

## Coding Dance and Dancing Code: Analivia Cordeiro's *M3X3*

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*I was not looking at historical questions. I was looking at the future. I was not trying to do something different. I was doing what I had to do.*

— Analivia Cordeiro, 2021

In 1965, critics dismissed the first US exhibition of computer art, which included A. Michael Noll's *Computer Composition with Lines* (1964), as “cold and soulless” and having about as much appeal as the “notch patterns found on IBM cards.”<sup>1</sup> Indeed, as art historian Grant Taylor has noted, “Almost any artistic endeavor associated with early computing elicited a negative, fearful, or indifferent response.”<sup>2</sup> The use of technology, particularly digital computing, by dancers and choreographers has met with particularly strong aversion. In the mid-1960s, computer choreography pioneer Jeanne Beaman observed that most people “do not even want a machine of any kind to succeed in conceiving any art form at all. The arts are usually presented as our last refuge from the onslaughts of our whole machine civilization with its attendant pressures towards squeezing us into the straitjacket of the organized man.”<sup>3</sup> In 1988, dance educator Judith Gray reiterated the field's prejudice very simply: “Dancing is human. Machines are inhuman.”<sup>4</sup> In spite of the proliferation of digital art and performance since the mid-1990s, this prejudice persists, as demonstrated by the paucity of literature on the history of computer dance.<sup>5</sup>

This aversion has a distinctly sexist edge, which makes Analivia Cordeiro's *M3X3* (1973) revolutionary—politically, technically, and aesthetically. The female body is traditionally

associated with maternity, nature, emotion, and purity, so the incursion of technology into that sacred domain can be seen as especially unsettling: it threatens to sully the divinely feminine source of organic life by transgendering it with the man-made, masculine, rational, mechanical surrogate. Following this (il)logic, it is more acceptable for a male choreographer to use computers to program a dance performed by women because the computer serves to maintain conventional patriarchal domination. In 1973, for Analivia Cordeiro, a nineteen-year-old female choreographer from Latin America, to program a computer by herself to score a dance performed by women, strikes me as an egregious transgression of European patriarchal ontology. *M3X3* is a revolutionary act that violates gendered and geopolitical divides: that men program machines and women dance to those cyborg dreams, and that technological (and artistic) innovation emerges in the northwest quadrant of the globe, which colonizes the rest. In *M3X3* the white, male authority is no longer in control. Instead, a teenage Latina has hijacked the computer, the supreme device of masculine rationality. On top of that, she has (mis)used it to allow other postcolonial female bodies to expressively contest the relationship between control and freedom in masculinist, technological society, to contest, in particular, an extreme form of control exacted by Brazil's military dictatorship. More than a decade before Donna Haraway's "Cyborg Manifesto" (1985), Cordeiro saw and used the computer as a great equalizer: "It flattened the field. It put everybody at the same level."<sup>6</sup>

*M3X3* is a monumental artistic accomplishment. It occupies a special place beside early innovations in computer dance beginning in the 1960s, including works by Beaman, Noll, and John Lansdown. Without knowing the work of these precursors, Cordeiro exceeded them in concept and artistry. Indeed, to restrict the context of *M3X3* to dance does an injustice to this highly interdisciplinary work. Trained from an early age in modern dance technique and Laban

notation and enamored with Merce Cunningham, with whom she later studied, Cordeiro's artistic vision was equally shaped by the international milieu of experimental visual art, including the rationality of Concrete art and the emphasis on mathematics and science of New Tendencies. To grasp the importance of *M3X3*, one must recognize how it converses in dialogue with multiple artistic discourses simultaneously.

