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Digital Performance as Multidimensional Romance: notes on the production of C8's *Flatland*¹

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Introduction

The object of this paper is to contribute to the development of a working method aimed at collaborative practice within digital dance theatre. We will draw on our own work in live-art digital media, as members of the artistic collaborative C8 (Salazar Sutil + Melo). Our case study explores the idea of a body/machine romance, as it were, particularly in relation to the opening scene of our experimental digital media production of *Flatland* (after Edwin A. Abbott's 1884 novella). The idea of a 'romance of many dimensions', which is the subtitle of Abbott's classic, is here understood not in terms of a literary romance. Rather, the digital romance is a *motional* relationship that engages two agencies through a common medium: movement itself (physical motion, in space and time). A romance of human body and machine. Our argument is that movement produces a physical intelligence that can link bodies and machines. We derive no distinction between these categories, so long as a common gesturo-kinetic language between them is ultimately found as a lingua franca of sorts. Our interest lies presently in articulating a working method that is premised around three basic questions, which probe and problematise complex interactions that emerge in digital dance— theatre between bodies and machine systems.

- 1) How and to what effect do we draw a line between digital technology and the body? Can we work from the premise that the division is an arbitrary one, and

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that the positions taken by body and machine, by the continuous and the discontinuous, are, within the context of their inter-communicational dynamic, contestable? Can, furthermore, the machine be the body, and the body our machine? Where do we draw the distinction between these unstable ontologies?

- 2) Similarly, how do we draw a line between the various media involved in the integrative process that is the act of representation in digital dance—theatre? Here we address the need to reconsider the division between four dimensions of graphic representation found in our work. These are: text (Abbott's text in this case), computer code (via the Open CV software used for this production), choreography, and image (computer and/or video).
- 3) Finally, how do we achieve integration so as to obtain a multidimensional and synthetic form within what we consider to be a transdisciplinary and transmedial type of artistic collaboration?

To begin to answer these questions, we make use of Abbott's 'romance of many dimensions' as both ground and vector. Our aim is to put forward an understanding of digital media practice grounded within certain disciplines (e.g. dance, theatre, video), and, at the same time, to move toward a practice that combines and moves between these disciplines, possibly departing from each one of them. The idea of a 'romance of many dimensions' then supports our search for a journey from discipline to transdiscipline, where form is realisable neither as textual writing, code writing, nor the virtual writing of choreography, but as a mixing which we will refer to henceforth as 'multidimensional graphism' (Leroi-Gourhan 1993), or multidimensional writing.

This hypermedia that is digital dance—theatre then leaves alphabeticism and phoneticism behind (theatre). It leaves out the pure body (dance). It leaves behind the prevalence of visualism (computer vision or video), at least in terms of these being separate and standalone systems. Instead, we wish to consider all of these as component parts of a single whole, in the context of this 'romance of many dimensions'. In sum,

none of the above are privileged, and yet all co-exist within a mixed medium, which involves wholly multidimensional processes of graphic production and thought-production (digital-analog). Our aim is now crystallising in terms of a desire to unify the alleged distinction between body and machine, between continuous and discontinuous, and to understand -to think- digital dance—theatre as neither body nor machine, but otherwise as a state of co-existence, a co-ontology that resists differentiation (at least at the level of the movements composed in this line of work). In what follows, we hope to provide more practical insights into how body—machine distinctions can be further contested, in the sense that, at least within a communicational context (within the context of the writing of movement) body and machine are no longer differentiated- they are both states in transition from continuous to discontinuous and back.

To answer the first of our guiding questions: bodies have a sense of the machine in them, and machines have a sense of the body in them (they are co-extensive). There is an internal dyad within each, in the sense that bodies and machines are constituted via the tensions generated by continuous and discontinuous processes. If so, then we hope to support our claim by a more focused examination that addresses the question of integration (romance) in terms of a unification through the processes of continuity and discontinuity. We begin with a rather controversial premise: the digital does not refer only to an historical technology. The digital refers to a production of discontinuous or discrete movement outputs, common to machines (e.g. through binary code) and bodies (e.g. through the differentiation of fingers, body parts, steps). From a language-oriented sense of the term, technological machines and human bodies are both digital (discontinuous) and analog (continuous)- the question is how to make instances of continuity and discontinuity compatible between the two seemingly differentiated ontologies. At the language level, the distinctions are not so ontologically permissible.



