Thinking movement and the creation of dance through numbers

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Abstract

How do we think of movement? In other words, can ideas be generated in and on movement? How does the scientific (i.e. physical or anatomical) idea of movement become an artistic creation of dance? Taking Deleuze and Guattari's philosophy as a point of departure, this article proposes a non-phenomenological approach to dance and its encounter with digital technology. Beyond the notions of technology as a physical extension of the living organism, of its functional use by the conscious human subject, or of its imitative aim (the machine unsuccessfully trying to render or substitute human movement), the essay explores if, and how, new and un-thought effects can derive from this encounter.

Introduction

How can we think of movement and its becoming-dance? How are ideas generated in (and on) a moving body? And finally, what does 'having an idea' in dance mean?[1] In the 19th century, in his short essay 'On the Puppet Theatre,' Heinrich von Kleist showed us a beautiful example of how an idea about movement and dance can be conceived (Kleist 1992). Going beyond the distinction of the 'mechanic' and 'syncopated' quality of a machine's movements from the fluidity and spontaneity of a living body, Kleist introduced the idea of technology (prostheses, artificial limbs and puppets) as a way to acquire new rhythms and discover new kinetic possibilities still unexplored by dancers. The artificiality of the puppet became thus equivalent to the highest naturalness and creativity: technology as a means of creation, transformation and becoming, rather than a tool for the imitation and extension of already known human possibilities. Taking Kleist's argument as a point of departure, this article explores movement, its becoming-dance through choreography, and its encounter with numerical technology. Beyond the notion of digital technology as a physical extension of the living organism, beyond its apparent disembodying effect on the conscious corporeality of the human subject, and beyond its imitative task (the machine unsuccessfully trying to render or substitute human movement), we will discuss if, and how, new and un-thought effects can derive from this choreo-cyber-kinetic encounter.

1: The imperceptible speed of a movement-idea

Every encounter happens by chance, with the unexpected appearance of a new body or a new landscape interrupting the repetition of an unbearable routine. Absorbed into sequences of habitual gestures and steps, we do not notice that every apparent repetition hides an emerging difference: for Nietzsche, the eternal return can only be a return of difference, a repetition of difference delineating the secret rhythm of life. In *Difference and Repetition*, Gilles Deleuze defines the appearance of an idea as an emerging of difference, revealing the unfolding of thought as a continuous becoming of the thinking body, and the idea as unpredictable thought-event (Deleuze 2001:168-221). Beyond clear definitions and appropriations, beyond precise times and spaces, beyond movement and stasis, thinking does not originate and does not aim towards any pre-determined point, being infinite and instantaneous at the same time, the abruptness of the idea condensing and fixing the absolute velocity of thought. According to Deleuze, having an idea does not correspond to the conception of a

subjective statement but intervenes before, as a different distribution of forces in the body, a critical moment in which the potentials of the body take a new direction or deviate from their previous trajectory. In this sense, thought ceases to be identified with the conscious reflection of a thinking subject: it is not 'I' who thinks but 'another thinks in me' (Deleuze 2001: 199-200). Forces think in me, emerging at a particular moment in a particular disposition, and constituting the singularity of the idea. An example of this moment, or momentum, of 'having an idea' is given by the cinematographic works of Straub-Huillet or Marguerite Duras, and their idea of separating image and sound of the film, disposing visual and acoustic forces as two independent but coexisting dimensions following their own respective rhythms (Deleuze 2003: 9-24). In this case, an idea is concretely expressed through the un-coordination of seeing and hearing, and through a particular distribution of perceptual forces which takes both the director's and the spectator's bodies beyond their conscious condition of rational understanding: words floating in the air, while the object of those words falls under the ground.

Travelling at the speed of thought, ideas do not only become non-subjective and non-conscious, but also in-corporeal and in-essential, pure virtualities to be actualised and expressed in different ways: artistically (for example cinematically) but also scientifically. Scientific disciplines such as anatomy and neuro-physiology express for example the idea of movement (considered here as a distribution of forces, or an energetic intensification) as the spatial displacement of a body (intended as a system of perceptual/motor coordination). At the same time, Euclidean geometry and Newtonian physics submit this displacement to the physical laws of gravity, reducing it to a gradual passage between a series of points/instants (or steps/units), and using algebra or arithmetic to measure the cadence and velocity between them. In this scientific idea of movement, numbers appear thus as limits or cuts, slowing down or freezing the virtual speed of thought and giving actual, measurable velocities to the infinite temporality of the pure movement-idea. Movement is subjected to a metre and difference (the difference generated in the body by a movement and its idea) is masked as repetition, regular or irregular. But in the meantime, how many necessary operations must intervene in this process!

