Embodied Interfaces: Dancing with Digital Sprites

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Abstract

This paper focuses on the research project, *Projecting Performance*, in which off-stage technical operators take on the role of performer through the live manipulation of digital 'sprites' in a theatrical environment. The sprites are projected onto gauzes in the stage space, and operators control them with graphics tablets and pens to perform with on-stage dancers. Operators have frequently described experiences of dislocation or translocation during the experience of operating, and this paper investigates the reasons for such reports. It presents the tripartite models of Zich and Castronova from the fields of theatre studies and human-computer interaction respectively, cross-referencing them to analyse the relationship between performer-operator and sprite. Merleau-Ponty's phenomenological theories are then employed through the writings of Crowther and Fraleigh to explore the experience of the performer-operator. The paper proposes an understanding of the digital interface in *Projecting Performance* as embodied and experienced both visually and kinaesthetically by the performer-operator.

Keywords: performance, interface, experience, transparency, embodiment

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1. Introduction

Projecting Performance is a research project at the School of Performance & Cultural Industries, University of Leeds, in collaboration with commercial digital artists KMA Ltd and funded by the Arts and Humanities Research Council, UK. The project focuses on the choreographic and scenographic [1] exchange between dancers and digital images within a theatrical context. It uses digital 'sprites' projected into the stage environment and manipulated in real-time by an off-stage operator in relation to on-stage performers. It seeks to explore relationships between the performer-dancer, projected image ('sprite') and the performer-operator, and through these interactions challenge dominant perceptions of the roles associated with performers and technologists.

Research workshops involving participants from multiple disciplines in the role of 'performer-operator' have repeatedly demonstrated that operators quickly become absorbed in the experience of controlling the projected sprites. After a period of operating, they are often unable to recall consciously being positioned behind the operating desk. Some describe an experience of being located on stage with(in) the sprite, and some are unable to pinpoint the location that they experienced. This paper is concerned with the question of why and how this dis-location or trans-location effect occurs. Thus it takes the primary perspective of the performer-operator, with occasional reference to the dancer's and audience's perspectives where they illuminate aspects of the role of the performer-operator.

2. Processes of working

Projecting Performance workshops take place within adaptable theatre spaces and promote an improvisatory approach to the iterative process of performance-making and technical programming. This approach is familiar to performers but not necessarily to technologists (Popat & Palmer 2005). It is based on playful, intuitive responses to situations as they arise, with all members of the team contributing on an equal basis within a collaborative environment. Ideas can be tried out, tested and developed quickly, using traditional theatre equipment and materials. Evaluation is suspended temporarily to promote uninhibited idea generation. All members of the team appreciate the benefits of this way of working, and it has impacted significantly on the development of working practices for KMA's digital artists outside of this research project.

The gauze (scrim) is the primary surface in the stage space onto which the abstract digital images ('sprites') are projected. The projection surface can be made to appear opaque or transparent depending upon both the stage lighting and the colour of the gauze itself. Dancers and other performers are seen behind this surface. Behind the gauze (upstage), they can see the digital sprites on it, and thus interact directly with the sprite. (Fig. 1) If the dancers touch the gauze then they experience the illusion that they are touching the sprite. The projected light spilling through the gauze onto their skin or clothes helps to enhance that illusion for both dancers and audience.

Figure 1: Snake sprite (with delay) and dancers 2007. Dancers: Keziah Mallard & Laura Blazy. Copyright: Authors.

Figure 2: Performer-operators controlling sprites via graphics tablets 2007. Operators: Tom Wexler and Lisette Wright. Copyright: Authors.

The digital sprites are created in Macromedia Director MX2004 and controlled by the performer-operator in real time via a Wacom graphics tablet and pen (Fig. 2). The resulting output is projected into the stage space through a standard data-projector. The precise parameters of each individual sprite can be modified in performance mode through keystrokes or more intuitively by using a midi interface, allowing elements such as delay times, rates, shape changes and subtle colour alterations, to be achieved with an instantaneous effect. Tom Wexler, the technologist from KMA, has created the sprites through programming that is "rooted in the modeling (sic) of the physics of nature, using the mathematics of swarm behaviors (sic), springs and masses, cellular automata and chaos." (http://www.kma.co.uk) Ultimately these principles define the characteristics of each individual sprite, dictating how they are able to move and the extent to which they can be manipulated by the performer-operator. Many of the most engaging sprites appear to have an inherent natural fluidity that is easily understood and controlled. However, the laws of gravity and space for the projected image differ significantly from those of the human dancer, which challenge both dancer and operator to develop new approaches to theatrical space.