Fig. 1. Opening Scene of C8's *Flatland*. Sarah Rogers playing Square. Performed at Ivy Arts Centre, Guildford (2013). Photo by Seb Melo

Leroi Gourhan on multidimensional graphism

French palaeontologist and archaeologist Andre Leroi-Gourhan makes an insightful analysis of the multi- and inter-dimensionality of writing in his book *Gesture and Speech* (1993). He writes of a distinguishing feature in alphabetic writing: its spatiality. Thus, he considers writing to be two-dimensional on account of the linearity of spoken language (phonetization). Written language, phoneticised and linear in space, thus becomes subordinated to spoken language, which is phonetic and linear in time. Perhaps most striking is Leroi-Gourhan's conclusion: with two-dimensional writing, 'the dualism between graphic and verbal disappears, and the whole of human linguistic apparatus becomes a single instrument for expressing and preserving thought- which is itself channelled increasingly toward reasoning' (1993, 210). In other words, a series of connections exist between the linear way in which we think (or reason), the equally linear way we write, and the linear way we speak. The chain is broken, however, when we move onto other dimensions of writing and thinking- particularly in kinetic production of

thought and inscription, where a set of nonlinear and alogical or non-rational processes start to take place. To understand the writing of movement in digital dance—theatre, it is worth then exploring other dimensions of writing, beyond this two-dimensional alphabeticism. We are looking for integrated modalities of writing, a form of mark-making and inscriptional activity that starts from multiple points (not just speech or the writing hand), and which involves the body whole.

Leroi-Gourhan speaks of ‘multidimensional graphism’ (1993), which he considers a primitive mode of inscription incorporating phonetic, visual and kinetic elements into a more synthetic modality of script making. By way of an example, Leroi-Gourhan speaks of Chinese writing, in which one half of a character is pictographic and the other phonetic. He speaks of “parasitic images” in this system (1993, 205), which cause the reader’s thoughts to stray in a manner irrelevant to the real object of notation. He suggests that the images conveyed by Chinese pictography are worthless, and yet give us an inkling of a mode of thought based on diffuse multidimensional configurations. Chinese writing does not function as an imprisoned language within linear phoneticism (205). The scripted character then opens multiple ways of thinking by mixing phonetic and visual associations.

To attribute multidimensional graphication to a primitive mind, as Leroi Gourhan does, is also interesting, seeing as we are actually locating our argument in a digital-era context. Is the digital conceivable as a movement forward, but also backward, a kind of future atavism² that recovers an essential gestural and motile form of communication characteristic, according to Leroi Gourhan of Cro-Magnon peoples? The question is provocative, and inviting. The question of digital atavistic tendencies, of digital languages returning to conditions of nonlinear, radial and multidimensional spatial engagement that are comparable to the graphic systems of Upper Palaeolithic cave, presents us with another fold, another conjunction, this time between pre and post-history, or between parietal and digital culture. Both conditions of possibility exist outside the hegemony of linear thought and linear speech: much like in the Upper

² The notion of an atavism, an anatomical or biological throwback, has been adopted in cultural theory to denote cultural tendencies that denote a recursion to past forms of behaviour conduct. An interesting debate in this regard is found in Dana Seitler’s book *Atavistic Tendencies* (2008), where the author explores the ways in which modernity itself is an atavism, shaping a historical and theoretical account of its dramatic rise and impact on Western culture and imagination.

Palaeolithic times as interpreted by Leroi Gourhan, we know think in non-linear, distributed, radial and wholly multidimensional ways.

