or closedness of either system depended on firstly the *focus* of the activity and the feedback that we wanted to more closely observe (the dancer driving the technology, or the technology driving the movement); and secondly, the level of *open play* we wanted to enact. If we were trying to achieve a certain combination, we would often close both score and system to exercise more control. This system is inherently different to traditional performance setups driven by playback programs like QLab⁷. This notion of a dual spectrum offered the technology – and myself as designer/technologist – greater agency as co-creator in the act of performance. Here, technology was not an addition, to use Santana's expression

⁴ A video of this combination can be viewed at <https://vimeo.com/album/5272493/video/279396094>.

⁵ A video of this combination can be viewed at <https://vimeo.com/album/5272493/video/279395243>.

⁶ A video of this combination can be viewed at <https://vimeo.com/album/5272493/video/279395246>.

⁷ QLab is capable of real-time interactions within the performance, such as through the input/output of live camera feeds. However, it is also very commonly used to facilitate closed loop performances.

(2006). The technology did not simply service the performance, but instead was a flexible system which adapted its behaviour to achieve our shared performance goal.



Figure 5. Two dancers respond to the presence of a digital performer in response to an open score. Gold Coast, Australia. December, 2013.

Real-time Technologies and Composition

As previously discussed, real-time systems allow for instantaneous changes in the performance environment (or as close to instant as the human being can perceive if the quality of the system is sufficient). Real-time reactions allow the scenography to be composed live, in response to the moment-by-moment choices of the dancer, and similarly, for the dancers' movement choices to be affected and driven by the scenography. In our creative developments, such responses were made possible through various combinations, including live camera feeds (Fig. 6). Another such combination involved the Wacom drawing tablet, running through *Isadora*, operated by Dancer A who sketched while Dancer B worked with the projected image as a visual movement score. In the absence of all other light or image, the projected drawings of Dancer A worked with Dancer B to shape the scenography of the space in real-time (Fig. 7).

Upon reflection of the practice and a review of the literature, it became clear that improvisational techniques have the same relationship to time and space as real-time systems. Improvisational choreography allows the performer to compose their movement in real-time, in the performance space, guided but not dictated by a score. Lycouris uses the expression “real-time composition”, in which “informed choices take place in the ‘moment’ of dance which are no less valuable than choices made by the

choreographers in their studios and then mediated to audiences by performers” (Lycouris, 2009, p. 349). This concept aligns with Coniglio’s statement, that dancers become “real-time creators” with the interactive system (2004, 101).

