

Dance and Technology: An Evolving Body of Dance

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Dance is work done with the body — it is necessarily about being human. Technology is work done by humans that minimizes the need for constant human labor. Our world is becoming increasingly technology-driven as we strive to make machines that are smarter than us and ever faster. It only makes sense that we would think to combine dance and technology in order to achieve a state of performance never before possible.

This paper discusses the role that digital technology plays in dance performance. While some works of dance tech focus on a robotic or technology-driven body,¹ I will focus on dance performed by humans that involves digital components. To understand how technology has become a part of performance, we can begin by understanding the role of technology in other aspects of our lives. As technology becomes smaller yet more powerful, it has contributed to everyday tools that allow for a more connected, efficient world. Tech accessories, which have become necessities for many people, have been marketed to take a more aesthetic stance in our lives, a concept which will become relevant in the discussion of dance and performance. Cell phones have gone from bulky, plain, and pixelated, to slim and sleek. Over the past five years, smartwatches have transformed from awkward wrist screens to stylish accessories. Although tech products may initially take on a clunky, digital look, over time, they evolve to better aesthetically suit our lives.

The integration of technology into our lives provides a strong analogy to the stage. As devices such as cell phones transition from novelties to essentials, so do technologies of

¹ As an example, the reader can view this dance performed by robots: *Bruno Maisonnier: Dance, Tiny Robots!*, Prod. TED, 3:09. YouTube, 26 February 2013, <<https://youtu.be/ww9ClmCWBr0>> (19 September 2016).

performance. Lights and theatrical rigging systems — now a standard part of performance — are technologies that advanced performance practice. Now, in the era of the digital, avatars dance with humans and the data of movement can be studied and manipulated through motion capture. Are we in the “bulky cell phone stage” of new technology in performance, or have we reached a sophisticated aesthetic that balances the potential of technology with the art of dance?

The world we live today is interested in the interdisciplinary — in the possibility of combining art and science to visualize and understand in new ways. Physicist David Glowacki uses motion capture and code to translate the human to a field in his dance-physics simulation, *danceroom Spectroscopy*. In 2012, Glowacki used *danceroom Spectroscopy* to create the dance performance *Hidden Fields*.² He commented that the technology did not remove the human, but made the performance more human, explaining that technology can provide viewers “another way to imagine their relationship with the energetic fabric of the universe.”³ While technology is commonly perceived as inhuman, removing the body, perhaps technology can move to a place in which it empowers our understanding of the body. Cell phones can be viewed as devices that isolate us by absorbing our attention, or they can be viewed as devices that connect us and help us access information. Likewise, an avatar may be a cold and distant imitation of the body without flesh, yet it may also be a new vision of the body that affords a valuable understanding of movement. Studying performance collaborations involving dance and technology, specifically those of Merce Cunningham, Bill T. Jones, Wayne McGregor, OpenEndedGroup, and Random International, leads to a discovery of creative and aesthetic products that can come of combining two seemingly disparate fields. By examining these works, we can understand concepts of the

² “Dance,” *Danceroom Spectroscopy*, <<http://www.danceroom-spec.com/project/dance-2/>> (13 December 2016).

³ David Glowacki, Skype interview by Melissa Kaufman-Gomez, 17 October 2016.

body in the past and in the present, and can imagine what possibilities a hybrid form may provide for the future of performance.

Approach

In studying a form that is truly a multiplicity of other forms, I aim to establish a level foundation of research, in which each aspect of the work is given comparable consideration and investigation. I am striving to understand what dance and technology can offer each other, and although this is a dance thesis, I hope not to write from a perspective biased with a dance lens. The audience of dance tech is not necessarily a niche community of dancers nor coders. I write not as a dance scholar, nor as a technologist, because dance tech pieces are not simply dances that incorporate technology, nor technology that incorporates dance. This work is not one form attending to the other, but multiple forms coming together.

Dropping the identities of dance scholar and technologist creates an openness that allows for discoveries within this hybrid form. With that said, collaborator backgrounds and motivations will be taken into account, as the collaborators involved — artists, scientists, technologists — shape the final work. I strive to be unbiased in my research of dance and technology, yet I recognize that the creators of the work themselves do not necessarily have the goal of making dance and technology equal factors.

In addition to acknowledging the motivations and expertises of the creators of dance tech work, it is worth noting that the available research on this subject is written primarily from an art perspective. The main texts on which I relied, *Performance, Technology, and Science* by Johannes Birringer, *Interdisciplinary Performance* by Natasha Lushetich, and *Identity, Performance and Technology* edited by Susan Broadhurst and Josephine Machon, are works of

performance theory. Dance tech pieces are usually born from collaborations between a collection of digital media artists, such as OpenEndedGroup and Random International, and choreographers who are open to technology and experimental forms. Most major tech companies are not involved in art nor performance; this is not a profitable field. Dance tech is understandably riskier than just dance or just tech because it requires close communication, understanding, possible failure, and embracing of the unknown. In the history of dance tech and today, the main players in this work are experimental artists and freelance technologists.

Definitions

“Dance tech” is an ambiguous term composed of other ambiguous terms, so I will begin by discussing loose definitions to guide this study and open the door to inquiry. We can shape these definitions by considering the practices of producing work in dance and technology. Dance choreography and performance involve process and iteration — improvisation, collaboration, creation, and rehearsal — culminating in an ephemeral performance. Similarly, computer programming depends on creative thought and iteration, as is evident in widespread code version control systems such as GitHub, which allow programmers to collaborate on code and save multiple versions of their applications. The open floor plans of tech companies, as well as the proliferation of open source software, demonstrate that coding is highly collaborative, as it depends on the collective thinking of many software engineers. While the dance and tech fields may look different on the outside, their iterative and collaborative processes provide potential to bring the fields together.