Cordeiro was not the first choreographer to use a digital computer to program a dance composition.<sup>7</sup> Nor was she the first dancer/choreographer to conceive of dance as an artform to be viewed on a screen, a field known as screen dance. *M3X3* is, however, generally recognized as the first work of video art in Brazil, an achievement of great national significance. More importantly, and of international significance, it is the first dance composition in which the choreography and the cinematography were generated by the same computer program as part of the overall conception of the work. In other words, both the choreography of the nine dancers and the cinematography of the three cameras were integrated. In Cordeiro's unique and original vision, a computer program could determine various parameters of the choreography (where the dancers' bodies and body parts appeared in the grid at specific instants), while a subprogram determined various cinematographic parameters (camera position, duration of shot, and field of view/zoom) at corresponding moments. In *M3X3*, the dancers knew in advance which camera would be active at each moment in time and the positions that the score directed them to perform were relative to that camera.<sup>8</sup> In theory, the video recording of the dance, shot and mixed as it was performed in the studio, needed no further editing.<sup>9</sup>

Beyond this combined conceptual and technical innovation, *M3X3* is remarkable for its bold artistic vision, its synthesis of aesthetic ideas and methods, and the challenges it poses to patriarchy and dictatorship. Cordeiro's extraordinary accomplishment is all the more impressive

when one considers that she produced this revolutionary work during the brutal *os anos de chumbo* (leaden years) of military rule in her country, when money for the arts was virtually non-existent and dissent was not tolerated.<sup>10</sup>

The genesis of *M3X3* unfolded through a series of serendipitous events. A friend encouraged her to write about her concept for the piece, which resulted in “A Language for the Dance.” She submitted this paper to the Computer Art Society (CAS) in London and it was accepted for presentation at the Computer in the Arts Conference/Event/Exhibition on the theme INTERACT: Machine: Man: Society—one of many “fringe” events taking place concurrently with the prestigious Edinburgh Festival in August 1973. With this imprimatur, Cordeiro persuaded TV Cultura studios in São Paulo to produce the screen dance. She programmed the computer choreography in FORTRAN herself, directed the dancers, designed the stage set and costumes, and performed in the work. In 1973, the original video of *M3X3* was broadcast on Brazilian television and a 16mm film print was screened at Edinburgh.<sup>11</sup>

Not surprisingly, the video of *M3X3* produced by the TV studio was edited more like a television program than a work of video art. According to Cordeiro, the director modified her original conception by adding an opening sequence introducing the dancers and a closing credit sequence, comprising two minutes of the nine-minute, forty-one-second recording. Although Cordeiro insisted on maximizing the contrast to pure black and white (eliminating the gray-scale in the studio’s rough-cut), she accepted the director’s additions, and the video has been shown in this form ever since. This “embellishment” has its own charm but comes from another aesthetic universe. It humanizes the machinic rigidity of Cordeiro’s choreography, soundtrack, and high-contrast tonality. It makes *M3X3* more accessible to a broad television audience but at the expense of defusing the work’s intensity. A “choreographer’s cut” (like a film’s “director’s cut”)

of *M3X3* that edits out the opening and closing sequences would result in a more compelling video installation in gallery contexts, one that more accurately represents the artist's vision.<sup>12</sup>

As impressive as Cordeiro's conceptual and technical accomplishments in *M3X3* are, they constitute but one part of the work's achievement. Ultimately, the use of computers to create choreography is only as interesting as the choreography that is generated. Noll's innovative *Computer Ballet* (1965) used a computer program to produce animated dance sequences based on the rules of classical ballet. In this sense, it is similar to his *Computer Composition with Lines* (1964), which analyzed linear relationships in an abstract drawing by Mondrian to create a computer program that would make drawings similar to the Dutch artist's. Noll's accomplishment was to develop computer languages that could create images and animations that emulated the existing languages of dance and visual art.

Cordeiro, however, was striving for something more: "In *M3X3* there is more than technology, there is a proposal for a new dance language, a body language.... a way to express yourself fully in a different way. I wanted to explore movement, not make animations of it," she explained.<sup>13</sup> Like John Cage and the Dada artists before him, Cordeiro sought to remove her own subjectivity. She determined the structure of the work but intentionally left the determination of specific values to the algorithm. For her, the computer proved to be a useful tool to explore a richness of expression beyond her subjective limitations. It generated a wide range of movements and a combination of possibilities that were never the same twice. *M3X3* could have been computed through analog means, such as casting *I Ching* hexagrams as Cage had sometimes done. However, Cordeiro felt that she could not have resisted the temptation to alter the results in accordance with dance conventions and personal tastes, and it was precisely that level of

subjectivity that she was trying to avoid: “It was important to me that the composition maintain integrity with the mathematical purity of the computer.”