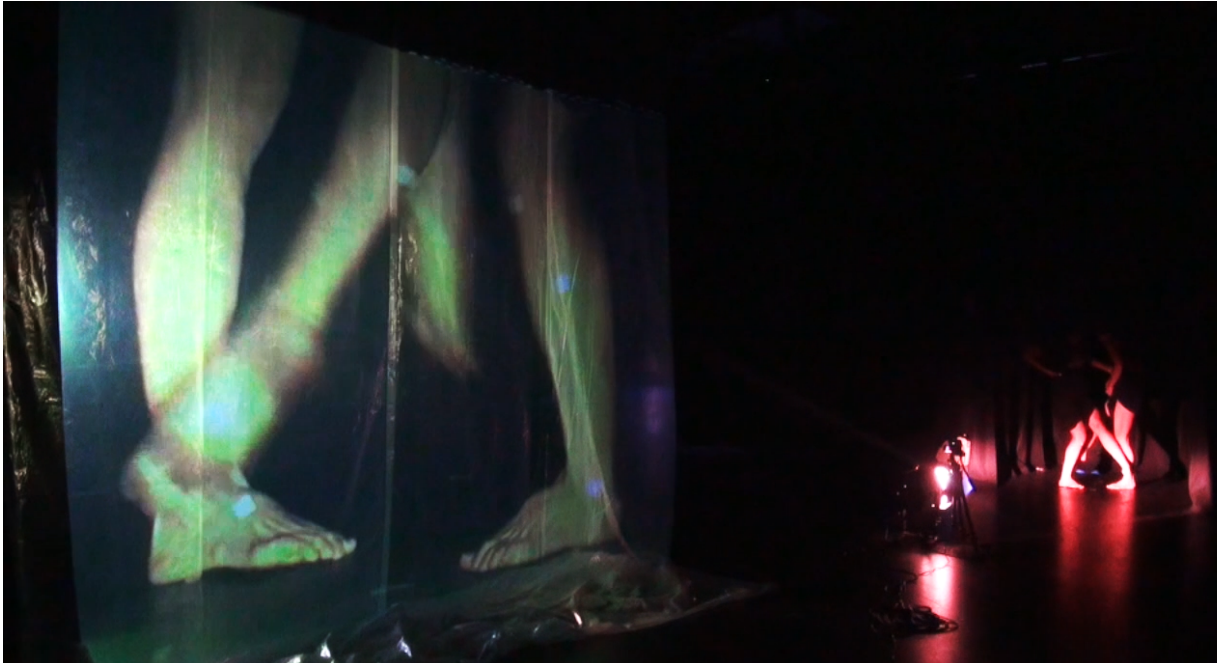


Figure 6. Composition involving live camera feed with time-jump effect applied by Isadora, paired with dots score. The camera can be seen to the left of the performers. Gold Coast, Australia. December, 2013. To view the recording of this combination, visit <https://vimeo.com/album/5272493/video/279393063>.



Figure 7. A dancer moves in response to the drawings of another, projected in real-time onto plastic sheeting. Gold Coast, Australia. December, 2013.

As both systems feed off one another in the moment, the second point of symbiosis emerges. Understanding both disciplines' reliance on real-time responsiveness to shape their performance presents scenographers and technologists with another point of entry to discuss, consider and shape the work with their dance collaborators.

Technology as Performance

And finally, the third point of symbiosis is the use of technology as performance. This is seen in three ways. First, there is the rise of technology as *co-performer*. This stems from the interactive quality of the system, and the self-generative capabilities of the software and systems often used in interactive digital performance. *Isadora* could produce sophisticated autonomous reactions to movement data. Relying on its real-time capabilities, the program could alter the characteristics of image and sound within the space, driving further movement and being driven by movement. The dancers were also aware of the presence of this digital performer, and learnt to work with the system to produce interesting choreographic moments. As a result of programs like *Isadora*, it is possible to “dance with technology” (LeCompte cited in Birringer, 2008b, pp. 122-123).

Secondly, we see technology used to *originate performance*. In our practice, this was demonstrated in a combination where pre-recorded video clips of Dancer A were manipulated with a time jump effect in *Isadora*, making the footage skip backwards and forwards unpredictably. Dancer A was then asked to use the movement of her past self as stimulus for a movement response, and find solutions to the non-linear movement of the recording (Fig. 8).

This process echoes a well-established approach in the dance field, specifically the work of influential American choreographer Merce Cunningham and his exploration of computer software to generate performance. Cunningham worked with *Lifeforms*, a choreographic software tool created at Simon Fraser University (Schiphorst, 1993). Known now as *iDanceForms*, *LifeForms* was a computer compositional tool for the creation of dance, which enabled a choreographer to “sketch out movement ideas in space and time” before starting work in the studio (Schiphorst, 1993, pp. 28-29; Schiphorst & Calvert, 2015). Cunningham used the program as the starting point for creating works, including *Trackers* (1991), *Ocean* (1994) and *BIPED* (1999). Dances were created on the computer by using software as a compositional tool to score movement – some potentially impossible to achieve physically – and then Cunningham worked with his dancers to translate the movement generated by the machine. In so doing, the computer broadened what Cunningham thought possible in dance (Brown et al., 2004, p. 110).



Figure 8 - A dancer performs with her pre-recorded digital self, attempting to echo the impossible time-jumps applied by the Isadora software. Gold Coast, Australia. December, 2013

Cunningham noted:

I will ask two dancers to try something based on the computer results, and the two of them do it together and all of a sudden something happens that we hadn't even ever thought of. And I'll say, "Oh, keep it!" because it's something that we hadn't experienced before. (as cited in Brown et al., 2004, p. 110)

Here, technology is used as a tool to conceptualise performance – to map out the work in the digital space before applying it to the human form. While its use in the creative developments was not in preparation for movement, but rather in the same space and time as the movement, the notion of technology as being the driving force for dance was similar.