More pressingly, we must ask ourselves how Leroi-Gourhan's thesis can support a conceptual framework to address digital dance—theatre in terms of a system that no longer favours phoneticism or the linear rationality of a written text (Abbott's novella in this case). Can multidimensional writing help bypass the linguistic and semantic conditions that linear writing imposes on performance? We do not locate multidimensional writing in the continuum of anatomical bodily movement and sensations, or in a conventional choreographic system of writing. Nor do we favour code, and the computational agency it brings with it. Nor is the starting point the image. The composite language of multidimensional graphism we are after seeks a complexity greater than Leroi-Gourhan's description of a Chinese character. We strive for a form of representation that is phonetic, with a parasitic image attached to it- we seek a form of writing that is a synthesis of text, code, body and image- all collapsed within an integrative and self-generative process. Multidimensional graphism, according to this theorisation, enables a writing that is synthetic: it combines full-bodily movement and sound with discrete language (code and image). In order to produce coherent form at this level of synthesis, it is necessary to activate a process of form composition grounded on a way of mixed modal thinking. We believe this synthetic writing can be most favourably represented in a transdisciplinary set-up like the one we hope to elucidate over the course of this essay.



Fig 2. An exploration of Leroi-Gourhan's notion of multidimensional graphism using long-exposure photography and LED moving lights displays to provoke a full-body writing. Photo by Seb Melo

Gesturo-haptic medium

Cultural theorist and philosopher of mathematics Brian Rotman picks up on Leroi-Gourhan's argument, to challenge the regime of alphabetic graphism in a digital-era context. Rotman argues that the regime of alphabetic writing, constitutive through what this author calls 'the lettered self' (2008) is drawing to a close in the digital age, giving way to an era 'in which the inscribing of speech-sounds with letters is but one element, not necessarily the overriding one, in the on-going bio-cultural-technological 'writing' of the body...' (2008: 4). Rotman offers an upturning of the two-dimensional regime of alphabeticism in the way of a techno-system defined by distributed selfhoods, expressive of a sense of para-self or networked and distributed 'I' (the I who writes, who is no longer localised in the present of an inscription, but networked, and available as a telematic or ghostly agent). Writing, for Rotman, is thus a process of communicating the digital 'I' through distributed means, where the common currency of all communicational transactions is the atavistic language of gesture. What is true of Rotman's theory of non-alphabetic writing is also true of the performance of that writing.

In our practice, once the form is no longer written as lettered text, but instead takes shape as a form of writing distributed across media, then the performance process, or the process of releasing a captured form into a moment of audience dispersal, no longer occurs within the disciplinary remit of a theatrical performance, a dance performance, or a computational performance, but in terms of a mixing of these.

Rotman argues that if a regime of the alphabetic comes to an end, then it will be toppled not necessarily by a form equivalent to what Artaud called “virtual theatre” (1952)— freed from written text, freed from alphabeticism and, by extension, freed from written canon. Having said this, Rotman suggests that Artaud provides a good starting point in this regard. For Artaud, at least according to Rotman’s reading, what counts and matters is ‘the pre-eminence of screams, silences and above all the gesturing body as the superior and proper vehicle for theatrical affect’ (2008: 4). Artaud presents an appealing alternative to a theatre of the alphabet, and its subservience to speech. By extension, it is a theatre that might be liberated from rational thought, and the strains of meaning and interpretation. Thus, bypassing the natural route to a semiotic theatre, the mouth is intended in Artaud’s theatre to emit gestural sounds, not words but onomatopoeias, grunts, tones, and so forth. According to Rotman, the opposition between the gestural and the linguistic in relation to the means and protocols of theatrical performance was the “overriding justification and moral force for a theatre of gestural sounds” (2008: 49). The gestural system Rotman has in mind, however, is not fully realised in a theatre of cruelty, but in what this author calls the language of the ‘gesturo-haptic’ (thus alerting us to the technological character of this post-theatre model). Moving beyond notation and beyond speech, the gesturo-haptic far exceeds, in this author’s opinion, the alphabet’s inscribing of the organs of speech. It nevertheless presents itself as a contemporary form of writing or “visual notation” (50). In our attempt to further Rotman’s notions as part of our artistic experiment, we look to the gesturo-haptic as a medium that crosses over media, and which favours an inter-sensory transit from the visual to the phonic to the proprioceptive. In other words, it is a written system in transit, a language becoming beside itself, considerably less linear, less logical, and less semantically valued than the languages of text (in theatre), and formal movement (in dance).

