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Shaping movement improviser's experiences: document(ing) embodied and extended sculptural qualities within motion capture environments[1]

Lucie Sykes

School of Arts, Media, and Creative Technologies, University of Salford, Salford/Manchester, UK

ABSTRACT

This audio-visual essay is a methodological approach to a document of my current doctoral practice as research investigating the embodied dance improvisatory approaches within motion capture environments. The research explores the emergence of sculptural qualities as a shaping process between the movement practitioner's body–mind, movement, technology, and the environment. This video essay demonstrates these emerging relationships through the document(ation) and expands the understanding of live performance and its possibilities within digital environments. This audio-visual essay combines movement practitioners' living experiences and improvisatory responses with reflective insights into the dynamic and unfolding relationships within the digital environment. Film techniques capture(ing) the improvisatory explorations at that moment, and the transformative potential of performance reveals the fluid, abstract, and temporal unfolding of *sculptural qualities* that arise from the interplay between improvising bodies, actual and virtual, and motion-capture environments. The audio-visual essay also observes a few initial thoughts on how movement practitioners can access (Range of Coupling ROC and visualisation of digital trace-forms) and activate (T-pose with Stillness) *sculptural qualities* within digital environments. The accompanying written text expands on the ideas in the video essay and offers contextualising interactions through the post-phenomenological lens and how *sculptural qualities* are a potential framework within live performances in digital environments.

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Introduction

In the realm of live performance in digital environments, the convergence of technology and creativity offers new avenues for artistic expression and blurring lines between the

CONTACT Lucie Sykes lucieleesykes@gmail.com, l.sykes2@edu.salford.ac.uk School of Arts, Media, and Creative Technologies, University of Salford, 9 Eddercliffe Crescent, Liversedge, West Yorkshire, WF15 6LR, UK

*Please watch the video before reading the documentation writing. Sykes, Lucie (2024). Shaping Movement Improviser's Experiences: Document(ing) Embodied and Extended Sculptural Qualities within Motion Capture Environments. University of Salford. Media. https://doi.org/10.17866/rd.salford.23593026.v1

physical and the virtual (Whatley and Sabiescu 2016). The intersection between conventional live performance and media-based works can be explored through performances in virtual reality, augmented reality, mixed reality, or other immersive digital spaces. According to De Spain (2000, 6), 'film and video and graphical computers have as much claim to being movement-based media as does dance' (Boucher 2011). His connection of media-based work to movement-based work opening a dialog on live performance in digital environments and to explore the blurring lines between the physical and virtual – creating an opportunity for new artistic expression.

De Spain's idea of media-based work has resonated within me and contributed to creating this audio-visual essay, developed collaboratively with a filmmaker and a choreographer, Gavin Rees, to explore film techniques when *capturing* an accurate and spontaneous account of improvisatory movement in the moment. Movement is multidimensional, enabling collaborative expressions and explorations between dance, movement, digital environment, and film. Thus, this audio-visual essay allows us to transmit the improvisers' living experiences and the creative process of dance improvisation through different filming techniques such as framing, camera angles, and camera movement. This audio-visual essay is not a fixed form and becomes a medium of happenings and reflections. It is a document 'in the sense of documentary residue' (Sant 2017, 2) and 'in-process' (Daboo cited in Whatley, Cisneros, and Sabiescu 2018, 178) of exploratory approaches to dance improvisation and live performance within a digital environment. This audio-visual essay invites audiences to engage with the diverse movements embedded within the inherent digital and artistic processes. The performing and capturing (recording) method could have been applied to live-streaming approaches, as live performances were still at risk from the lockdown policies.

In this short text, however, my focus is not on the relationship between dance and film. Instead, it focuses on contextualising my practice as research and how *sculptural qualities* can provide an account of live performance in digital environments. I introduce *sculptural qualities* as a shaping process of improvising physical and virtual bodies within motion capture environments. The research explores how *sculptural qualities* emerge through a feedback loop and how to access (with a set of conditions) and activate (core elements) these sculptural forms and expressions within digital environments. In this audio-visual essay, I discuss these elements of emergent *sculptural qualities*, which form my second-year initial findings as follows: (a) a range of coupling between the physical and virtual bodies, (b) exposing the technical process of calibration to a new opportunity for a performative calibration, and (c) visualisation of a digital form, which influences the non-linear narratives explorations within dance improvisation practices. In the next section, I introduce the overall aims of the practice as research exploration of sculptural qualities and how it contributes to understanding improvisation within these dynamic and technologically mediated spaces.