And finally, we see technology as *performance itself*; scenography that can perform with only the audience member to interact with in the making process. While trained dancers used the system during the 2013 and 2014 developments, Courtney and I discussed potentially adapting several configurations into a public installation. This was possible as the interactive system could produce engaging reactions to any human presence, regardless of discipline skill or knowledge. Such an approach to interactive installations is adopted in both the dance and Production Arts disciplines (Rubidge, 2009; Smallhorn, 2013). To further this point, consider the notion of choreographic

objects and the work of American choreographer William Forsythe. As explored through collaborations such as the *Synchronous Objects* project⁸, Forsythe argued that a “choreographic object” is not a “substitute for the body, but rather an alternative site for the understanding of potential instigation and organization of action to reside” (Forsythe, 2008). Blades, following the lead of Leach, deLahunta and Whatley, uses the term to “refer to an object that is created with the intention to articulate and disseminate choreographic thought” (2015, p. 26). In so doing, often with the use of digital technology and scenographic techniques, choreographic objects become performances without performers. In the 2015 installation *Nowhere and Everywhere at the same time no. 2*, 400 metal pendulums swing from the ceiling of the Folkwang Museum, separately controlled and choreographed by Forsythe. The audience moved through the space, working to avoid hitting the objects and as such created a “lively choreography of manifold and intricate avoidance strategies”(Forsythe, n.d.)⁹. In such an installation, the object becomes dancer, driven by the score imposed by choreographer Forsythe. This treatment of object-as-performer turns the discussion toward a subsection of dance and technology which challenges the human body’s role in the art form. Kent de Spain envisioned this “brave new world” of dance almost twenty years ago in his paper *Dance and Technology: A Pas de Deux for Post-Humans*, where computers become a tool with which all people, even those lacking discipline knowledge, “can organize and edit, essentially choreograph, digital movement-based works” (2000, p. 3). This new mode of creating, as evidenced in the practice of Forsythe, has forced critics, scholars and dance artists to “redefine and reassess” how dance is understood and interpreted in our culture (2000, p. 3). Technology as performance leads us to ask: “Must dance involve humans? Real or imagined, must dances be danced by creatures, or will we accept and attempt to interpret a computer-based dance of shapes and colors?” (2000, p. 6) Such questions shift us away from the symbiosis of dance and technology but are useful in opening enquiries into the roles digital technology can play in dance.

Conclusion

This paper has examined two subsets of digital scenography and dance – interactive real-time systems and improvisational choreography. With the increase of technology in dance over the past few decades, many have discussed the relationship between the two forms. While existing literature has touched on symbiosis as a theme, there has been little consideration of the actual points at which this occurs in theory and practice. Three points of symbiosis – open/closed scores and open/closed systems, real-time interactivity and composition, and technology as performance – have been identified to address this gap. I suggest this framework of symbiosis – with a focus on

⁸ The *Synchronous Objects* project, available online <https://synchronousobjects.osu.edu/>, brings together multiple choreographic objects made through transdisciplinary practice in response to Forsythe’s choreography for *One Flat Thing, reproduced* (2000).

⁹ For a video of the installation, https://www.youtube.com/watch?time_continue=44&v=as1bQ6XI_fg

the interdependence between the two disciplines – strengthens collaborations between scenographers, technologists, choreographers and dancers. This strengthening was directly observed in my experience of two creative developments as scenographer/technologist. By possessing a more informed understanding of the similarities between our practice, Courtney and I were able to work more efficiently and produce richer, more engaging combinations of technology and dance. Working from a foundation of symbiosis, I found my creative practice was enhanced as I had more agency in the collaboration; the design and system were not seen as mere additions to the space, but as equal partners in the creative process.

The mutual understanding and respect that grew from the recognition of symbiosis between our creative practices was essential for effective collaboration. As such, this paper offers the idea of symbiosis as a notion to reconsider the relationship between technology and dance. This is important for designers and technologists, as the idea of symbiosis shifts the perception of our practice as a service to one of mutual creative contribution to the greater system of the dance performance. On that note, further research needs to delve deeper into the second level of symbiosis as it is found in interdisciplinary collaboration. While this discussion has focused on the relationship between technology and movement, there is more to be discovered in how symbiosis plays out between the human collaborators involved in the process.

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