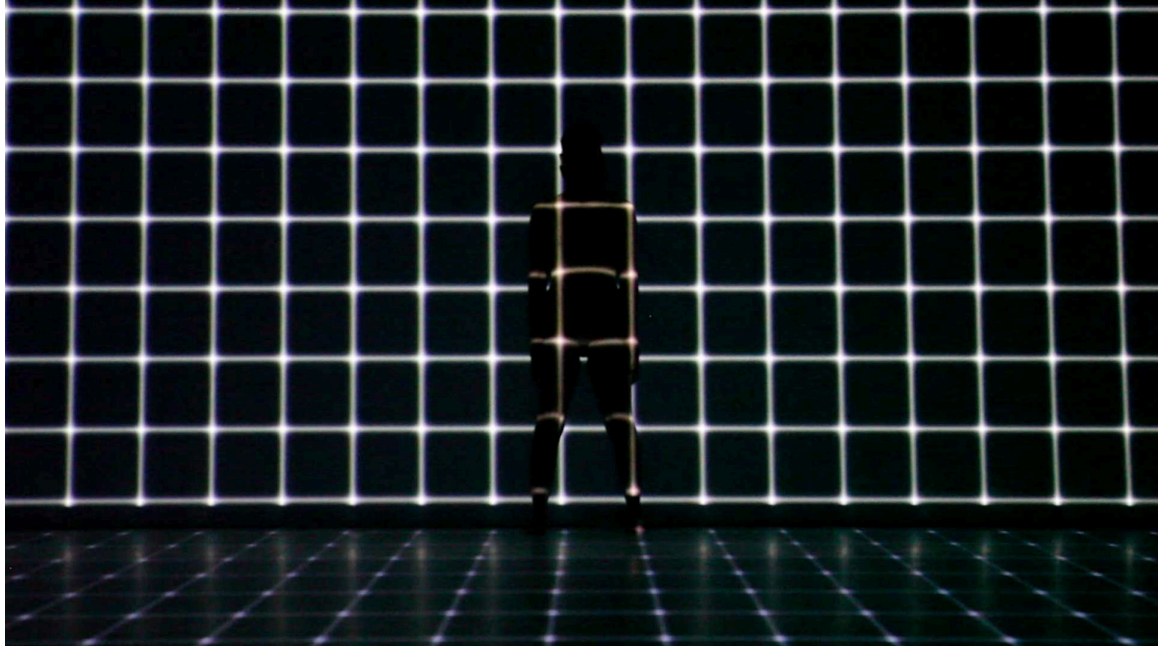


Fig 3. Angelina Jandolo as Sphere. C8's Flatland, performed at Ivy Arts Centre Guildford (2013). Photo by Seb Melo.

Digital media: tools and method

C8's *Flatland* was conceived for two dancers. One dancer played the character of Square (Sarah Rogers), the other played Sphere (Angelina Jandolo). It is worth noting that we did not want to engage in a literal and theatrical reading of the specific characters that are the centrepiece of Abbott's *Flatland*, but to emphasize the less explicit tension arising between kinesthetic space and the conditions of possibility of digital space. For instance, we were interested in integrating full bodily movement within the dimensionalising vision of a digital camera vision and Kinect camera. As such, the key dialogue explored in C8's *Flatland* was not so much between the two dancers playing Square and Sphere respectively, but between their bodies and a mixed-media design comprising four technological strands: (1) time-lapse photography, (2) algorithmic visualisation (Jitter package for Max/MSP), (3) slit scan video and (4) Kinect motion capture. Each of these technologies was devised as steps that progressively incorporate increasing levels of spatial and temporal restrictions to the performer. Each step brings us closer to an integration of the otherwise separated worlds of technology and the human

body, as part of a multidimensional composition where the final form is due both to the human and technological agent. The subjectivity of writing— owned by the I-who writes, is no longer the sole preserve of the human. As we will show, the machine also has a say in the process of inscribing and communicating scripted signs, by the inclusion of automated and self-generative process of form composition.