2: Moving ideas into dance: the numbered movements of choreography and the dancing numbers of the body

How many operations does a choreographer need to generate a movement-idea? How does the scientific conception of movement become an idea in dance? Introducing a series of mathematical operations and calculations in the artistic composition of dance, notation and choreography write a kinetic score, attributing exact values to the limited possibilities of the body's anatomy and precisely tracing its displacement (in technical terms, negotiating a body's 'Degrees Of Freedom', for example the 240° Pitch, 180° Yaw and 90° Roll allowed to the shoulder). In any case, we should not forget that the dancing body, kinetically in-formed by the numerical indications of choreography, is always already captured into a pre-determined anatomical grid from which its movements are selected. The most skilful dancer extracts its kinetic ability and originality from an extremely amplified, but nevertheless limited numerical set of possibilities, from which particular variables are chosen and decisions are taken. In the closed numerical systems of both science and choreography, movement is never totally new and unpredictable: how can new ideas be generated in dance?

For a (temporary and unstable) answer, we should look much more closely at the moving body and its relation to 'numbers'. Organising movement according to precise time, space and energy parameters, the choreographic notation has a rigid arithmetic aspect, necessarily implying numbers as measuring tools for the fixing of those parameters and of the combinations, tempo and direction followed (or to be followed) by a dancer.[2] These numbers make the dancing body proceed according to the One-Two counting schema (1-2 as the basic cadenced meter of a march steps), and to the distribution of binary distinctions (A-B as departure and arrival points of movement) on a sequential line. In *A Thousand Plateaus*, Gilles Deleuze and Fèlix Guattari define the number considered as a counting and measuring tool as a 'numbered number', an instrument used by the subject to inscribe its own movement on a surface (Deleuze/Guattari 2002a: 387-394): from the paper (or screen) of choreography to the body, from body to space, the surface becomes an inert object of inscription and codification. On the stage/space, the codifying force is gravity, the principle of choreographic determination which links the number to geo-metric magnitudes.

Transforming every spatial displacement of the body into a predictable and programmable reproduction of the Newtonian law and of its linear, laminar model of motion and speed measurement (falling as acceleration), gravitational laws express

velocity through the reduction of space and time to divisible arithmetical units (V=distance/time). In other words, the anatomical and physical numbers populating the choreographic space provide a solution to the problem represented by the un-thinkable movement-idea, a possibility to predict and plan motion by giving it a subject, a direction and a quantifiability. Every movement is expressed thus on stage as a controlled fall, or as a measured attempt at flight from a gravitational centre. Nevertheless, a dropped or falling body does not have speed but only an infinitely decreasing slowness: in other words, rather than a quantifiable and determinable velocity, speed is the potential of a body to deviate from its (choreographic) path and to change direction while continuously transforming itself. In this sense, the rhythm of movement cannot be reduced to a measurable and linear passage from point to point, but corresponds to the relation between critical moments in which the body imperceptibly deviates (i.e. acquires speed) and changes. A falling (or linearly moving) body does not have speed (or rhythm); or, rather, it has it but in potential, a potential for change. In this sense, every movement becomes a spiral, a swirling of incipient, emerging differences hidden behind a surface of repeated steps.

These moments of 'invisible' deviation are the objects of a different scientific or mathematical thought, and the diagram of the critical moments of change woven between, behind and beyond the arithmetic units/steps of a dance is composed by 'irrational' numbers, infinitely small, uncountable and unstable numbers appearing in movement rather than being used to count or measure it. More specifically, the movement of a body, its speed and rhythm, i.e. its minimal potential deviations and the vortexes generated in its spatial occupation, can only be thought through 'differential calculus', the 'minor' mathematical branch that allows us to calculate the velocity of a body in a particular instant (by dividing space for an infinitesimal time while avoiding division by zero): rather than macroscopically measuring average velocity, we can microscopically 'understand' the critical moments, or singularities, when a movement takes speed.[3] As an addition or multiplication of these moments, space ceases to be homogeneous and immutable and appears as a heterogeneous and shifting multiplicity of infinitesimal changes. The mathematical function complementary to differential calculus, 'integral calculus', gives us space as the sum of these infinitesimal changes (or differentiations) of a movement, a patchwork of approximations only asymptotically approaching exact distance as a limit. In other