Although *M3X3* was shown widely in the 1970s, there is little documentation of how it was received by audiences. The most insightful perspective is represented in the correspondence between Cordeiro and Beaman. Reporting on a 1976 screening in Boston, Beaman wrote that, “In general musicians in attendance understood what you and I are doing but many dancers felt, “Why bother with a computer?” What Cordeiro was doing, Beaman continued, was “perfectly clear” to Linda Desmond, an MIT computer applications analyst; however, Nancy Mason, Dance Coordinator of WGBH, “lamented on the video aspect of your film.”<sup>14</sup>

Given the aforementioned prejudices and the early adoption of electronics in music, it is not surprising that musicians and programmers more readily appreciated the transformation of code into dance. Argentine artist, critic, and curator Jorge Glusberg, who had seen *M3X3* in Edinburgh, curated that work into *Art Systems in Latin America*, a showcase of fifteen artists that was presented in Buenos Aires, Paris, London, Ferrara, and Buffalo. At the invitation of Vladimir Bonačić, a central figure of the New Tendencies group, Cordeiro joined a seminar in Israel on art and science, featuring elder male luminaries of computer art.<sup>15</sup> She recalls that after her work was presented at a public screening in Tel Aviv, there was a “very frightening moment”—a long silence that felt like it went on forever—then the room burst into applause. If that was not enough, Gyorgy Kepes invited her to join a Ph.D. program at MIT, another powerful affirmation of her accomplishment.<sup>16</sup>

Cordeiro’s three early computer-choreographed dances, *M3X3, 0 ⇔ 45* (1974) and *Cambiantes* (1976), “set up a dialog between the body and mathematical space.” Whereas in Oskar Schlemmer’s *The Triadic Ballet* (1922) the dancers’ bodies become abstract forms

through sculptural costumes, Cordeiro's choreography demands that the body "express itself by performing geometrical space with mathematical precision." These works ask, "What is horizontal? What is vertical? How do you deal with diagonals, in a mathematical sense?"<sup>17</sup>

*M3X3* uses vertical and horizontal as line, exploring the ever-changing linear forms expressed by the dancers as a type of drawing in time and space, an approach that Cordeiro admired in the work of Merce Cunningham. Despite the highly regimented grid, stark contrast, and repetitive beat of the soundtrack, Cordeiro explained that "the sequence reveals an implied organicism."<sup>18</sup>

The computer-generated score precisely specified the pose or shape that each dancer was supposed to express, where, and when to express it. But how the dancer got from one pose, place, or position to the next was up to her to decide. It was those transitional moments that were especially fascinating for the choreographer. In this way, *M3X3* combined mathematical precision with a significant degree of subjectivity, as the dancers literally *incorporated* the computer choreography into their bodily movements, a merging of digital software (code) and organic hardware (body).

The tension between the human and the machine in *M3X3* parallels the way Cunningham "explores how the artificial can be integrated into the organic," to use Cordeiro's words.<sup>19</sup> He "makes the body go in three different directions at the same time." Performing these "multidirectional movements makes your mind work differently," she noted. "You become like a Cubist painting: you are, and are seen as, many angles at the same time." In order to successfully perform such challenging choreography, "you must maintain the utmost concentration, you must be intelligent in your body and act quickly. There is no time to think. If you think, you lose." Pushing the body to behave more like a machine than like flesh and bone

creates tension and forces the dancer into a heightened state of consciousness that, according to Cordeiro, “involves the audience directly.”