Aims of this research

This practice as research explores the embodied dance improvisatory approaches within motion capture environments. As a researcher and dance movement practitioner experimenting with movement and technology, I find myself on a captivating journey to explore complex relationships between the body, technology, and the world. The research

focuses on dance improvisation as a tool to access and activate *sculptural qualities* and 'the ways these qualities are put to use when enacting the dance in performance' (Ravn 2020, 84).

Dance improvisation is often understood and experienced as a spontaneous act of moving and sensing in the moment without pre-determinate choreography. Dance improvisation enables the improviser to unlock creative expression with freedom and authentic movement responses. I ground my practice within dance improvisation, and this research focuses on improvising as a performance in its own right.[1] as a process of temporal shaping experiences and responding to the immediate environment. De Spain (2003) suggests that 'improvisation is performed in order to achieve a movement-based somatic state' (Bresnahan 2014, 86). His proposition on improvisation suggests what Kozel (2008) refers to as a state of *being there*[2] – a state of heightened awareness – and attuned to the sensations, which I call *sculptural sensibilities* and their qualities. With these sculptural sensibilities, the improviser can enter a heightened kinaesthetic awareness and tactility while sensing-responding to the immediate environment. Thus, this awareness offers an understanding of *sculptural qualities* and the interplay between the intentionality and spontaneous shaping of the body and mind within threedimensional, physical, and virtual space. *Sculptural qualities* as shaping processes encompass the physical and virtual in this research. I propose that the intentionality of the shaping engagement between the body, movement and motion capture technologies allows dynamic and spatial–temporal relationships to unfold in real-time. Thus, dance improvisation allows discoveries and embodies these shaping qualities to reimagine movement-based work.

The intersection between dance and technology has impacted embodied practices in dance and performance practices and shifted the thinking-doing-being in these domains. This research examines these relationships through the *praxis* approach (Nelson 2013), which allocates the practice in the heart of the enquiry. This practice-as research enquiry into emergent sculptural qualities and developing a framework and it integrates theory and practice and shapes my knowledge and understanding through direct engagement with the artistic practice. The praxis-based method challenges the boundaries of live performance through experimentation, an interdisciplinary approach, and the incorporation of motion capture technology. In this praxis, motion capture technologies are part of the wholeness. Therefore, technologies become '… vital for … art-making' (Whatley and Sabiescu 2016, 18). In this research, the motion capture technology transforms dance improvisatory making into a dynamic, innovative, and extended shaping process. In the following sections, I discuss these embodied relations between the improviser's body–mind, technology, and the world to offer a framework applicable to live performance within digital environments.

Embodied interactions

The embodied interactions within a digital environment, such as a motion capture environment, offer new movement and choreographic output possibilities. These environments and interactions allow the translation of movement practitioners' movement into digital representations such as avatars, trace forms, sprites, and particles. The seamless integration of the physical and virtual realms allows experimentation and choreographic-creative tools. Rubidge (2002) suggests that these systems can contribute to or enhance choreographic content and aesthetic explorations. For example, in the

Hand-drawn-Spaces work created by choreographer Merce Cunningham in collaboration with motion-graphic and visual artists Paul Kaiser and Shelley Eskhar in 1998.[3] Creating bipeds' movement and visualisation consisted of 72 phrases of 'motion alphabet' for two dancers, dancers wearing reflective markers at key points on their bodies, and their motion data were recorded with optical motion capture technology. The raw motion data were applied and animated with hand-drawn lines (creating figures) with Character Studio software (De Spain 2000). These hand-drawn lines reflected Cunningham's movements signatures of wingspan, elevations, and pivot points. The traces left behind by two dancers were stitched onto only one biped, creating a choreographic composition with Cunningham's input (Kaiser and Downie 2023). Therefore, the possibilities offered by motion capture and other additional software offer a creative and rich tapestry of exploration and innovation in live performances.