The use of Macromedia Director coupled with Wexler's programming skills means that in *Projecting Performance* there are not the long delays normally associated with the use of technology in the creative process leading towards a performance. Wexler can work quickly to achieve small changes within Director, and often will only require five or ten minutes to alter parameters of the sprites creating different theatrical effects as the need arises. Furthermore the improvisatory approach to this research has led directly to technical developments and changes in working methods within the project. Initially the performer-operators used a computer mouse to manipulate the projected sprites. Limitations experienced with the mouse as a control mechanism led to experimentation with a graphics tablet and pen as a substitute interface. This freed the operator to use a wider palette of gestural control, from broad sweeping motions to precise fine-motor movements, so enabling a more intuitive and expressive operation of the sprite. The more recent addition of a midi-controller allows us to change the parameters of each sprite quickly whilst in the process of operating. Aspects such as colour, size and delay rates can be altered 'live' with a fader, rather like a sound mixing desk or a lighting control board. These increasing types of control mechanism further promote the playful experience of working between technology and performance.

3. Sprites and operators

Through experimentation in our workshops, we have gathered responses from a wide variety of participants in the roles of performer-operator and performer-dancer. Participants have been drawn from the disciplines of dance, scenography, drama, visual arts, performance arts and digital arts. We have worked with sprites that have a range of different behaviours, and for the purposes of this paper we are concentrating on two which demonstrate different

characteristics. One is the Snake sprite, which is a line made up of segments (Fig. 1). One end is controlled by the operator through the graphics pen and tablet, and the rest of the segments follow it like a chain. The other is the Star sprite, which is multi-limbed and has a central point that is controlled by the operator. When it is in a state of stillness, its limbs spread around its central point evenly (see Fig. 3), but the limbs react to even the tiniest movements of the operator. The limbs are interconnected and respond to each other's position and they react once the central point of the sprite is moved, which makes its quality fluid and graceful, rather like a jellyfish. When moved quickly, the sprite's limbs fold back so that it becomes streamlined (see Fig. 4).

Figure 3: Star sprite 2007. Copyright: Authors.

Figure 4: Star sprite (projected onto two screens) and dancer 2007. Dancer: Rachel Sparks. Copyright: Authors.

The performer-operator works most directly with the technical/digital interface in our work, as he/she is using the graphics tablet and pen to manipulate the projected sprite. For initial workshops, computer monitors were placed in front of the operators but these quickly became superfluous as the operators preferred to focus on the image projected onto the gauze within the stage space. This had a major impact as it engaged the operator directly within the stage environment. The decision to move from mouse control of the sprite to graphics tablet and pen provided freedom and flexibility to achieve a dynamic range of expressive movement input, enabling both fine control and broad gestures. The pen provided an intuitive input mechanism that functioned as an extension of the body along the lines of Heidegger's hammer, where the engagement is haptic and becomes sub-conscious so that the operator thinks only of the results and not of the action. Humans have a natural understanding through constant physical experience of the Newtonian principles underpinning the modelling of these sprites, which enables intuitive engagement with their motion.