This tension between control and freedom in *M3X3* was also a response to the era of dictatorship during which she grew up—a time when, she noted, following the rules was “a matter of life or death.” In that context, Cordeiro explained, “A vertical is a vertical. Forty-five degrees is forty-five degrees. Things are yes or no, black or white, like the film.... When you perform it, when your brain and your body are locked into a specific definition, there is an emotional response—a kind of radicalization.”<sup>20</sup> This emotional response, the choreographer believes, is conveyed by the dance. Even after being transferred from the original videotape to film, then converted to a digital file and streamed from YouTube and viewed on a computer screen, one can feel the tension between the rigidity of the digital program and the 3-by-3 grid, and the freedom of each dancer interpreting the score with her body in a unique way. As Cordeiro explained, “I wanted to explore the idea of control but to look at it as an illusion. There is never complete control or complete freedom.”<sup>21</sup> As hinted at in this essay’s title, I propose that *M3X3* involves both “coding dance” and “dancing code.” Cordeiro used a digital computer to code the numerical values of various choreographic parameters, while at the same time, she coded a veiled critique of Brazil’s military dictatorship into the work itself.

An account of Analivia Cordeiro’s work must mention her primary influence: her father, the celebrated artist, theorist, and critic Waldemar Cordeiro. Analivia grew up as part of the core of experimental art in São Paulo, where Waldemar was a pioneer of Concrete art and computer art. He also participated in the events and debates of the international New Tendencies group, centered in Zagreb, and frequently returned to Italy, where he grew up, maintaining his ties to the European avant-garde and introducing his daughter to that milieu. In the late 1960s Waldemar



turned to computers as an artistic medium in order to overcome the limitations of traditional art and what he called “paleocybernetic art history.”<sup>22</sup> When Vladimir Bonačić visited Waldemar in São Paulo, the pioneering Croatian computer artist taught Analivia about computer programming. Waldemar’s work *The Woman Who is Not B.B.* (1971) offers a touchstone for Analivia’s subversive use of media and the politically charged nature of *M3X3. Not B.B.* is a computer-generated image based on a widely circulated media photo of a Vietnamese woman in great distress, clutching a child. The title asserts that this woman is not B.B. (Brigitte Bardot): in other words, she is not a highly sexualized starlet performing a role for an audience of millions; she is a human being trying to save herself and her child from unimaginable atrocities of war.<sup>23</sup> As Darko Fritz has noted, “printouts of Cordeiro’s digital artworks could be run off in large numbers... a subversive technique for appropriating media in the context of censorship of communication in Brazil at that time.”<sup>24</sup>

Indeed, Waldemar’s theory of *arteônica* proposes that communications technology “not only transforms the nature of the transposed image, but also exposes it to a much more ample and refined fruition” by enabling communication to a broad public on an international scale.<sup>25</sup> Analivia’s early computer dance works embrace these core commitments to the artistic potential of computers, to political resistance, and to expansive communication. As discussed earlier, *M3X3* reflects her political sensibility, using the “machine body,” to use Mariola Alvarez’s term, to interrogate the rigidity of dictatorship.<sup>26</sup> In parallel with her father’s practice in the early 1970s, Analivia was drawn to the use of computers as a tool to make art and to the use of video and television to transmit it to an international audience. But unlike her father’s work, the intelligence of which came almost solely from the mind, the daughter’s practice can be

interpreted as transforming many of her father's ideas into flesh and, in so-doing, leveraging the intelligence of the body to push those ideas into places that the mind alone cannot access.