These explorations unveil the dynamic relationship between movement, technology, and live performance by examining these movements and choreographics, connecting to and expanding upon Cunningham's legacy. Scholars like Kozel, Popat, Broadhurst, and Whatley focused their scholarly explorations on the embodied intersections of dance and technology. Their scholarly works contribute significantly to understanding how movement and technology interact and produce knowledge. For example, Kozel's work considers the philosophical lens of dance and digital technologies to emphasise the intertwined relationship between the physical and digital and the mediated spaces and bodies. Kozel (2008) proposes that as computer and digital representations become life-like to our bodies, the question of ethics, corporeality, and ontology within motion capture environments becomes part of the discussion of using mocap for embodied dance practices. However, within this research, I am interested in exploring how *sculptural qualities* can emerge in these environments through abstractions in relation to the physical and digital within the Optitrack motion capture environment. As motion capture technologies rapidly develop, they become 'embedded in our social and cultural experience' (Rosenberg and Popat 2016, 1). As Popat et al. (2017) propose, the embedded relation could also be extended through critical analyses of 'bodily extensions' and how technologies shift the perceptions and experiences within physical and virtual spaces. These augmented perceptions emphasise transmission towards the body being extended (Popat et al. 2017, 101). Within this *transmission in motion,* Bleeker (2017) and deLahunta emphasise knowledge production, which is 'mediated, stimulated, or redirected' (3). In this sense, *sculptural qualities* emerge from embodied and extended relationships between the physical and virtual realms. These transforming ideas enable the creative and playful movement experimentation to expand creative concepts like sculptural qualities. For this research, *sculptural qualities* within motion capture environments (hereafter mocap) offer innovative framework for dance improvisatory approaches

Sculptural qualities extend the improviser's shaping experiences through a feedback loop discussed in the next section.

Extended relations

As mocap becomes a sensing and responsive system in this research, it becomes part of the wholeness. Thus, *sculptural qualities* enable the interaction between the movement practitioners and the motion capture environments. The human-technology relations

can be investigated through the post-phenomenology lens of *embodiment relations* developed by Ihde (1974). He proposes conceptualising technologies as mediators that are observable within relations between human beings and the world in which they situate themselves. Within these relations, technologies shape human beings' perceptions, practices, and experiences and help us understand how we 'can be present in the world and how the world can be present for human beings' (Verbeek 2015, 29). Ihde offers four types of relations: embodied, hermeneutic, alterity, and background. This research is aligned with the *embodiment relations* as the mocap technology and its haptic and visual feedback enable 'unity with a human being directed at the world' (Verbeek 2015, 29). For example, in the video essay, I discuss the importance of the tactility of the motion capture suit and the markers and how body and mind are coupled with technological sensibilities through a sense of touch. The improvisers' sensibilities are intentionally shaped (and reshaped) through tactility (of the suit and markers) and transformed into digital trace-forms within a mocap environment, allowing for embodiment relations as follows:

Embodiment relations: (*movement practitioners' sensibilities–motion capture tactility*)

→ *directed at the world*

In the above relational example, I apply Ihde's schematic visualisation of these interactions through brackets and directional symbols. The brackets suggest the perceptual properties and materiality and how the sensory and perceptual engagements flow towards them. This research emphasises that improvisers interact with the mocap tools and environment, involving the whole body and sensory experiences (discussed in the video essay in relation to the Range of Coupling and T-pose with Stillness).

The intertwining relations between humans (technology) and the flow of sensory information can also be cognitive processes. This idea within embodied relations aligns with Clark's (2008) EXTENDED mind concept (capital letters in original), suggesting that our cognitive processes are intertwined with the tools and technologies we interact with. As he suggests, '[c]ognition leaks out into the body and world … ' (Clark 2008, viii). In this research, it means that the digital trace-forms become extensions of the improviser's body and mind.[4] Also, it interconnects with the somatic practices of the Body–Mind Centering (US spelling of Centering) method developed by Bonnie Bainbridge-Cohen (2020), as it recognises that cognition is not solely a product of the brain but is intertwined with the body and its movements. In the video essay, I discuss the importance of this method through touch-hand brush strokes between the improviser's body and the motion capture suit and markers. This reciprocal information focuses on the awareness of the body's different systems, such as skeletal, muscular, and organ systems. The interconnectedness and extension of the mind create a dynamic interaction between body, mind, and environment – creating a feedback loop and coupling experiences discussed in the next section.

Feedback loop

The intertwined relationships between body–mind, technology, and the world can be associated with a feedback loop: 'loops promiscuously criss-crossing the brain, body, and world boundaries' (Clark 2008, viii). For example, in this video essay, the feedback loop is observed in the movement examples of both improvisers and more evident in

the first half of the video essay, where the improviser's moves with seeing – responding to the digital trace-forms directed towards the environment, which affects the environment, in return it affects the improvisers' way of being moved/moving. This type of feedback loop creates what Clark (2008) calls an 'outward loop … [of] … continuous reciprocal causative recursions' (322). The improviser continues to respond with movement possibilities upon receiving feedback from the digital trace-forms and environment and increasing dynamic complexity, enabling *sculptural qualities* within motion capture environments.