The sprites are largely predictable in the ways that they respond, but there are elements of the movement that are chaotic within fixed parameters. The tail end of the Snake tends to swing, as the weighted end of a rope or chain might swing. (See Figs. 5 and 6) The arms of the Star have some random elements in the speed and pathways that they take to come to rest when the operator stops moving the sprite. The Snake looks like a snake and appears to have a head end, which the operator controls, and a tail end, often causing both performer-operators and performer-dancers to anthropomorphise. These characteristics, when coupled with the limited movement potential of the single line, lead to a tendency for operators to play a role or character creating simple narratives with the performer-dancer. First-time operators tend to prefer the Snake as it is the least threatening to operate since users already understand the ways in which it moves. There is an immediate sense of satisfaction as they control it like a puppet. [2] The Star has a greater level of complexity and slightly more unpredictable behaviour because of the multiple arms. The design makes it less initially attractive to first-time performer-operators, but it enables greater aesthetic immersion for those with more experience of operating or with movement training. These inherent behaviours give the sprites characteristics of their own that affect the ways in which they can be operated. The fact that the programming is based on models of springs and masses means that the sprites move easily in curving, fluid pathways but tend to resist jerky or staccato motions. There is also a very slight delay in the transmission of the operator's pen movement to the sprite's motion, which is more noticeable when making small detailed movements. One of the greatest restrictions, and probably the one that is most frequently noticed by participants, is the use of the two-dimensional projection screen. Experiments with haze, smoke, clothing and other projection surfaces have so far failed to supply a satisfactory solution to this fundamental staging issue. Current trials with screens in front of and behind the performer-dancer to catch the projected light 'spill' have produced interesting results through extending the projection of the sprite onto multiple surfaces through the space.

Figure 5: Snake sprite and dancer 2007. A ‘delay’ parameter has been set on the sprite so that its pathway remains visible, demonstrating the weighted ‘swing’ of the tail. Dancer: Laura Blazy. Copyright: Authors.

Figure 6: Two snake sprites and dancers 2004. Dancers: Paul Clark, Elizabeth Collier. Copyright: Authors.

The level of intuition involved in operating the sprites allows even first-time operators to achieve complex motion and to experience themselves as performer-operators. They are excited at seeing their instinctive motor skills translated to the screen in a way that can be understood. Some scenographers working as performer-operators have commented on the feeling that they were dancing as equal stage partners with the performer-dancer, even though they have little experience or skills in dancing with their whole bodies. Operators often quickly develop a preference for a specific sprite, and with experience they will begin to prefer particular settings of the sprite parameters (where available). The choice of type of sprite and the way in which it is manipulated are governed by both the operator’s aesthetic preferences and by their movement habits. Some of our experienced operators seem to favour gentle, pulsing movements, while others have a predilection for large, swirling, hypnotic images (see Fig. 7). Operators will usually begin to develop a movement vocabulary with their preferred sprite that has habits and personal quirks, much as a dancer develops a personal movement style. Performer-dancers and performer-operators working together over a period of time will come to know each other’s movement vocabulary and be able to respond more easily to each other, just as dancers who improvise together regularly will ‘learn’ each other as dancing partners and be able to increase their sensitivity in responses over time. Despite the restrictions in the sprites’ programming that tend to push the operator towards particular types of movement, performer-dancers can consistently tell when the performer-operator changes, even if this is disguised from them by swapping operators secretly. Dancers sense the changes in the sprite’s behavioural patterns, even if they are inexperienced performers themselves. It is telling that the performer-dancers describe the sprite as “alive” and “intelligent”, seeming to indicate that they can sense the intention/attention of the operator in the sprite, yet they almost never report thinking of the sprite as being controlled by the operator. In a workshop in 2007, one dancer described the sprite as having “a human quality – it’s responding to you,” and another said, “You forget that someone is operating it.” This experience was further corroborated by a third dancer’s comments: “It’s its own life form. It’s like another performer.” [3]

Figure 7: Snake sprite and dancer 2007. Experienced operators can achieve a range of qualities by selecting different parameters. Dancer: Rachel Sparks. Copyright: Authors.

4. The dancing sprite

On our way to investigating why the performer-operator becomes dis-located or trans-located during operation, we made a brief detour to examine the reasons for the dancers’ apparent lack of awareness of the operator as an individual separate from the sprite. This led us to question the relationship between the sprite as a programmed animation and the *dancing* sprite. The dancing sprite as an entity exists somehow independently, situated between the sprite’s inherent programming and the performer-operator’s personal movement vocabulary. In exploring this phenomenon, we have cross-referenced the tripartite models offered by Castronova for digital game avatars (2003) and Zich for the “stage figure” (McAuley 2000). These models map closely to each other, despite being developed within two different disciplinary fields: human-computer interaction and theatre studies. Together, they provide a useful set of reference points for our research because they address both the digital avatar, which is how our digital sprites essentially function in representing the operator on stage, and the stage performer, which is fundamental to the location of this project in the field of performance academia.