Analivia expressed her reverence for and gratitude to her father by putting her own work on the back burner from 1990 to 2014 in order to ensure his artistic patrimony.<sup>27</sup> Beginning in 2015, her career experienced a substantial resurgence. Her three-channel video installation of *M3X3* at the renowned ARCO international contemporary art fair in Madrid was awarded the BEEP Prize for Electronic Art in 2015 and was acquired by the BEEP collection. Since then, her work has entered collections and been presented at major venues around the world.<sup>28</sup>

The growing literature on technology in the visual arts has rarely considered dance.<sup>29</sup> Relatively little dance literature has addressed the history of dance and technology. Even in the 787-page *Oxford Handbook of Screendance Studies*, Cordeiro appears only in Brazilian dance historian Leonel Brum's chapter, "Brazilian Videodance." This absence is not surprising to Jeanette Ginslov, a screen-dance innovator from South Africa, who is critical of the prejudice against the artists from the global south. As Ginslov noted, "Despite the fact that South American Screendance is prolific, it's not taken seriously by the academy in the Northern Hemisphere, and so it's not written about, obviously, no?"<sup>30</sup>

Given the roots of her artistic sensibility in her father's visual arts practice and theory, Analivia Cordeiro's work particularly lends itself to analysis from the perspective of art history and criticism. Indeed, such an approach is especially warranted given that she has maintained a long-standing practice as a visual artist in parallel with and complementing her ongoing practice as a choreographer, dancer, and filmmaker. Alvarez's excellent 2020 essay, "Machine Bodies: Performing Abstraction and Brazilian Art" is the first scholarly work in English to focus on Cordeiro's computer choreography.<sup>31</sup> Cordeiro's absence from art and dance history can be

attributed to many factors, including the patriarchal aversion to the pioneering women choreographers who worked with computers, prejudices against artists from the global south, and the decision to put her father's career before her own. Recently, however, growing interest in Analivia Cordeiro is helping to establish the importance of her contributions to dance, screen dance, computer choreography, video, and other genres of practice. I hope that it also serves as a model for rediscovering and celebrating the brilliant contributions of women artists from outside the U.S.-EU axis.

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<sup>1</sup> "Computer Generated Pictures," *New York Herald Tribune*, April 10, 1965 and "Computer Generated Pictures," *Time*, April 23, 1965, quoted in Cynthia Goodman, *Digital Visions: Computers and Art*, exh. cat. (New York: Abrams, 1987), 25].

<sup>2</sup> Grant D. Taylor, *When the Machine Made Art: The Troubled History of Computer Art* (London: Bloomsbury, 2014), 4.

<sup>3</sup> Jeanne Beaman and P. LeVasseur, "Computer Dances," an essay/presentation accompanying performance exhibitions in the early 1960s, quoted in Taylor, *When the Machine Made Art*, 5.

<sup>4</sup> Quoted in Francisco Sagasti, "Information Technology and the Arts: The Evolution of Computer Choreography during the Last Half Century," *Dance Chronicle* 42, no. 1 (2019): 3.

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<sup>5</sup> See Edward Shanken, “Contemporary Art and New Media: Hybrid Discourse or Digital Divide?” in *A Companion to Digital Art*, ed. Christiane Paul (Malden, MA: Wiley-Blackwell, 2016): 463-481.

<sup>6</sup> Analivia Cordeiro, conversation with the author, September 17, 2021.

<sup>7</sup> This distinction goes to dancer Jeanne Beaman, in collaboration with computer scientist Paul LeVasseur (Sagasti, “Information Technology,” 9).

<sup>8</sup> Analivia Cordeiro, “A Language for the Dance” (unpublished manuscript, 1973), 4–5.

<sup>9</sup> The studio removed a pause when a dancer had to go to the bathroom. In post-production, Cordeiro increased contrast and added the soundtrack and the title and credit sequences. The sequence of shots from the cameras remained true to the cinematographic score determined by the computer program.

<sup>10</sup> Mariola V. Alvarez, “Machine Bodies: Performing Abstraction and Brazilian Art,” *Arts* 9, no. 1 (2020).

<sup>11</sup> “Interact: Man: Machine: Society,” Computer Arts Society, 1973. Cordeiro was unable to travel to the event, so John Lansdown read her paper at the symposium. She donated the original videotape of *M3X3* to the Victoria and Albert Museum.