These reciprocal looping relationships between the improviser's living experiences, perceptions, and actions are intertwined with their environmental perception. The intertwined feedback loop empathises with the notion of *coupling* in relation to the extended body–mind within the motion capture environment. Clark (2008) suggests incorporating external tools into cognitive processes to create coupling relations of dynamic interactions between the cognitive process, sensory experiences and the environment. In this sense, the improviser's cognitive processes are not confined to their mind but extended into the environment through the mocap tools. This research demonstrates an adaptive and active feedback loop and extends improviser's body–mind beyond their boundaries within motion capture environments.

For example, returning to the moment where the improviser attends to the touch of the motion capture suit and actively places the markings on the suit – even if it is a technical requirement – attention to touch couples the body and mind to the suit and the external environment. The next stage is the *Range of Coupling (ROC)*, the movement sequence. Because wearing the suit, the improviser's body–mind awareness reinforces experiential coupling and can influence the improvisers' shaping experiences while seeing-sensing-responding. In the ROC example, coupling signifies the dynamic relationships interwoven with the sensory and cognitive interactions within motion capture environments. Therefore, ROC became an initial finding on how to access *sculptural qualities*.

Through the extensive workshop process, including the ROC finding space within the praxis, the T-pose with Stillness became part of the ROC. As I performed the technical T-pose over the past two years, I noticed the sensory and cognitive responses even within the calibration process, discussed in the video essay. The calibration is performed through a T-pose position (in some mocap systems, it is an A-pose or N-pose) to configure the skeletal and bone structure of the performer correctly into the digital model (available by the software). Because this T-pose is held in stillness, I argue that the movement practitioner must be attentive to the state of *being there* (Kozel 2008). Merleau-Ponty (2002) suggests that attending to the here and now of the living experience, the embodied engagement with the world, allows one to engage with the body, self, and the environment in the present moment. The short poetic excerpt 'I am – I can T-pose with Stillness' in this video essay is inspired by these embodied practices of thinking-doing-being in PaR. I suggest that through T-pose with Stillness, the sculptural qualities are activated, enabling the improviser's living experience to

Be - Being

Shape-shaping

Sense-sensing

Move-moving.

In live performance in digital environments, these technical requirements can transcend their functional role and become an integral part of the performative experience – coupled with and extended. Coupling the improviser's extended body–mind with the motion capture technology guides the expressive shaping processes within live performance. According to Clark (2008), the cognitive process can be 'offloaded' onto the external environment, creating what I call mind-extenders. In this research, the mind-extenders can be motion capture technologies and their practices, such as the motion capture suit, markers, T-pose calibration, digital models, digital trace-forms, and the environment. Therefore, mocap acts as a mind-extender in supporting the improviser's cognitive tasks while improvising. In the next section, I focus on the digital-trace forms and their visualisation. These digital trace forms provide a visual, non-linear narrative and often embodied narratives of the extended shaping processes.

Visualisation

Building on the feedback loop discussion, the digital trace-forms are formed through the real-time interactions between the improvisers' shaping experiences and the environment. Motion capture technologies enable the creation of hybrid spaces and performances that blend live and digital elements in real-time and allow the performer to interact with virtual or augmented sculptural forms in these environments. The visualising of motion, within this research, is through a digital trace-form as an air pathway of movement (Laban and Ullmann 2011) utilising two visualisation software, Motive and Touch Designer. Motive allows visualisation of the movement data through lines influenced by the technical configuration of the marker history. These lines trace the history of the paths, starting at the marker point and back to the marker on the dancer's body. In the context of my research, I call these *line visuals*.

Additionally, using Touch Designer, I explored trace forms in the form of dots, introducing aesthetic texture of colour. Integrating these digital visuals in real-time allows for a hybrid experience within improvisatory explorations, where the movement practitioner's physical movement interacts with and is influenced by the digital traceforms. The feedback loop allows the movement practitioner to shape and reshape with an immediate response when perceiving these digital trace forms. The revisit output of the new reshaped trace form is enriched by incorporating feedback, which is then reintroduced into the artistic expression and practice. It fosters a constant cycle of growth and transformation of both improvising bodies, actual and virtual, within motion capture environments.