One of the decisions we stuck to throughout the rehearsal period was to introduce these technologies as compositional tools. Both the Kinect motion sensing camera and digital video camera were employed for the purpose of documentation and feedback throughout the rehearsal process. Incorporating both camera recordings in an early stage produced a disruptive rhythm to the rehearsals, not least because the team's attention was continuously torn between live and mediated action. We also had to deal with the inevitable problem of a screened image, whose overpowering effect can often undermine live action. Over large periods, this feedback proved frustrating and disempowering as the development of the code and custom software that controlled the sensors and generation of live image had a time-frame of its own, which required repetition, extensive testing and close collaboration with coder Max Worgan and media artist Sebastian Melo. One could argue that technology offers itself to the performer not only as a medium that can re-dimensionalise image and sound, or as a tool for the re-spatialisation of movement. Digital media is not only concerned with an aesthetic process involve the making of form, but also a content-generating process. This is why it was necessary to stick to the slow and often counter-intuitive dynamics of a rehearsal set-up that combined live-coding, screen work and dance.



Fig 4. Sarah Rogers in rehearsals. Photo by Seb Melo

In this somewhat disjointed set-up, self-reflexive learning could be generated to guide the overall creative process in a way that was led neither by code, nor image, nor body, but by mutual understanding and by the challenge of co-participation and co-ideation. For the dancer, the opportunity to see oneself, rather than have someone else do the seeing and the subsequent feedback, at once reveals and helps surpass constraints met along the way. In this sense, the immediate feedback of recorded rehearsals and the trial-and-error process employed to achieve an integration of body and technology illustrates how, in the absence of an external authorial view, the process of creation can be more automated, and also, more susceptible to randomness. To quote N Katherine: “randomness is not simply the lack of pattern but the creative ground from which pattern can emerge” (2005: 286). Pattern and randomness are bound together not so much as opposites, but as complements or supplements to one another. Each helps define the other; each contributes to the flow of information from one system (the human body) to another (the computer). The feedback mechanism allows, after levels of iteration and error, a way in which the two systems can recognise one another and achieve integration at a higher level of complexity.

Capturing gesture- the ‘luminous wake’

The first technique we experimented with, and which provided a very immediate integrative effect, was the technique of time-lapse photography. Time-lapse photography can be described as a parsing technique, which arbitrarily selects moments in time to seemingly reveal and recompose the duration of time. Yet, the technique brings to our attention the fact that any camera system is inevitably a parsing mechanism. Even though high-end optical technologies are able to reach rates of several thousand frames per second, photography still collects only a discrete set of fragments of spatialized time, thereby failing to be continuous movement (see also Salazar-Sutil and Melo, forthcoming).

And this was in fact our ultimate aim: to visualize continuous movement produced by the performer’s multidimensional body through 3D space. Yet, alerted to the restrictions described above, we set ourselves the task of building a parsing mechanism that would not emphasize a linear display of movement, but would rather have the form of a database of gestures that could be accessed through algorithmic operations. This would allow us to later manipulate and combine the photographic fragments not only in relation to its correspondence in time. Our intention was to make up more complex visual form by parsing any of the parameters by which the gestures could be described (the relative position in a timeline would be just one of them). Just like Leroi-Gourhan’s definition of multidimensional graphism, as presented above, the aim was to combine a moving photographic sequence (a linear form of writing or inscription), with nonlinear arrangements such as an algorithmic visualisation process (looping), thus producing a form that combining images, text and an algorithmic process.

To produce a database, we had to define the minimal unit of a gesturo-haptic language. This unit would help build more complex arrangements of gesturo-haptic form through looped iterations and combinations. Abbott’s text offered a guiding principle to this effect: the wake of a point moving in space (what in choreographic language we would call a trace-form) renders the ‘invisible visible’, thus turning movement into trajectories. When the point is still, it becomes the minimal unit of any gesture, and when in motion, it turns into a linear trajectory. By attaching a source of light (an LED portable