Castronova presents a rather mathematical analysis of the players of ‘virtual world’ computer games and the avatars that they choose to represent themselves. He proposes that players

select their avatars based on the physical attributes of the avatar, e.g. some people might be "happiest when experiencing the world as a tall ogre than as a short human" (2003, p.10). However there are aspects of the player that are non-physical, "certain features, inherent in her own mind, that do not change regardless of the avatar she inhabits" (p.8). Castronova suggests that emotional satisfaction for the game player is dependent upon the sum of the avatar's attributes (and the virtual world that the player has chosen to inhabit with that avatar) and the player's non-physical attributes. The way in which other players in the virtual world perceive that player is also the sum of these attributes. This model maps directly to the relationship between performer-operator and sprite, as the dancer/audience perceives the entity of the dancing sprite as the sum of the physical attributes of the programmed sprite and the personal movement style of the performer-operator. Change either of these two elements and you change the dancing sprite entity that the dancer/audience perceives.

McAuley (2000, p. 94) quotes Otakar Zich's structural theory of the actor's signifying process, describing three elements that function simultaneously:

> […] there is the actor him- or herself who is physically present in the space, there is the character that the actor presents who comes into existence in the minds of the spectators through the actor's performance, and between the two there is the "stage figure", that is to say, the physical manifestation of the character or persona constructed by the actor and the other artists involved in the production (using the body of the actor, costume, makeup, gesture, etc).

McAuley sets up a positional hierarchy in rehearsing Zich's theory. The "stage figure" sits between the actor as individual and the character as perceived entity. The actor here is the equivalent of the operator, acting as the intelligent agent driving the performance. The programmed sprite equates to the "stage figure", with its physical characteristics inherent in the programming rather than created by elements of costume, makeup and direction. The character as perceived by the audience is, then, the equivalent of the dancing sprite; existing as the sum of the attributes of the actor (operator) him- or herself and the physical attributes that have been created upon him/her by the makeup artist, costumer and director (programmed sprite). Mapping this to Castronova's model, we can see that the way inhabitants of a virtual world perceive a player through his/her avatar is closely aligned with the way in which the audience perceive the character in a performance. Both of these models contribute to an understanding of the way that the dancer/audience perceives the dancing sprite as an intrinsic combination of operator attributes and sprite attributes. This helps to explain why the dancers seldom foreground the operator as a part of their danced experience with the sprite; the operator is understood to be a part of the dancing sprite entity but is not extractable in the dancer's immediate perception of that entity. [4]

5. Transparency and reflectivity

To return to the original question for this paper, how could we account for the experiences of dis- or trans-location that the performer-operators describe after operating? As both operators of the technology and performers via the sprite, what did they experience of the digital interface and the moment of performance? These are some of the responses from performer-operators after operating:

> "I was in both places [*stage and operating position*] at once."
> "It was amazing! Magical! I was on the stage with the dancer."
> "I can't remember where I was. You forget about the pen and [*graphics*] tablet and everything. It's so transparent."
> "I felt like I was dancing. And I don't think of myself as a dancer!" [5]

In Palmer & Popat (2007), we combined ideas from Bolter & Gromala (2003) and Crowther (1993) to consider the nature of the interface in our interactive digital performance projects. In that article, we aimed to discover what it was about the digital interface in the *Dancing in the Streets* installation that caused participants to describe the interface as "transparent" and

the experience as “magical”. We noticed that similar words were used by performer-operators in relation to *Projecting Performance*, so this paper revisits those ideas and progresses them.

Bolter & Gromala argue that it is a common error to assume that the goal of design is to achieve transparency at the interface. Instead they suggest that the goal should be “to establish an appropriate rhythm between being transparent and reflective” (2003, p. 6).