Returning to the idea of what performance *is* or can be within motion capture environments, the non-linear narrative explorations influence abstract storytelling by utilising these *line visuals* and *dots*. Both improvisers in the video essay embody these sculptural forms to create visual motifs and metaphors in the moment while improvising. For example, the moment of the improviser's interaction with the echoing *line visuals* left in the virtual space allows the emergence of a narrative thread within the performance. The mover's gestures, shapes, and trajectories of responses become intertwined with the visual echoes. This relationship of interactions and response to the echoing *line visuals* is open-ended and explorative and offers possibilities for creating a thought-provoking and

transformative experience. Within this view, the interplay between *sculptural qualities* and forming narratives can extend storytelling beyond and towards the digital environments.

Within my research, I acknowledge the ever-evolving interactive and visual technologies such as Unreal Engine, Unity, and Virtual Production. These platforms offer experimental scenographic experiences within live performances as demonstrated, for example, by the *Dancing in the Metaverse* (2021–2023) research project by a consortium of organisations[5] with a lead scholar Strutt (2022) who describes the work embodied co-presence to emphasise the remote creation within virtual environments.

Alternatively, the live performances *DREAM* (2021) by Royal Shakespeare Company (RSC), *Game Changers* (2023) by Megaverse, and new work *Reset – Beasts and Demons* (2024) by Cie Gilles Jobin, utilising motion capture technologies and Unreal Engine to create interactive environments for live performance. These are exciting examples of works opening creative and storytelling opportunities. I propose that the *sculptural qualities* framework is the foundation for the improvisers/performers to build upon when working within these environments. It is a practical and theoretical framework to understand these complex relationships between the performer's bodymind, motion capture technologies and digital /virtual environments. Therefore, *sculptural qualities* are a working tool/method within these cutting-edge and interactive environments, where performers can respond and connect to the wholeness of these interactive experiences in the moment. The shaping process of sculptural qualities focuses on the fundamental dialogue and transformative relationships between body, movement, technology, and the world. Therefore, this audio-visual essay demonstrates how these processes emerged through practice, theory, active reflections, and through film techniques to offer insights into these transformative shaping experiences.

Conclusion

In conclusion, this audio-visual essay has explored the initial ideas and relationships between dance improvisation and digital environments, highlighting the potential when these elements converge in performance practices. Reimagining practice-based experiences within motion capture environments through which I call *sculptural qualities* a process of shaping, offering new aesthetic possibilities and interaction for the movement practitioner. The transformative opportunities of mocap offer to unlock new performative potential and reshape the boundaries of performance. The fusion of the physical with the digital blurs the boundaries between the tangible elements of live performance. Furthermore, the document(action) of lived experiences through film suggests an aspect of sharing the *experiential coupling* of dance improvisation within motion capture environments. By capturing this interplay which improvising bodies inhabit, film and this audio-visual essay become a medium for reflections and inprocess document (ation) of the practice-based experimentations and reshape the understanding of what live improvisatory performance *is* or can be within digital environments.

Notes

1. In this research, dance improvisation can align with Carter (2000) definition as 'improvisation for its own sake that is brought to a high level of performance' (184).

2. The phenomenological lens interprets the state of 'being there' in reference to Heidegger ([1926] 1993); (Svanæs 2013) concept of *Dasein (Being)*. The *Dasein* concept is related to the nature of being-in-the-world, a lived experience and something concrete and actual. In this research, the movement practitioners lived experience is 'a sign of being' - temporal capturing, holding, and releasing of an improviser's movement (motion) through the digital-technical mediations in the mocap environments (Woodcock 2016, 24).
3. It is a four-minute virtual dance installation projecting virtual figures, which Cunningham calls bipeds (further influenced his work BIPED in 1999), onto three walls within animated theatre space at the Siggraph conference (Kaiser and Downie 2023).
4. In this research, the improviser's mind is distributed across the brain, body, and the motion capture environment in which the interactions are situated.
5. *Dancing in the Metaverse* (2021–2023) is a joint research project by Goldsmiths, University of London and its partners Akram Khan Company, Alexander Whitley Dance Company, Midheaven Network, and Gowanus Loft, and has received AHRC funding.

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Notes on contributor

Lucie Sykes is an academic, researcher and artist in dance and digital performance practices. She is undertaking practice as a research PhD at the School of Arts, Media, and Creative Technologies at the University of Salford. Her research title is Shaping Dance Improvisatory Processes Intertwined with Actual and Virtual Bodies: Exploring Sculptural Qualities Within Motion Capture Environments. Lucie is fascinated by movement and the interactions between the body–mind and digital technologies. By using cutting-edge digital technologies, she explores and experiments with themes of embodiment, human-machine interaction, and immersion. Lucie creates interactive dance digital performances and interactive installations with multi-sensory output.

ORCID

Lucie Sykes http://orcid.org/0000-0001-8505-5403

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