In progressing from practice and process to “performance,” we find that the final products of dance and technology share even more. “Performance” is a term traditionally

ascribed to a work presented to an audience, often on a stage. Digital artist Hans Dieter Huber, quoted by Harmony Bench, holds that code execution is performative.⁴ This concept, while perhaps initially provocative, is not all too extreme when we consider ourselves, the users, as the computer's audience. When you turn on your laptop, the code of the operating system causes electrons to dance. For example, if you are a Mac user, Apple is putting on a performance by welcoming you with the shining Apple logo and singing the iconic startup sound. The aesthetic of the final product varies between dance and software, yet the user or viewer is an audience member to the execution of a practice of technology or dance.

By broadening the definition of performance beyond the stage, we can better understand nontraditional forms like dance tech. In an interview with Dawn Stoppiello, co-founder of dance tech company Troika Ranch, it became apparent that the definition of technology could also benefit from elucidation. Everything from a pen to a smartphone is a technology, although when people talk about technology, they are often referring to computers or visual and audio tools.⁵ Rather than considering computer stuff/programming as the sole technology in dance tech, we can view dance and programming both as technologies that come together in performance. As scholars Susan Broadhurst and Josephine Machon describe, "Technology is a perception or belief. Technologies, once widely diffused and adopted, become invisible and lost currency through their necessity Many people also consider technology as the perception of something as a means of accomplishing something else."⁶ Code is a technology that allows for

⁴ Hans Dieter Huber, "Only!4!!!!!!!!!!!!!!!!!!!!4-for your private eyes. A structural analysis of <http://www.jodi.org>" (2002), quoted in Harmony Bench, "Computational Choreographies: Performance in Dance Online," *International Journal Of Performance Arts & Digital Media* 5, no. 2/3 (December 2009): 157.

⁵ Dawn Stoppiello, Skype interview by Melissa Kaufman-Gomez, 7 October 2016.

⁶ Susan Broadhurst and Josephine Machon, *Identity, Performance and Technology: Practices of Empowerment, Embodiment and Technicity*, (Basingstoke, Hampshire: Palgrave Macmillan, 2012), 12-13.

applications such as projection, motion capture, and augmented reality. Technique is a technology, or a “code” that allows dancers to accomplish movements such as turns and leaps. Light was a technology that through “necessity” — lighting performances in dark theaters⁷ — became an assumption rather than a technology. When forms of modern technology, such as projection and motion capture, become assumptions of the theater, we may reach a possibility of more seamlessly combining dance and computer technologies.

In reworking the definitions of “technology” and “performance,” I have extended what these terms encapsulate. It is my hope that these more open descriptions will aid in a comprehensive understanding of dance tech. By investigating the overlap in descriptions of dance and technology vocabularies, we are prepared to study the possibilities of interaction between the fields.

The “Digital Aesthetic”

In analyzing dance tech, I examine what media artist Johannes Birringer describes as the “digital aesthetic.”⁸ The “digital aesthetic” is self-evident in iLuminate’s robotic light-up suits, in the sinewy animated body of Bill T. Jones in *After Ghostcatching*, and in the “living sculpture”⁹ of Wayne McGregor’s *Future Self*. As Birringer writes, the digital “produces a machinic vision, an algorithmic writing of data.”¹⁰ The material that these works present to us is not strictly human. When we see the digital aesthetic in dance tech, we observe that a non-human factor has entered the stage — a computer that turns on lights and makes decisions with or independent of

⁷ The Edison Electric Illuminating Company of Boston, *The History of Stage and Theatre Lighting*, (Boston: The Edison Electric Illuminating Company of Boston, 1929), <http://www.iar.unicamp.br/lab/luz/ld/C%EAnica/Hist%F3ria/the_history_of_stage_and_theatre_lighting.pdf> (22 November 2016), 11.

⁸ Johannes Birringer, *Performance, Technology, and Science* (New York: PAJ Publications, 2008), 8.

⁹ “Future Self,” *Random*, 2012, <<http://random-international.com/work/future-self/>> (13 October 2016).

¹⁰ Birringer, 18.

the dancer. Must everything that involves the digital take on this aesthetic? Light is essential in dance performance, yet we would not call all performances that use light “light performances.” Is the digital aesthetic a necessary byproduct of integrating dance and technology?

In order to understand the digital aesthetic in dance performance, let us first explore the aesthetic of technology. This topic, specifically the aesthetic of programming tools and electronic devices, has not been widely researched. Popular culture provides images of technology, for example, the neon green falling code in the film *The Matrix*. This image is in fact representative of the tech industry today, as many software engineers still code in black computer terminals with green or white text. While there are not many reputable sources describing the origins of this “digital aesthetic,” it seems that the bright green or white text on a dark background was the result of engineering constraints. Early screens used a beam to excite luminescent substances called phosphors. For computer screens, which would contain large amounts of text, a phosphor of high persistence was used to minimize flickering. This phosphor was composed of Willemite, resulting in green text, and at times, creating a trail of text, or the falling code exhibited in *The Matrix*.¹¹

Although modern screens have moved past the constraints of phosphors, many programmers still write code in dark terminals with neon-colored text. After doing a bit of research across online developer forums, it seems that this aesthetic stayed around for the practical purpose of being easy on the eyes, and also for the sentimental value of honoring the beginnings of computer science. Justifications of this terminal aesthetic from programmers

¹¹ Phillip Remaker, “Why did early computers use green on black text?,” *Quora*, 30 July 2016, <<https://www.quora.com/Why-did-early-computers-use-green-on-black-text>> (11 October 2016).

include, “My terminal has to be black, with neon green font, or it doesn’t feel like a terminal,”¹² “I have light text on dark background because it ‘feels’ ‘right’. It takes me back to the 80s, when I was first exposed to home computers,”¹³ and “when it comes to a terminal I want white font on an black background. It makes me feel like I am doing computer stuff. I could use green font also, make me feel like I am in one of those old SiFi movies.”¹⁴ In the practice of programming, the display of the text is clean and efficient, while also giving the programmer a mission, or a sense of being in the “zone.” Although these sources must be gathered colloquially and reflect the opinions and preferences of individual engineers, they are integral in understanding a culture of technology that then becomes a part of the dance sphere. The backgrounds of the collaborators and the aesthetic preferences that each of them bring to the work must not be overlooked in analyzing dance tech performance.