light) to the extremities of the dancer's body, we then recorded traces of movement making use of time-lapse photography, combined with long exposure times.³ This two camera settings enabled us to capture the moving light attached to the dancers wrists and ankles, and to transform a series of different analog bodily movement into a sequence of images in which each frame corresponded, in real-time, to the phrase performed by the dancer. In addition, because the sequences were shot in darkness, the photographic eye only 'saw' the moving light, thus creating a visual effect in which the gesture is extrapolated from the body. In sum, all we see, in fact, is the single (one-dimensional) gesture. In this way, a collection of a couple of thousands images of captured gestures constituted our working database, so that our composite form became, much like Leroi-Gourhan's Chinese symbols, diffused. *Flatland's* narrative of multidimensionality, and the idea of jumping from space to hyperspace, was then navigated in terms of a journey from the bodily gesture, to the recorded gesturo-haptic visualisation, to the algorithmic combinations and iterations of these, making up an example of multidimensional script.

Once constructed, we could apply the database to linear and algorithmic operations enabled by visual computational methods, such as the ones offered by the MAX/Jitter software. The first level of operation comprised linear functions, that is: multiplying, repeating, rotating or else not affecting the data as a whole. This allowed the creation of a landscape of gestures that expressed visual rhythms and patterns which, given the linearity of the codelang through which they were re-inscribed (re-written), retained the recognisable form of the input data. In other words, linear forms of data processing produced images that did not depart in a significant visual way from the original gestures or captured trace-forms.

³ The photographic camera is set on tripod shooting continuously, yet action is not frozen as each frame is exposed for 2-3 seconds, thus accumulating in each fragment the longer duration that corresponds to a whole movement phrase.

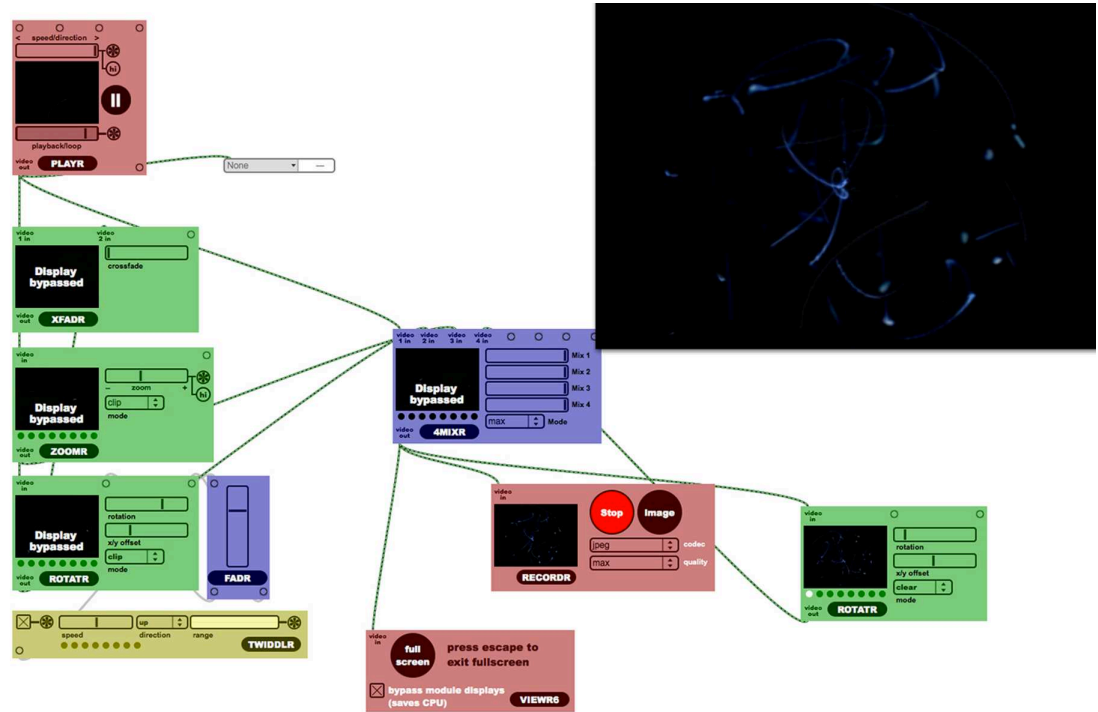


Fig 5. Max-Jitter processing of full-bodily gestures to produce random hypergestures. Photo by Seb Melo