words, areas, lengths, volumes and statistics are only approximate sums of microscopic deviations. Rather than quantifying the amount of space run by the body (in terms of steps of an immutable subject on an inert surface), movement is calculated as an accumulation of differentiations, a fractal space of continuous variation. Space is occupied without being counted: for this reason, the static angularity of geometric measurements and the bulky homogeneity of arithmetic operations are not tenable: the indiscernibility and mutability of the critical moments of movement makes numbers sink into the infinite, or the infinitesimal. From one moment and until the next one, the number ceases to function as an exact instrument for the measurement, calculation and translation of movement: rather than describing or predicting movement, it is generated by it, not pre-existing or following but simultaneous to it. Beyond and between codes (for example between the arithmetical units of anatomy and physics), in extremely long or extremely short durations, numbers reveal thus their limit (what they cannot reach as immobile wholes) but also their potential (what they can touch as infinitely articulated and multiplied): between 1 and 2, in the intervals of counting, infinitesimal and infinitely divisible numbers spring continuously.

In other words, the crucial event to be highlighted in this passage from arithmetical calculation to infinitesimal calculus is a qualitative difference of the number in its own variation; for Deleuze and Guattari, from 'numbered', the number becomes 'numbering', i.e. acquires vagueness, irrationality, but also small scale, mobility and a potential for creation which is revealed in its capacity to follow the microscopic mutations of a body in movement. In the same way, rhythm differentiates itself from metre. On the one hand, the periodic repetition of a basic component consciously counted, perceived and performed realises a behavioural code, a metric reiteration which disciplines the body and its movements through identification, synchronisation and communication mechanisms. Metric reiteration is the accurate clock which allows a body to recognise its organic and human identity (such as in the biological code as based on genetic and cellular reproduction), to perform its ordered movements and interactions (such as the cultural code as based on the adoption of rigid behavioural structures) and to adapt technology to its own aims (such as the digital code as based on clear information exchange). In order to perform all these operations, a body has to consciously count. In this sense, metre would correspond to 'generality', i.e. a set of

immutable laws regulating the identity and resemblance of subjects and their equivalence to designated terms. Against the equality and equivalence of metric generality, the behaviour of rhythm is related to singularity and uniqueness, the repetition of an external conduct echoing a secret vibration. Linking together and trans-coding heterogeneous blocks or lines (of molecules, human populations, information bits), rhythm opens every bio-physical, social or technical organisation to identity contaminations, synchronicity disruptions and communication disturbances. In this contagious rhythmic economy, the body escapes physiological, cultural and communicative constrictions. Rhythm cannot be counted, but does this imply that we can do without numbers[4]? As we will see, in many cases numbers are both rhythm and metre, pathology and cure.

From this double, paradoxical point of view, the relation between movement and mathematics can be reversed. Rather than having a moving subject consciously thinking and counting, choreographing and measuring its own body, movement and space through numbers, the number becomes a subject, through the non-conscious becoming-number of the moving body. Numbers are not functionally superimposed onto a body but emerge as soon as this body moves, i.e. spreads its molecular composition and distributes itself in a space that does not pre-exist and cannot be divided up or distributed but is always re-created, re-drawn with a shifting diagram of forces. These forces cannot be exactly defined and delimited by numbers but continuously generate and multiply them as 'ciphers'. The body becomes a composition of moving and changing numbers, its rhythm becomes 'ciphered', while numbers spring not only from the mouth but also from pelvis, legs and arms, head... The number adapts now itself to the qualitative differentiations of the moving body (for example when 'calculus' finds the particular intensity, duration, speed of a body's motion, when it traces its continuous microscopic contractions and dilatations 'topologically', or when it follows the sounds, consistencies, colours generated by it).