Now that we have a grasp of the digital aesthetic and its origins in technology, we can investigate how it becomes part of dance. Hans Dieter Huber elaborates on the idea of code execution as performative, writing, “Digital texts produce surface effects of computer behaviour that cover over the source code, which disappears as it is performed.”¹⁵ When code is executed, the actual text is not visible to the user. Instead, the user sees only the “performance” of the code — the running application. In computer science, this is exactly what we hope to see: the application is superimposed over the textual code, and the user does not need to confront details of the programming. Unfortunately, when programming is integrated with dance, the program

¹² swoll1980, “Terminal: dark vs light,” *Ubuntu Forums*, 27 July 2009, <<https://ubuntuforums.org/archive/index.php/t-1198455.html>> (13 October 2016).

¹³ t0p, “Terminal: dark vs light,” *Ubuntu Forums*, 27 July 2009, <<https://ubuntuforums.org/archive/index.php/t-1198455.html>> (13 October 2016).

¹⁴ irv, “Terminal: dark vs light,” *Ubuntu Forums*, 27 July 2009, <<https://ubuntuforums.org/archive/index.php/t-1198455.html>> (13 October 2016).

¹⁵ Huber quoted in Bench, 157.

often overshadows the movement. The application created by the computer program — projection or motion capture, for instance — is superimposed over the dance, to a point at which it is difficult for the audience to discern the human movement.

iLuminate's work is an example of dance tech dominated by the digital aesthetic. The emphasis on the digital is obvious in the introduction to the company's performance at TEDxTeen in 2014;¹⁶ it even features the black terminal and neon green text. The dancers wear light-up suits, which flash in coordination with the choreography. We observe robots, not dancers, on the stage; the computer application shrouds the movement of the human body, and we are presented instead, with a spectacle of the video-gaming world. This is what David Glowacki refers to as a representation of "hacky culture."¹⁷ For iLuminate, the interaction between the audience and the stage is akin to the interaction between the gamer and a screen. iLuminate strives not to explore the body, but to entertain with a futuristic portrayal of the digital. iLuminate emphasizes technology, making human movement secondary.

Because of the duality of dance and technology on stage, each component must stand out obviously. Artists perhaps overcompensate for the newness of digital technology in the stage space, resulting in avatars, grids on the floor, and in general, a sci-fi scene. These are indicators that let us know we are watching a dance *tech* performance. Yet, in the midst of this spectacle, we lose the human. This loss of the human subject is not a new criticism. Some may say that in commercial dance (in this context, commercial dance refers to dance that strives to fulfill a market rather than solely artistic purpose), the spectacle of tricks draws away from the meaning of the piece. When we use technology as a trick or spectacle, we run the risk of losing meaning

¹⁶ *iLuminate at TEDxTeen 2014*, Prod. iLuminateDance, 2:58, YouTube, 14 April 2014, <<https://youtu.be/ijsPFAIwohU>> (17 September 2016).

¹⁷ Glowacki.

and the possibility for human connection. By incorporating technology, a representation of the new, into performance, it sometimes becomes a spectacle superimposed on the dance.

Technology brings the “cool” component, “selling” the art, yet reducing the weight of the other aspects of the performance.

Collaborators, Appearances, and Assumptions

Dance tech is inherently a collaborative field. The creators of these pieces are not often both dancers and choreographers, but more often collaborators — experts in dance working with experts in technology. This collision of ideas from different work cultures and practices results in the creation of something new. As performance scholar Simon Murray writes, in collaborative work, “we are talking of the relational, of a force field where two or more people, practices, groups or organizations ‘meet’ to create an outcome (known or unknown) which, it is imagined, will be different from the one to be produced if there had been no collaboration.”¹⁸ This fosters creativity, yet also affords the opportunity for one vision to shine more brightly than others in the case that collaborators do not “meet” to create a unified outcome. The dominance of one component of the piece over the others can manifest in a variety of ways, but for dance tech work, we will focus on the portrayal of the body.

Because dance tech demands visual attention, the appearance and aesthetic of the piece play key roles in the audience’s processing of the performance. Appearance can be consciously and subconsciously constructed. In this thesis, I strive to dissect dance tech pieces in order to understand both the deliberate and subconscious choices that contribute to the aesthetic of the piece. Society has conditioned us to pick up on visual cues and to understand them culturally.

¹⁸ Simon Murray, quoted in Noyale Colin and Stefanie Sachsenmaier, *Collaboration in Performance Practice: Premises, Working and Failures* (Basingstoke, Hampshire: Palgrave Macmillan, 2016), 36.

Assumptions we make based on appearances in reality may be translated to the reality composed on the stage given the aesthetic of a piece. For example, the subway is a site that facilitates the convergence of people from many walks of life. Two men in their twenties take a broad stance, confident, not gripping the handrails. They are talking about a bug, a software problem, that they want to fix. They are dressed casually — t-shirts and jeans — wear black backpacks, and sport Apple watches. They exhibit a culture that took root in Silicon Valley — relaxed outwardly yet driven and slightly arrogant. Predominantly male. Nerdy yet sleek, exhibiting the latest gadgets. Tech is their reality — their career — but they also make it a reality for themselves. They create a body that gives us information about their passions and careers; they wear the tech aesthetic.