The second level of operation featured a linear function feeding back onto the beginning of the operation, creating a loop or cyclical sequence. In other words, the writing operation carried out via MAX/Jitter was spatialised no longer as a straight line, but as a figure of eight. It is at this point that the initial gestural input and the specific combination of operations became critical to creating a self-organised system (a pattern). The processing of the gestural units in non-linear algorithmic operations can be now compared, for simplicity's sake, to the process of blending. Out of the blender that is the non-linear algorithmic process, the separate units of gesture that were fed into the loop 'came out' as new gestural assemblages, multiform and multi-layered images rich in visual complexity. We made use of these outputs as though they were a cryptic, non-symbolic form of digital writing. In other words, we followed the process through as though it was an activity of writing; albeit distributed across media. As the software allows for each node to accept input of content, anything can be connected to anything else, yet not every configuration led to a result that was legible (readable as an algorithmic form of graphication). In most cases the feedback loop only resulted in an output that grew exponentially, collapsing out of control. By contrast, specific sets of

instructions, which were found by trial and error, allowed the output to evolve into a self-organizing graphic-motional system.

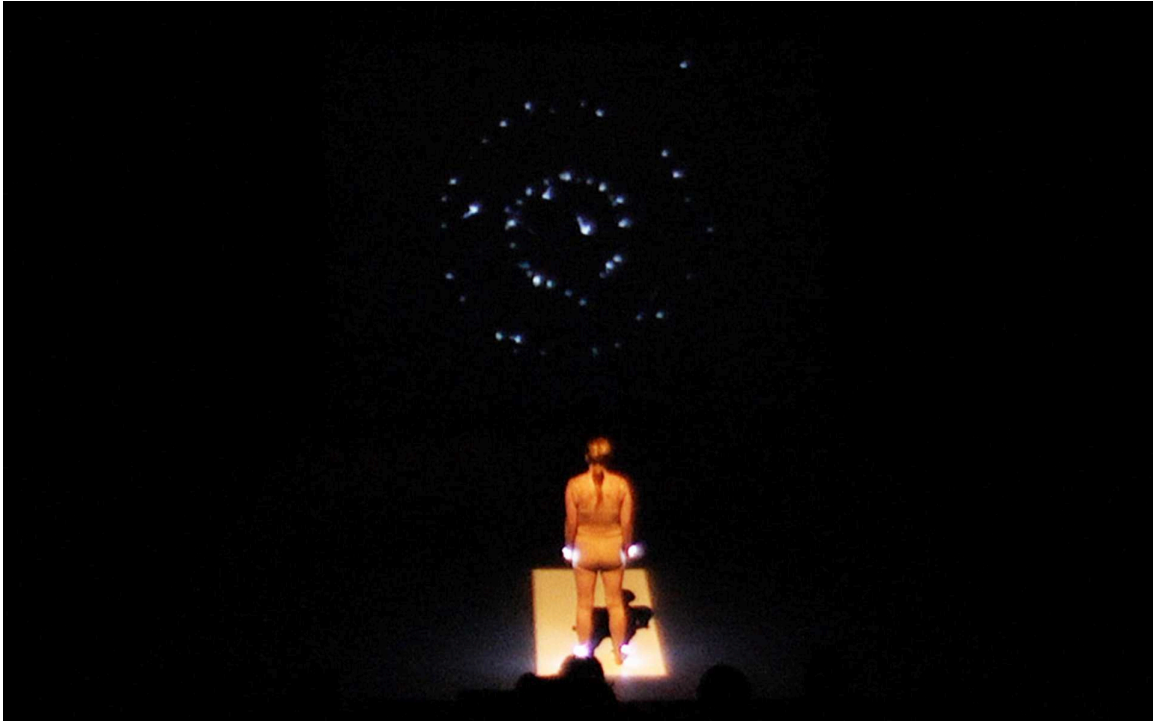


Fig. 6 Sarah Rogers walks to the Eye, a hypergestural visual produced via random processing of full-bodily gestures on Max/Jitter. Photo by Seb Melo