Linked to qualities rather than quantities, the moving body of the numbering (or 'rhythmic') number cannot be considered as a simple arithmetic unit obeying the laws of gravity: immeasurable multiplicities, molecular packs with a metamorphic potential rather than whole bodies, the celerity of a swarm rather than the gravity of a subject, machines of transformation rather than apparatuses of movement, all appear in

infinitesimal numbers which generate conditions of becoming, rather than binary relations between states. In this sense, numbers make of the dancing body a pack, or an anonymous, collective and impersonal function: 'it' (a man, a woman, an animal, a molecule, a cinema or video character, a number or all of them) moves, as an element of a nonsubjectified assemblage with no intrinsic but only situational and combinatorial (or connective) properties. The combinatorial nature of the body's numbers does not identify them with numerical, statistic elements (the body as a statistic aggregate of pre-existing units with pre-existing properties, as in the anatomical composition of organs and limbs), but with a fractal complexity, a complex of numbers, articulated and 'assembled': the body as an assemblage of molecules, its gestural units also appearing as assemblages of molecular, microscopic gestures. Every gesture is articulated as a number distributing itself in the body: as shown by Josè Gil, a gesture is always an aggregate of micro-gestures that cannot be easily isolated, presupposing multiple articulations of heterogeneous elements imbricated into each other, for example toes, ankles, knees, legs as the articulations of a jump (Gil 1998: 112-13). These micro-gestures are the ideas of a moving body. In the meanwhile, movement is always happening 'between … two articulations, [as what] … is necessary in order to pass from one to the other … "between" the two, in that instant, even ephemeral, if only a flash, it proclaims its own irreducibility' (Deleuze/Guattari 2002a: 355). Between two steps, between two articulations, there is always something more: movement in itself, thought in itself.

Continuously generated in a mutating molecular body (rather than originated by an immobile one), movement is distributed between parts (for example joints or limbs) and beyond the direction of a central entity (consciousness) guiding it according to anatomical and physical laws. At the same time, the thought of movement is not separated from the body and situated in a different point, or temporally delayed, but coincides with movement in the same moment (the 'act') of its appearance (and of its sensation): movement becomes in this sense ephemeral and abstract, or unintentionally thought. As Brian Massumi points out, sensation and thought are two vectors running in opposite directions: one, sensation, as a bodily tendency which can only be felt, the other, thought, as the thinking of alternatives for the active realisation of what had been only in tendency (Massumi 2002: 98). The concrete event of bodily movement emerges in the moment when the two ('sensational' and thinking) paths

cross. A moving body is also always imperceptibly, rhythmically becoming; not becoming something, but simply becoming (i.e. thinking, sensing).

This simultaneity of body/mind (as of matter and its abstractness) emerges in the distribution of thought/motion throughout the whole body, so that thought and action coincide in the de-localisation of brain and limbs. An example of the delocalisation of movement is given by tribal dance where, according to anthropologist Renato Troncon, the movement is kept in the body, which vibrates and is tended as a serpent's tail, and where the motion never abandons the body and does not distinguish between a centre (torso, or mind) and periphery (limbs) (Troncon 1991: 116). The same happens in Kleist's 'Puppet Theatre,' where the movement of puppets and the continuous play of the puppeteer (the central guide, or consciousness) with the law of gravity (a play which is also defined by the author as the relation of the arithmetic unit, the puppeteer, with its logarithms, the puppets) is transferred to a 'spiritual' realm where the 'light' puppets overcome all gravity, and do not even need to be guided by a central subject (the puppeteer) anymore (logarithms become autonomous). In the body of a ballet dancer, the same condition coincides with what Kleist defined as the perfect 'centring' of thought and action beyond consciousness and reflection, i.e. with the de-centralisation and distribution of thought/sensation/movement in the body before the appearance of gravity and weight: it is in this way that a dancing body senses, or thinks, itself as a celestial body or an artificial satellite. Impossible thoughts and sensations become thus performable, gestures becoming the logarithmic operations detached from a consciously feeling and rationally thinking subjectivity. 'Another moves in me', forces performing their continuous improvisation, or a continuous development of new ideas in movement. This creative process represents the abstract, incorporeal dimension accompanying every step beyond its conscious realisation. In movement, ideas reproduce themselves with an incredible speed and are not to be easily stopped or captured, in the same way as the inexact, infinite numbers of calculus fall into the void between two arithmetical units.