The two men, and everyone on the subway for that matter, are putting on a performance. They make choices about their aesthetic; these choices are informed by their backgrounds and by what they want people to gain from their performance. There is nothing much different between the way in which aesthetic choices affect an audience in a pedestrian performance versus a performance put on a stage, labeled as art.

Wearables - An Exhibit of the Digital Aesthetic

The discussion of appearance is nontrivial in understanding dance tech. Creations have an appearance. The appearance of the creators might say much about their backgrounds and priorities, and how they would like to be portrayed. What happens by pairing someone who selects from a closet of t-shirts and sneakers every day with a person who lives primarily in leggings and a leotard? The way in which we present ourselves says much about who we are, or at least who we aspire to be. An IBM group researching wearable technologies holds that the

accessories we wear, such as smart bracelets and watches, should reflect us.¹⁹ “Aesthetically, although devices are increasingly more stylized, these products continue to look and feel like pieces of technology On the body, any technology that asserts itself forces the user to incorporate a technological image into his/her self-image.”²⁰ This trend of technology asserting itself over the body applies both to daily life, and to the stage. In an effort to put the user first, IBM is pushing for the jewelry first, with the technology as a functionality, but not an aesthetic presence.²¹ This trend can be observed increasingly in the technology industry as wearables, in addition to products for the home, such as Google Home and Amazon Echo, have become ever more present in our lives. Are we going to see this shift, from tech object to integrated tool, in the performance world as well?

Over time, wearables have evolved to prioritize the user, and his/her aesthetic choices. For example, the first generation of the Moto 360 watch veered strongly toward a tech aesthetic, while the second generation appears to be much more of a piece of jewelry, especially in the rose gold edition.

¹⁹ Cameron S. Miner, Denise M. Chan, and Christopher Campbell, “Digital Jewelry: Wearable Technology for Everyday Life,” *CHI '01 Extended Abstracts on Human Factors in Computing Systems* (2001): 45.

²⁰ *Ibid.*, 45.

²¹ *Ibid.*, 45-46.



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Digital technology does not serve a directly aesthetic goal. It aims to store data and perform computations that will make our lives easier. The wristwatch is a technology that allows us to tell time; the smartwatch is a technology that goes a step further — it can tell us the time, show notifications, and make phone calls. Technology’s immediate concern is not achieving an aesthetic, but achieving a function. Technology adapted for wearables because these devices became an aesthetic part of the body. As the images above demonstrate, wearables evolved to suit human aesthetic purposes. Thus, technology can also evolve on the stage in its interactions with the human body. To study this potential for evolution, I will discuss two late twentieth-century pieces, *BIPED* and *Ghostcatching*, along with a more recent piece, *Future Self*.

***BIPED* — A New Creature**

BIPED (1999) is a landmark piece in dance technology. The piece is a collaboration between Merce Cunningham and OpenEndedGroup, a collective of artists and technologists that creates digital art. OpenEndedGroup translated motion capture on Cunningham’s choreography

²² Google Store, 2014, *Moto 360*, <https://store.google.com/product/moto_360> (8 November 2016).

²³ Google Store, 2015, *Moto 360*, <https://store.google.com/product/moto_360_2nd_gen_rose_gold> (8 November 2016).

to hand-drawn bodies to create the “visual decor”²⁴ for the piece. These drifting animations were projected onto a transparent scrim at the front of the stage,²⁵ and inserted into the choreography via chance operations.²⁶ *BIPED* can be seen as a culmination of the growing use of digital media in dance, particularly video, during the 1970s and 1980s.²⁷ Cunningham’s involvement comes as no surprise given his reputation as an “artist whose work literally moved through the compositional technical equipments that became available.”²⁸

Cunningham informed his collaborators that the piece would be “about technology” and compared it to “flicking through channels on TV.”²⁹ This is conveyed in the animations that appear and dissipate into thin air throughout the piece. In designing the animations, Kaiser explained that he and artist Shelley Eshkar developed “dot bodies (from the dots seen in motion-capture), stick bodies (inspired by the yarrow sticks cast by I Ching practitioners like Cunningham and Cage), and cubist/chronophotograph bodies (our nod towards Marey and Duchamp).”³⁰ These variations gave OpenEndedGroup freedom in their work, yet they “took care never to lose the underlying perception of real and plausible human movement.”³¹

Because I have not had the opportunity to view *BIPED* live, my response to the piece is based on videos of live performances. A 1999 recording of the piece reveals striking movement,

²⁴ “BIPED,” *Merce Cunningham Trust*, 2016, <http://www.mercecunningham.org/index.cfm/choreography/dancedetail/params/work_ID/165/> (14 November 2016).

²⁵ Shelley Eshkar and Paul Kaiser, “BIPED,” *OpenEndedGroup*, 1999, <<http://openendedgroup.com/artworks/biped.html>> (14 November 2016).

²⁶ Paul Kaiser, “On BIPED,” *La Scena Digital*, 1999, <http://openendedgroup.com/artworks/biped_essay.html> (14 November 2016)

²⁷ Birringer, 5.

²⁸ Birringer, 7.

²⁹ Merce Cunningham quoted in, Kaiser, “On BIPED.”

³⁰ Kaiser, “On BIPED.”

³¹ *Ibid.*

but unfortunately, the video quality does not capture the details of the decor.³² Even without the digital components of the piece, the movement, looping from circular to sustained, is magical. Through the variety of solos, group sections, unison, and canon, the audience observes the bodies of the dancers as individuals, as a group, and as individuals within a group. The body is bright yet obscured by shadows, begging the viewer to look more closely.