The culmination of the first process of ‘algorithmic blending’ is marked by the formation of what we came to call “the eye”: a rotating concentric figure formed by a network of unitary gestures which evolved in its form, yet maintained its general circular structure. Although the narrative role this graphism came to play within the larger context of the performance was attached in retrospect, this figure emerged accidentally by means of a set of initial instructions that could not be predicted until it happened. The eye motif consolidated the notion that what the dancer sees and what the machine sees, are different images-spaces, which despite their dimensional divide, can become conjugal. What this eye came to signify was the moment in which the dismembered unitary gestures, although mediated by algorithmic operations, regained its analogue continuity of

movement. Thus, and here we stake a key claim of this work, by extracting the gesture from its body, and by using it as a unit of gesturo-haptic and techno-choreographic writing, we were capable of achieving a synthesis of digital and analog processes as part of the combinatorial multidimensional graphic approach we have been championing in this essay.

Conclusion

Our methodological approach to explore digital dance—theatre has brought us against the question of creating and delivering a piece that depended on a techno-system defined by distributed selfhoods, expressive of a sense of networked and distributed para-selves integrated by a ‘multidimensional graphism’, which incorporates phonetic, visual and kinetic elements into the process of inscription. This original combination of elements found no clear precedent into how to assemble them in a form that could reach mental associations outside the scope of linguistic space and time and into the inscription of a multidimensional bodily performance. In this sense, one other pioneer of computer art whose contribution was most valuable in this regard is Manfred Mohr, who made use of computer technology in the late 60s and 70s to address explicitly his interest in multidimensional space, and non-alphabetic forms of computer writing. Mohr concentrated on drawing associated text, angles, binaries and directions, parallel lines, all calculated with algorithms. Mohr experimented with the fracturing the symmetry of a cube (including since 1978 n-dimensional hypercubes), using the structure of the cube as a ‘system’ or ‘alphabet’. He writes:

I saw a fantastic alphabet, three dimensions projected into two dimensions. The system of the dimensional idea is to have more and more complex elements to play with; it’s like playing a very long piano. The cubes lose their sides, start flashing and dancing wildly, according to some kind of calculated randomness. So after I studied this cube I started making drawings. Let’s say a cube turns slowly from left to right. The centre is complete but towards the outside it loses its sides. I did a whole bunch of drawings from this. But then I looked at the cube and split it in two and rotated each side. So now each side is rotating separately, randomly. Then I went one dimension higher. (Hatrick, 2012)

For Mohr, the disturbance or disintegration of symmetry becomes the emergent behaviour, through which, computers can create shapes, and pathways between shapes that produce strange hieroglyphic languages, in increasingly complex arrangement, at increasingly higher dimensions, all welded together into a kind of 'multidimensional syntax', which articulates the interaction of perception and cognition. The kind of computer-generated art described above generates a gesturo-haptic production (or digital inscription) that assembles itself into a language somewhere between notation and image, somewhere between written sign and drawing, in the limen between visual language and word-based linguistics- a proto-language if you like. It also enables an increasingly sculptural and choreographic sense of writing-imaging, derived from movement and combinatory operations, which, with the aid of computers and supercomputers, can help visualise such graphisms not only in terms of the two-dimensional spatiality of alphabeticism, but also a computer visualisation in higher dimensions (Cox 1988).

In this sense, our procedural and algorithmic approach, in both the image creation and choreography development, offered a balance between pattern and randomness that enabled emergent behaviour to express the potential compatibility of body language, video and codelang. By opening a path that takes the digital realm as a system of possibilities that offer 'more and more complex elements to play with' (Hattrick, 2012) the multidimensional syntax projected over a lower dimension became a generator of new constructions and relationships of a sculptural and choreographic kind. When the projected image became a field of possibilities with which the performer could play with, then it was most clearly that the mechanical movement of the projection screen and the movement of the performer's body became not a blended or amalgamated composite, but a distributed system. An example of this was what we came to call the eye motif, which consolidated the notion of how the dancer's and machine's physical thinking can come together as a common intelligence. Although separated by a fundamental divide (fundamentally, bodies and machines are not, of course, the same), at the level of a language of movement, in space and in time, the two can and indeed should be married into the same system of co-moving and co-gesturing intelligence.

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