A continuous differentiation animates the moving body, as a frenetic passage from one idea to the next. An extreme image of this un-countable distribution of microscopic acts, or gestures, of thought and movement behind the macroscopic surface effect of a metric linearity (one step after another) is given by the spastic

movements of the hysterical body. With its innumerable fits furiously intermingling into one another, the spastic body shows a continuous qualitative variation, myriads of unstoppable numbers never clearly offering themselves to the strictness of an arithmetic or geometric measurement. The hysterical body as a moving thinker. In the Italian language, the definition of madness, hysteria or epilepsy, is that the body 'is giving us its own numbers'. Can we think of every moving body, for example an athlete or a dancer, as containing and expressing a hint of this mad paroxysm? If we look at the scientific and artistic experiments with digital Motion Capture, the detailed presentation (or micro-photography) of movement shows a multiplicity of wobbles, or jerks, behind the most fluid gestures of athletes or dancers. The moving and dancing body is revealed thus as a spastic body, the sensitivity of the machine allowing the capture of the most imperceptible micro-variations, the disturbances, the 'noise' composing the linearity of movement. The proliferation of data stored by the computer appears on the screen as a frenetic succession of algorithms intuitively suggesting the un-measurable and un-traceable character of motion: the moving body as a swarm of dancing numbers, a disordered accumulation of flickers to be purified, i.e. cleaned, filtered and edited through particular software tools.

3: Between bodily numbers and digital algorithms
Before starting our discussion of the dance/technology relation, let us take a step backwards. Choreographic composition already allows a sort of movement 'purification' even before its technological capture: as a possibility of formal movement construction, choreography deploys numbers and arithmetical operations in order to play with physical and anatomical laws, guiding the variation of bodily attitudes in space, and allowing the most acrobatic postures to stand in equilibrium despite the continuous jitters and de-formations of the moving body-swarm. The artistic becoming-dance of movement is an effort to modulate, to surrender to but also to bend, the anatomical principles, through precise numerical calculations. The numerical composition of dance is what enables a sequence of movements to maintain its own consistency and to stand on its own as a work of art (Deleuze/Guattari 2002b: 162), while simultaneously containing and generating uncountable and non-measurable events.

But how are we to understand this kinetic precariousness of choreography and dance? We can define dance as the choreographed evolution of a body's displacement in space and time, and its simultaneous infolding towards a virtuality of imperceptible acts, sensations or thoughts putting its stability and balance at risk. The performative space ceases to be a linear juxtaposition of steps to become punctuated, or 'patchworked' by an accumulation of proximities, each accumulation defining a *zone of indiscernibility* proper to 'becoming'.

Between two steps, the body 'becomes', i.e. intensively varies, is traversed by a flow of forces that vectorise its efforts towards the next position, the body's tension towards an unreachable point being the non-conscious thought of movement. From this point of view, choreography 'looses' its rigid character of immutable prescription, and becomes a meta-stable diagram of bodily capacities and adjustments, of indecisions and uncertainties, its calculations and indications anticipating efforts and tendencies, or approximations, before producing accomplished movements and results. Inducing efforts and ideas, the choreographic creation reveals a virtuality, an affective nature that is only actualised in unpredicted consequences. The 'becoming' (aiming at, tendency, a sensation of movement or a movement-idea) of the dancing body is generated by the affective character of choreography and is actualised in a step. In other words, movement is generated in the body through an affective passage of ideas between different codifying orders of expression: from choreographer to dancer, from anatomy to physics and dance, numbers are the components of the passage, vehicles of an idea in movement. Borrowing Massumi's words, we can define the functioning of this process as analogical, 'a continuously variable impulse or momentum that can cross from one qualitatively different medium into another … Variable continuity across the qualitatively different: … transduction' (Massumi: 2002: 135).

Being based on counting and clear cuts, rather than on the imprecision of analogical demarcations, digitisation represents another possibility of 'transduction', or expression, for the vagueness of movement-ideas, replacing the inexact quantities and fluid dynamics of thought and motion with discrete numbers, and submitting the indeterminacy of matter to a new form of codification and control which operates through the numerical discrimination of very small differences. Being defined by Massumi as a 'combinatoric of the possible', digital technology systematises matter

and forces through 'a numerically based form of codification (zeros and ones) … a numeric way of arraying alternative states so that they can be sequenced into a set of alternative routines. Step after ploddingly programmed step. Machinic habit' (Massumi 2002: 137). The routine, programmable and predictable algorithms of the computer differentiate its working from the open nature of sensation, thought and the 'calculus' of a movement's rhythm. With digitalisation, indeterminate micro-variations (the minimum, infinitesimal differences of differential calculus) become macroscopically coded as binary digits.[5]