In viewing more recent recordings of *BIPED*,³³ in which the digital components are easier to discern, I came across another vision of the body: the disembodied body — the digital body. The projection of avatars floating in thin air around the dancers enhances the experience by providing an abstracted portrayal of the body. Abstraction, such as in the visual art of Piet Mondrian and Henri Matisse, can be used as a way of opening a window of thought for the viewer. As a dance tech piece, *BIPED* must negotiate the interplay between abstract visual components and the dance. In *BIPED*, the dancers seem to be creatures exploring the possibilities of movement. When the movement is controlled, it seems mechanical, but then it effortlessly blossoms into luscious sweeps. This juxtaposition makes the piece profoundly human in its inquisitiveness and variety of movement dynamic. Because the movement is already so powerful, the placement of technology in the piece is delicate. A layer of abstraction can be constructive in opening the mind of the viewer, but only if it does not detract from the beauty of the human body.

³²Jerome Robbins Dance Division, The New York Public Library, *BIPED*, 47 min, New York Public Library Digital Collections, 1999. <<http://digitalcollections.nypl.org/items/eb6604d0-3434-0131-b55c-3c075448cc4b>> (10 December 2016).

³³ Jerome Robbins Dance Division, The New York Public Library, *Biped [and] Sounddance, 2007-01-07*, 47 min, New York Public Library Digital Collections, 7 January 2007. <<http://digitalcollections.nypl.org/items/052a1840-314f-0132-4597-3c075448cc4b>> (10 December 2016).

The avatars appear to be larger than life; they even seem celestial³⁴ as they float above and around the dancers. While watching the piece, I perceived the stick bodies to be arbitrary glowing bars floating through the space; the connection to the human form was lost. The dot bodies appear to be atmospheric, it seems that the dancers are simply moving through a digital environment.³⁵ In these instances, when there is too much abstraction from the body, the technology becomes part of the set, rather than part of the dance. The Merce Cunningham Time Capsule even describes, “The décor for *BIPED* is an exploration of the possibilities of the animation technology of motion capture.”³⁶ Although “décor” is often used in Cunningham literature, here, it suggests that the technology is meant only as a supplement to the dance; it is not meant to be an integrated part of the work. For me, these moments of atmospheric technology cause the digital aesthetic to loom over and burden the piece.

Cunningham combined disparate elements as individual components in much of his work. In describing the elements of music, dance, and decor, he commented, “the three arts don’t come from a single idea . . . but rather they are three separate elements each central to itself.”³⁷ Cunningham viewed each component of the performance simply as that thing, to be presented without expectations.³⁸ For example, a black cat could cross the stage and be simply a black cat crossing the stage, not bad luck.³⁹ It is possible to apply this multidisciplinary⁴⁰ approach to

³⁴ *Merce Cunningham Dance Company: Park Avenue Armory Event*, Prod. Davison Scandrett, Disc 3: 90 min., Artpix: Microcinema International, 2012, DVD.

³⁵ *Merce Cunningham Dance Company at BAM: BIPED*, Prod. BAMorg, 3:04, YouTube, 28 December 2011, <<https://youtu.be/YHeoYdDMbLI>> (13 December 2016).

Excerpt beginning at 0:40 and ending at 0:58.

³⁶ “BIPED,” *Merce Cunningham Trust*.

³⁷ Merce Cunningham quoted in Natasha Lushetich, *Interdisciplinary Performance: Reformatting Reality* (UK: Palgrave Macmillan, 2016), 73.

³⁸ *Ibid.*, 72.

³⁹ *Ibid.*

⁴⁰ Lushetich, *Interdisciplinary Performance*, 7. Lushetich distinguishes multidisciplinary from interdisciplinary in that, in multidisciplinary work, different elements converge, but do not form a hybrid.

technology. However, when the technology is very abstract, as are the floating sticks and dots in *BIPED*, the audience may begin to perceive the technology as an atmosphere to the choreography, rather than an individual, contributing component to the piece.

The cubist digital body, however, is successful in providing an abstraction of Cunningham's choreography on the human body. The brief moments during which these avatars flit into view are when, as critic Judith Mackrell writes, we are "treated to monumental and magical spatial illusions."⁴¹ The avatars, although clearly bodies, are twisted strings of blue and green. The juxtaposition of the digital body — purely an outline — with the solid human body — confident in its form and flesh — is the level abstraction that takes the piece away from the trap of an overpowering digital aesthetic. The avatar bodies cross each other and cross the human bodies, allowing the audience to see through the transparent digital "flesh" to the human.⁴² The slightly random, disconnected relationship between the digital and human bodies does not subordinate the human body, but elevates it. We can recognize and reflect on elements of the choreography in the movement of the avatars. The movement of the avatars intrigues us, makes us question; the human dancers allow us to come to know and feel the movement within our own bodies.

Another delightful nod to the human, despite the subject of technology, is the title. Interestingly, "Biped" was also the name of early versions of OpenEndedGroup's character studio,⁴³ a choreographic software used by Cunningham. The digital is a celebration of choreography on the human form, the "biped." The title unifies the concepts of the digital and

⁴¹ Judith Mackrell, "Merce Cunningham's Digital Dance," *The Guardian*, 11 October 2000, <<https://www.theguardian.com/culture/2000/oct/12/artsfeatures4>> (14 November 2016).

⁴² *Merce Cunningham Dance Company at BAM*. Excerpt beginning at 1:34 and ending at 1:49.

⁴³ Kaiser, "On BIPED."

the human in the piece. The dance of the human and the dance of the avatar come from the same place — Cunningham’s choreography on a two-legged form — and the piece takes us to the reality of a new creature, a biped. This is an early example of technology adapting to the needs of the human and the dance — technology empowers the study and creation of human movement. *BIPED* can be both about technology, as Cunningham envisioned, and about humans — two legged creatures.