> We should be able to enjoy the illusion of the interface as it presents us with a digital world [*transparency*]. But if we cannot also step back and see the interface as a technical creation [*reflectivity*], then we are missing half of the experience that new digital media can offer. (2003, p. 27) *Authors' additions*

There were elements of this rhythm in the design of the *Projecting Performance* sprites, which had transparency in terms of their Newtonian modelling and organic motion, but also contained elements of reflectivity in the restrictions that were inherent in their programming. The combination of these elements served to give them interesting performance qualities and mannerisms, and led to operators often developing preferences for a particular sprite. However, we suggest that the binary nature of the rhythm between transparency and reflectivity that Bolter and Gromala imply in this description frames the technology as a ‘window’ to another (digital) world. While this duality might be appropriate for some types of digital artwork, it assumes an externality to the experience that promotes an auratic perspective reminiscent of Walter Benjamin. We propose, therefore, that Bolter and Gromala’s perspective is better suited to the viewing of digital artworks rather than the experience of participation or performance within an art installation. The terms used by our performer-operators, “magic” and “transparency”, are not rationalized but closer to instinctive “gut-reactions”. The binary nature of Bolter and Gromala’s model is perhaps too objective to explain these subjective reactions. The words suggest an immersive experience more akin to the Deleuzian concept of the “objectile” (Deleuze & Guattari 1988), where the experience of the object is predicated upon fluidity between transparency and reflectivity in the simultaneous tension and resolution of becoming. We began to suspect that the performer-operators’ experiences of transparency and reflectivity might not be wholly located at the technological interface, but might be equally sited in the mode of aesthetic experience. As practice-led researchers, we have extensive experience of taking the performer-operator role ourselves. This is essential to the project as it enables engagement with the experiential elements that we are trying to analyse. We noted the embodied nature of our experiences, and we turned to Paul Crowther’s critique of Merleau-Ponty to explore embodiment and aesthetic experience.

6. Embodiment

Crowther, in his thesis on *Art and Embodiment*, describes a phenomenological mode of experiencing visual art, which he terms “a sensuous manifold” (1993, p. 4):

> [The sensuous manifold] is this integral fusion of the sensuous and the conceptual which enables art to express something of the depth and richness of body-hold in a way which eludes modes of abstract thought – such as philosophy. (1993, p. 5)

The experience of the sensuous manifold requires a state of pre-rationalization in order for the fusion or folding of the sensuous and the conceptual to take place. Crowther describes the artwork as “mute” (1993, p. 114) in that it cannot express or comment explicitly on our relation to the world in the manner of philosophy and literature. Yet Crowther sees this quality as “a positive virtue, in so far as it is able to return us to our primordial historicity with a ‘full innocence’” – a pre-rational place that allows us to be fully present and to experience the moment. These concepts of “full innocence” and “body-hold” that Crowther draws from Merleau-Ponty provide a valuable insight into the way that the sensuous manifold is experienced, because they indicate something of the quality of the moment of engagement. The fusion of the “sensuous” and the “conceptual” leads to the “inseparability of the visual and tactile in the pre-reflective perception” (p. 107). This fusion involves our “sensory, motor, and affective capacities, operating as a unified field” (p. 107) where engagement as body-

hold is a fully embodied experience of being there in the moment. Crowther's use of the term "body-hold" implies that the body is held absorbed in the experience, innocent of all else. This moment of intense absorption in the event is such that the perceiver's awareness of their immediate surroundings recedes; this constitutes a moment of rapt contemplation.

In this paper, we are concerned with the experience of the participant, and particularly of the technical operator in the role of performer. We acknowledge that Crowther is writing about the experience of viewing artworks, and there is a potential contradiction between notions of "body-hold" and live performance. However, we assert that our conception of the role of performer-operator incorporates elements of both the stage performer and the audience; the performer-operator simultaneously performs in and experiences the stage picture visually. Is this why the performer-operators were unable to pinpoint their physical location whilst operating? Some felt located on the stage, performing in the stage picture, and some were unsure of their location, caught in a state of suspension somewhere between viewing and performing. We propose that the interface that we were using for operational purposes had something to do with this transportation or multi-locational existence that the operators describe.