<sup>12</sup> Indeed, by using the computer to choreograph both the dancers’ movements as well as those of the camera, Cordeiro intentionally strove to have artistic autonomy from the TV director, producer, and camera operators. She did not want them to “interpret and subjectively translate the ‘intentions’ of the choreographer,” which she considered a “defect” in the conventional process of filming or broadcasting dance. See Analivia Cordeiro, “The Programming Choreographer,” *Computer Graphics and Art* (February 1977), reprinted in Analivia Cordeiro, *Human Motion: Impression/Expression* (Frankfurt: Galerie Anita Beckers, 2016). [NOTE: Publisher info per worldcat.org] <https://www.analivia.com.br/> Downloaded August 12, 2021.

<sup>13</sup> All quotations in this paragraph from Cordeiro, conversation with the author, September 17, 2021.

<sup>14</sup> Letter from Jeanne Beaman, June 1976, in Cordeiro, *Human Motion*, 29. Punctuation modified for clarity.

<sup>15</sup> These included John Whitney, Michael Noll, Abraham Moles, Herbert Franke, and others.

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<sup>16</sup> Cordeiro, conversation with the author, September 17, 2021. Cordeiro was a college student at the time and her ambition was to go to New York and work with Merce Cunningham, which she did in 1976.

<sup>17</sup> Ibid.

<sup>18</sup> Cordeiro explained that during rehearsals and in the studio when the piece was performed to record *M3X3*, music by Bach was played. The familiar classical music helped balance the rigidity of the computer choreography, resulting in a better performance by the dancers. However, she always planned to use the harsher, repetitive percussive beating for the sound. (Cordeiro, conversation with the author, September 17, 2021)

<sup>19</sup> All quotations in this paragraph from Cordeiro, conversation with the author, September 17, 2021.

<sup>20</sup> Ibid.

<sup>21</sup> Ibid.

<sup>22</sup> Annateresa Fabris, “Waldemar Cordeiro: Computer Art Pioneer” *Leonardo* 30, no. 1 (February 1997). <https://leonardo.info/isast/spec.projects/fabris.html>. Cited October 19, 2021. [Online document unpaginated.](#)

<sup>23</sup> <https://gaytonia.org/the-woman-behind-the-woman-who-was-not-b-b/>

<sup>24</sup> Darko Fritz, “Parallel Lines: Waldemar Cordeiro and New Tendencies – Transitions from Analog to Digital in Socially Engaged Art,” in *Waldemar Cordeiro: Fantasia Exata*, ed. Analivia Cordeiro, trans. John Norman (São Paulo: Itaú Cultural, 2014), 665.

<sup>25</sup> Fabris, “Waldemar Cordeiro”

<sup>26</sup> Alvarez, “Machine Bodies.”

<sup>27</sup> This shift away from her own work at mid-career to focus on the work of her father helps account for why her extraordinary contribution to the arts is only recently being rediscovered. Her efforts culminated in the award-winning 2013 exhibition, *Waldemar Cordeiro: Fantasia Exata*, which she curated and organized at Itau Cultural Center in São Paulo, as well as editing the accompanying 765-page catalog.

<sup>28</sup> In addition to the present exhibition, these include the Victoria and Albert Museum, the Centre Pompidou, The Reina Sofia Museum, the Brooklyn Museum of Art, the Hammer Museum, the Mercosul Biennial, and a forthcoming solo exhibition at the Center for Art and Media (ZKM).

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<sup>29</sup> Cordeiro's work does not appear in major surveys of new media art or digital performance. Much to my chagrin, it is absent from my *Art and Electronic Media* (New York: Phaidon Press, 2009) and also from Steve Dixon's *Digital Performance: A History of New Media in Theater* (Cambridge, MA: MIT Press, 2007). Both books do include screen dance and dance technology works by a number of choreographers, though almost exclusively from North America and Europe.

<sup>30</sup> Jeannette Ginslov, email correspondence with the author, September 30, 2021.

<sup>31</sup> An essay about *M3X3* by Catherine Mason is forthcoming in a volume on CAS exhibitions to be published by the British Computer Society. Catherine Mason, email correspondence with the author, October 15, 2021.