***Ghostcatching* — The Fleshless Body**

In 1999, Kaiser and Eshkar also collaborated with Bill T. Jones to produce *Ghostcatching*. Motion capture on Jones results in an avatar that “reflect[s] the position and rotation of the body in motion, without preserving the performer’s mass or musculature. Thus, movement is extracted from the performer’s body.”⁴⁴ Sweeping lines define the body, at times, suggesting muscles. We hear the swoosh of the body as it responds to the music of Jones’ own voice. The body investigates its path — its memory — leaving glowing wisps in the dark space.⁴⁵ In *Ghostcatching*, the dance relies solely on technology. Jones’ live movement is invisible to the audience, and its remnants can only be gathered from the data of motion capture and the reinterpreted form provided by Eshkar and Kaiser.

Jones’ movement, not nearly as angular as Cunningham’s,⁴⁶ was more vulnerable to loss of data and richness after being translated from motion capture. For this reason, the artists of *Ghostcatching* called the avatars “ghosts or half-lives.”⁴⁷ The piece distinguishes itself in a

⁴⁴ Bill T. Jones, Paul Kaiser, and Shelley Eshkar, “Ghostcatching,” *OpenEndedGroup*, 1999, <<http://openendedgroup.com/artworks/gc.html>> (22 November 2016).

⁴⁵ 13. *Ghostcatching (1999) Chor. Bill T. Jones Digital Artwork. Paul Kaiser & Shelley Eshkar.mkv*, Prod. profesionalesartes, 2:36, YouTube, 29 May 2011, <<https://youtu.be/x-7Mo3cg9jw>> (22 November 2016).

⁴⁶ Paul Kaiser, “STEPS,” *OpenEndedGroup*, <<http://openendedgroup.com/writings/steps.html>> (22 November 2016).

⁴⁷ Ibid.

“sculpting” sense, which was born from Eshkar’s observations of Jones’ sculptural quality as a dancer. Jones, or rather, his avatar, manipulates his own body and fits into self-created spaces;⁴⁸ Jones’ dance was captured by a motion capture system, and we see the result as a figure captured and escaping from drawn spaces of his own movement.

Another theme investigated by the piece is aloneness; the dancer moves largely solo through space, yet wisps of his movement sometimes spur new figures, or ghosts.⁴⁹ We hear a score of Jones’ voice, indicating a body, yet the body is not there. In addition to the solo of the avatar, the abstraction provided by the technology causes the viewer to feel alone as a human. The viewer watches a body moving in space, yet the viewer is alone in having flesh. The avatar continues to isolate himself by capturing himself in a web of his own movement, trails of the dance.⁵⁰ As we become increasingly separated from the dancing avatar, we begin to contemplate our own presence and form.

As a purely digital work, *Ghostcatching* invites the viewer to imagine the flesh. The movement is indubitably human, and the avatar gives us space, a level of abstraction, at which we can imagine the human body. Jones is represented as a figure composed of curving wisps of chalky color; he is a cartoon that we must color in to create life.

Dance Tech and Innovation — New Bodies of Work

BIPED and *Ghostcatching* are distinct pieces. *BIPED* is about technology, features an ethereal score, and is marked by defined and clear modern movement, interspersed with digital interpretations of the choreography. *Ghostcatching* lives entirely in the realm of the digital, yet it questions technology, creating images of capture, escape, and isolation from humanity. With this

⁴⁸ Ibid.

⁴⁹ Ibid.

⁵⁰ 13. *Ghostcatching* (1999). Excerpt beginning at 0:34 and ending at 0:50.

said, I would like to highlight some of the similarities between representation of the body in *BIPED* and in *Ghostcatching*. The two pieces were created during the same year, although OpenEndedGroup began collaborating with Cunningham first. As leaders in the field, the pieces were likely created in a rapid, trailblazing manner. OpenEndedGroup applied technology they had already been developing to both *BIPED* and *Ghostcatching*, and Kaiser credits Eshkar for creating “the hand-drawn bodies that made *Ghostcatching* and *BIPED* what they were.”⁵¹ The avatars, with their chalky, colored outlines and curvatures, are recognizable between the two pieces, yet because the technology was stylized in each piece, it does not appear to be redundant. However, because technology moves so rapidly, it is worth mentioning that the performance sphere has difficulty keeping up with the pace of technology. By the time one technology is implemented in performance, the tech industry has leapt ahead to something new. This fact discourages artists from developing and exploring new technologies, both due to limited resources and the time it takes to learn any technology well.⁵²

Computer scientist Mark Downie, who later joined OpenEndedGroup, complains that “digital art, as a field that refuses to grow up and understand its history, or that there is a history, has generally ignored the possibility that there may be a useful prehistory in the performing arts.”⁵³ When I spoke to Kaiser about studying the history of what has been done in the dance tech sphere, he commented that he tends not to look at what has been written about dance tech, as it makes him feel “locked in.” In a similar vein, he commented that he does not view much work outside of his own.⁵⁴ With this in mind, along with the limited resources to obtain

⁵¹ Birringer, 275.

⁵² Dawn Stoppiello, Skype interview by Melissa Kaufman-Gomez, 7 October 2016.

⁵³ Birringer, 273.

⁵⁴ Paul Kaiser, interview by Melissa Kaufman-Gomez, New York City, 31 October 2016.

technology, it is not unreasonable to say that dance tech innovation is limited. While artists may have the desire to create new portrayals of the body and layers of abstraction in their work, they may be blocked by the rapid pace and high expense of technology.

Downie explains that the tools available to digital artists are few, and what's more, they stay the same over time. Modern systems are built on ideas from the 1980s, which were influenced by engineering concepts of the 1950s.⁵⁵ Companies who are seen as the face of technology — Google, Facebook, Amazon — rarely enter the art space. Instead, small collections of artists and technologists do this work with limited resources. While digital art may naturally venture into a realm of the future, helping us envision new realities, the technological tools available to artists may be a cause for stagnation. The vision may be to create the future, yet the reality of creating art may lock us in the loop of continuously creating the same vision of the future. Luckily, more recent work proves that some artists, such as Wayne McGregor, have found resources to continue the innovation of the body.