How, then, does the performer-operator experience the interface? Merleau-Ponty's theories of embodiment have been developed in dance theory by Fraleigh, who discusses the states of reflectivity and pre-reflectivity in dance performance through the concept of the "lived body" which, she argues, does not recognise "dualism of body-mind" and assumes "an invisible unity of body and mind" (1987, p. 4). This notion corresponds closely to Crowther's definition of the sensuous manifold where the sensuous and the conceptual are experienced as being folded into each other. Fraleigh describes a state of being where:

> I live as my body spontaneously … not noticing it, not looking back upon it, and not anticipating or imagining it in some future state. (Fraleigh 1987, p. 14)

The innocence in which that moment of movement is lived is fully centred in the performer rather than being directed externally, but it is still an aesthetic experience (albeit experienced kinaesthetically rather than visually). We thus suggest that body-hold can be felt through the lived body despite or even because of the fact that the body itself may be in motion, and therefore it might be seen as synonymous with Crowther's "full innocence". In modelling Fraleigh's concepts in relation to our work, we realised that the lived body for our performer-operators extends to include the digital interface. The experience entails the "invisible unity" of body, mind, graphical interface and sprite, since the lived body is experienced in the performance as a folding together of all of these elements. We propose that this is why performer-operators so often fail to recall being located behind the operating desk with the graphics pen in hand; because their lived body is experienced beyond the confines of the desk. They have embodied the interface with the sprite and they perform through it. Here we can relate back to the concept of the dancing sprite entity. Just as the dancers do not comprehend the operator as a separate part of the dancing sprite, so the operators experience the same or similar understanding of themselves. Their presence is dis-located or trans-located by their identity as part of the dancing sprite, facilitated by the haptic nature of the embodied interface.

Our workshops to date suggest that the distance inherent in offstage operation of the sprites has the effect of creating a duality of the aesthetic experience of visual engagement with the stage picture and kinaesthetic engagement of embodiment and 'being in the moment' often associated with improvised dance performance. The visual aspect suggests that the attention is centred outside of the body (i.e. on the artwork); the kinaesthetic aspect suggests that the attention is embodied. The "collapsing inwards of the sensuous and the conceptual" that occurs in the sensuous manifold provides us with a metaphor that seems to represent more closely the descriptions of our performer-operators. The performer-operator's attention is centred upon the distanced stage space, experiencing it through embodied engagement with the sprite. The resulting potential, we propose, is a place of rapt attention to the visual experience folded together with pre-reflective performance via the digital interface.

7. Conclusion

Our investigations lead us to conclude that our performer-operators who have described themselves as being located entirely with(in) the sprite, or else were uncertain of their location, were actually reporting a lived body experience that enfolded their own body, the graphical interface and the sprite. Many participants see this experience of transportation as evidence of interface transparency. However, we suggest that the two-way impact of the sprite on the operator and the operator on the sprite is not the same as transparency. If the interface were entirely transparent then the operator's movement would be directly represented in the sprite rather than being mediated by the sprite's inherent behaviours. Neither is it as simple as the binary that Bolter and Gromala propose, since the participants do not experience the interface as either the presenter of an illusory digital world or as a technical creation in its own right. Zich's and Castronova's models help to highlight the importance of the tripartite existence of the dancing sprite entity, functioning as an intrinsic combination of programmed sprite and performer-operator. Awareness of the interface is folded into the embodied experience of performing, influencing and influenced by the operator's behaviour in the manner of the constant tension and resolution of the Deleuzian "objectile". We suggest, therefore, that the aesthetic experience for our performer-operators is literally both visual and kinaesthetic at the embodied interface.

Notes

[1] 'Scenography' is a term with Greek origins, literally meaning 'scene-writing' or writing in the stage space. The term is used in contemporary theatrical practice to denote a holistic approach to design for performance.
[2] Tillis (2001) would define our digital sprites as 'media figures' rather than puppets. See his paper for a discussion of the differences between puppets and media figures, and the implications for presence therein.
[3] Quotations from interviews with participants after a *Projecting Performance* workshop at the *Universal Voices* International Symposium, Rose Bruford College, UK in April 2007.
[4] For a discussion of McAuley's writing in relation to the onstage performer as operator, see Kuhn (2006).
[5] Quotations from interviews with participants after the *Universal Voices* International Symposium workshop (see Note 3) and after research workshops at the University of Leeds in January/March 2007.

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