From where comes the “new”? Wayne McGregor Creating Reality

Performance scholar Natasha Lushetich writes, “Daily performances sediment through repetition and create habits and habitual ways of seeing. Performance thus has much to do with the forging of reality.”⁵⁶ As tech becomes increasingly integrated into our lives, it is natural that we imagine new realities through technology in performance. Choreographer Wayne McGregor creates new spaces through his exploration of the body and technology. In his 2012 piece with Random International, *Future Self*, McGregor invites us into the future, a new reality, by presenting interactions between humans and a “living sculpture” of LED lights.⁵⁷ The work

⁵⁵ Birringer, 276.

⁵⁶ Lushetich, *Interdisciplinary Performance: Reformating Reality*, 2.

⁵⁷ “Future Self,” *Random*, 2012, <<http://random-international.com/work/future-self/>> (14 November 2016).

“studies human movement, mirroring interaction in dance, light and sound, while exploring the self, present and future.”⁵⁸ The audience surrounds the installation space, observing a confrontation between human and machine. Planes of light flash down the sculpture, revealing its personality, its liveness. Stuart Wood, founder and director of Random International, describes the challenge behind its creation: “How can you recreate . . . [the] movement of a person?”⁵⁹ The company takes light out of its more traditional form on the screen and gives it depth. Wood uses light as a “tool” that can change the way the audience sees the piece and feels.⁶⁰ Random International evolves the tech aesthetic to consider how the technology will make the audience respond.⁶¹

The opening moment in which an abrupt blackout lifts to reveal a human form standing in front of the glimmering installation is already packed with emotion.⁶² The human is still, while the sculpture continues to flicker. The human and the sculpture are both moving objects of the performance space. The piece does not make one larger than the other, but instead, begs the question: Which object is living? The sculpture is not so much a piece of technology as it is a “new form or body,” according to McGregor.⁶³ It gains further liveness from the fact that the human has the power to affect and shape it. The sculpture is living in the sense that it allows “you to see a different version of yourself.”⁶⁴

⁵⁸ *FUTURE SELF Project Film*, Prod. Sin Preocupaciones, 9:31, YouTube, Berlin, 29 May 2012, <https://youtu.be/yOCUq5MWU8?list=PL-3EjejHKaSZcuTI2bfcJ_F8e113Lndqi> (18 September 2016). Excerpt beginning at 0:00 and ending at 0:10.

⁵⁹ Ibid. Excerpt beginning at 2:21 and ending at 2:26.

⁶⁰ Ibid. Excerpt beginning at 2:30 and ending at 3:06.

⁶¹ This discussion that follows carries from research I did in Professor Paul Scolieri’s course, Digital Performance, in Spring 2016. My research for this class is summarized in my final paper “Light and the Making of New Space” (May 2016).

⁶² *FUTURE SELF Project Film*. Excerpt beginning at 6:43 and ending at 6:45.

⁶³ *FUTURE SELF Project Film*. Excerpt beginning at 4:50 and ending at 5:02.

⁶⁴ Ibid.

The play between visibility of the human versus the machine makes ambiguous the protagonist of this piece. The human confronts the machine, and the machine, in interacting with the performer, confronts the human. The living sculpture exhibits “vitality,” which is defined by Nietzsche as “the ability to act and react in an energetic way.”⁶⁵ This allows McGregor to construct a new image of the body that is beyond just a digital aesthetic. The light from the sculpture is, at least in part, what makes the dancer's movement visible. The living sculpture is a body that responds, affects the body of the dancer, and moves the viewer. The sculpture becomes an active performer, with “actions” that define and sculpt our vision of the human.

The living sculpture, as a representation of one's own image, suggests that technology has become embedded in humanity. The plane of light in the sculpture mirrors the dancer, and his vertical movements suggest his fascination with his lighted image.⁶⁶ McGregor comments that there is a “sensitivity between the object or the technology and a live body, and that interface is very fragile.”⁶⁷ The sensitivity exists in the space between the dancer and the object. He moves and the sculpture moves — there is valuable tension in this relationship that provides an interface with which the audience can engage and imagine. In the relationship between the human and the sculpture, the dancer increases the pace of his movement, yet fails to escape his own image. The emotion between the parallel movement of animate and inanimate is vital to the piece. In *Future Self*, technology does not overshadow the human, but helps us see ourselves; it is both our literal and our symbolic light. *Future Self* transplants us to a new universe in which a sculpture “lives,” yet it also grounds us in an internal space of reflection.

⁶⁵ Lushetich, *Interdisciplinary Performance*, 15.

⁶⁶ *FUTURE SELF Project Film*. Excerpt beginning at 7:49 and ending at 8:10.

⁶⁷ *Ibid.* Excerpt beginning at 4:13 and ending at 4:20.

Art without technology provides a chance for reflection, but technology can provide tools to guide an audience to a new space in which reflection can be deeper and more focused. As Natasha Lushetich writes, performance is a way of forging a new reality, and technology can enable us to believe in the liveness of what we see.⁶⁸ Lighting designer Yaron Abulafia describes artworks as “metacognitive systems that reflect the changing views on the social and cultural functions of art, as these develop from one period to another. Technology has great influence on the cognitive networks that artists can create, through the aesthetic qualities that one technology or another instils in art objects, and brings to the cognitive process.”⁶⁹ Technology plays a central role in creating a formative, reflective experience in McGregor's work. Abulafia's statement supports the idea that technology can adapt its aesthetic to suit the performance and move the viewer, and the intimate interaction that McGregor creates between the dancers and the living sculpture in *Future Self* further supports the power of technology.

The vital role of technology is exhibited further into the piece, when we watch one of the dancers, back turned to us, walk slowly, almost cautiously, toward the living sculpture. Her slow walk is deliberate and directed singularly toward the sculpture. The precise linearity of her stride, as well as her exaggerated, outreached hands, give the impression that the sculpture is drawing her in. Just as she nearly reaches the sculpture, the light sculpture goes tauntingly dark, with the exception of its bottom layer, seeming to say that she can never grasp the light.⁷⁰ The persistent light emanating from the sculpture's bottom plane is a statement of defiance. The light reveals

⁶⁸ Lushetich, *Interdisciplinary Performance*, 15.

⁶⁹ Yaron Abulafia, *The Art of Light on Stage: Lighting in Contemporary Theatre* (Routledge, 2015), <https://books.google.com/books?id=ePIsCgAAQBAJ&pg=PT159&lpg=PT159&dq=how+light+in+performance+art+makes+us+feel&source=bl&ots=FtIW_jGlyp&sig=DMVo1kmHnOnQi7eCkkDQD7aslig&hl=en&sa=X&ved=0ahUKewjA4sSw1qHMAhVL5iYKHWZDBY0Q6AEINDAE#v=onepage&q&f=false>, (15 November 2016), 96.

⁷⁰ *FUTURE SELF Project Film*. Excerpt beginning at 6:44 and ending at 7:03.

the movement of the dancer, enticing her with her own image, which she cannot grasp. She must confront the out-of-body experience of viewing her own image. *Future Self* uses digital art to open up a psychological space — a space of self-enlightenment, or perhaps, a display of one’s inability to reach a space of enlightenment.

This interplay between what is living and what seems to be living yet is not is explained by digital theorist Ghislaine Boddington. She writes that, as technology enables our world to become more connected, we exist in multiple worlds — real and virtual. “We have moved into an era of representation of the self through diverse virtual bodies, thereby expanding ourselves into many selves.”⁷¹ *Future Self* uses technology to augment our world⁷² by providing a new way of seeing our bodies and ourselves.

Dance Tech and the Future

A powerful dance tech work relies on connection — connection between the art and the technology on stage, connection between the dancers and technologists backstage. As discussed previously, dependence between technology and the human is not a new concept. Cell phones and smart watches, once awkward accessories, have become products on which people depend for communication, recreation, and arguably, social status. Digital technology has evolved from a purely functional to a visible and aesthetic part of our lives. The aesthetic of a phone becomes part of our image, while also providing greater access to information and connection with others. As Boddington writes, “By accepting the inherent dynamic networking made possible by the World Wide Web . . . we can enable the development of natural, intuitive, emergent patterns of social, creative interconnectedness to become full bodied.”⁷³ Digital technology has come to

⁷¹ Ghislaine Boddington quoted in Broadhurst and Machon, *Identity, Performance and Technology*, 77.

⁷² *Ibid.*, 79

⁷³ *Ibid.*, 88.

connect us in ways that were never before possible, and dance, as a form of communication, can benefit from these technologies. By embodying the 1's and 0's of the digital, dance can come to investigate and define new bodies of connection.

The dancer's body is a particular one crafted from years of training. Technique is the technology that governs dance, just as data encoded in 1's and 0's is the technology that governs the computer. Technology is not the removal of the body. Technology takes an input, transforms it, and provides new opportunities. Technique takes the "natural" human body and returns a body that is more than human. Digital technology takes bits — 1's and 0's — and returns applications that can achieve what no human can.

Artists create a reality of the stage, and the effectiveness to which they do this makes the stage reality either possible or unreasonable to the viewer's own reality. Dance with an added digital aesthetic is most often a spectacle that is not real beyond the stage. It is like seeing a lights show at Disneyland — entertaining and spectacular, maybe even beautiful in the moment, but something that struggles to exist beyond the show.

Elizabeth Coker, dancer and movement scientist, explains that technology should not be the question itself. Rather, technology is the tool which helps to answer the question.⁷⁴ Although Coker refers to this theory in the context of her scientific motor research study, it can also extend to art and performance. The force behind a dance tech *spectacle* is the technology, as we observe in the flashing lights and robotic suits of iLuminate. A spectacle is marked by the dominance of the digital. Of course, in any performance in which technology is involved, there will be a digital aesthetic. However, when the digital aesthetic is moderated and coexists with the aesthetic of the

⁷⁴ Elizabeth Coker, interview by Melissa Kaufman-Gomez, New York City, 13 October 2016.

dance, the technology of the performance as a whole is heightened. The technologies of dance and the digital become necessary to one another. They serve as abstractions to each other, stimulating the mind of the viewer.

As Broadhurst and Machon argue, “The body invents technology as it absorbs it, absolves technology as it critiques it, and reduces technology as it claims it.”⁷⁵ A major way of forging reality in dance is through the body. In *BIPED*, Merce Cunningham provides a window to the human body through the lens of a digital body. *Ghostcatching* reveals Bill T. Jones’ dancing body without showing the body itself, isolating the viewer yet also making them consider their own reality. Wayne McGregor explores the interaction of a present body with one of the future in *Future Self*. Technology does not rule these pieces. In the words of Broadhurst and Machon, technology is ultimately “reduced” by the thought and reflection that it promotes in the viewer.

All three of the primary works discussed in this paper address the question, “What does it mean to have a body?” The dancer’s instrument is the body, and we will continue to discover how technology can change the pitch and volume, or make the instrument more accessible. Technology evolves rapidly, yet the creative minds of artists evolve rapidly as well. As the digital aesthetic varies and the interactions between dance and technology change from piece to piece, we, as viewers, feel different thoughts and emotions; we are moved in different ways. Technology and dance provide ways of transforming our visions of ourselves — as two-legged creatures, movers of flesh and bone, and bodies looking to confront our own light.

⁷⁵ Broadhurst and Machon, *Identity, Performance and Technology*, xi.

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