Nevertheless, as Felix Guattari points out, these 'technological machines of information and communication operate at the heart of human subjectivity, not only within its memory and intelligence, but within its sensibility, affects … Recognition of these … dimensions of subjectivation leads us to insist … on the heterogeneity of the components leading to the production of subjectivity' (Guattari 1995: 4). In other words, in all its different creative expressions (perceptual, intellectual, aesthetic), human subjectivity finds in the technological apparatus a new compositional element leading, with its infinitesimal scale of work, to different ways to sense, think and move, i.e. to create. According to Maurizio Lazzarato, the function of electronic and numerical technologies is to crystallise (synthetise) material flows at a microscopic scale (Lazzarato 1986: 7). For the philosopher, the analysis of the body according to forces and flows is an important tool to understand numerical technologies beyond the anthropomorphism which transforms them into prostheses of human organs and into extensions of the human senses. As a decodifying machine, the computer works in the same way as human perception, i.e. through the continuous interruption of flows of matter, which it inserts into further processes of re-codification (for example breaking an electrical flow and transforming it into a series of 0s and 1s). As Henri Bergson pointed out, human subjectivity has evolved its expressive faculty as a specific combination of perception/movement (the concrete elaboration and codification of matter) and memory (or thought, the spiritual elaboration of time). Electronic and numerical technologies imitate and automate the process of material crystallisation, doing the 'material' work for us (for example capturing movement and creating moving images) with even more precision and detail. In this sense, we can echo Lazzarato's argument by pointing out how these technologies, rather than faithfully representing reality, amplify the intellectual potential, i.e. the 'spiritual' and creative side (using a Bergsonian terminology) of subjective expression, allowing a different

distribution of forces and potentials in the body, and creating more space for an emergence and proliferation of new, different ideas.

In 1968, in his book *Changes: Notes on Choreography*, choreographer Merce Cunningham imagined the conception of a digital technology that could allow the representation of dancing 3D figures on a computer screen. Twenty years later, the Life Forms software has given a pragmatic actualisation to the choreographer's hypothetical vision, allowing him to create choreography by mixing, matching and blending, copying and pasting pre-existing or newly created phrases and sequences of movements performed by tiny 3D bodies. Since his first choreographic compositions, the key word in Cunningham's work has always been the fragmentation of the compositional plane (i.e. of movement) into its multiple composing elements:

> As you're not referring one sequence to another you can constantly shift everything, the movement can be continuous, and numerous transformations can be imagined. You still can have people dancing the same phrase together, but they can also dance different phrases at the same time, different phrases divided in different ways, in two, three, five, eight or whatever (Cunningham 1998: 29).

Two, three, five, eight or 'whatever': as Cunningham's own words highlight, his 'numeral' method implies the creation and manipulation of different movements with different rhythms and, therefore, a multiplication of possibilities and a complexification of the whole dance performance. In this way, the classical conception of the stage/space as seen through a frontal perspective and endowed with a centralised structure is replaced by a more complex idea of all the different points of the scene as having equal value. Because the different points of the stage lose their reciprocal relations of correspondence, movement can be constant, and innumerable simultaneous transformations can be generated (as in the fractal space of 'integral calculus'). The same goes for time: different movements can be performed with different rhythms. In order to accomplish this complexification, Cunningham's use of chance procedures (for example the Chinese mathematical system of the I-Ching)

transforms the mobility of the dancers on stage into a sort of game with its own playground and rules.[6]

In his first as in his latest creations, Cunningham's choreographic method has therefore always implied an exploration of movement intended as an ongoing and a non-conscious, or non-intentional, process generated by chance, rather than a trajectory with a fixed goal. In this sense, his use of the LifeForms software has represented an amplification of the chance 'technique', allowing both choreographer and dancer to discover how to make possible the impossible. On the LifeForms screen, a series of algorithms visualised as 'odd little 3D bodies' without organs, bones or muscles move and float in a sort of vacuum space-time with no gravitational or chronological restrictions, simulating and suggesting all sorts of unexpected and unimagined motions. On this screen, everything can be decided by chance: selection of bodily parts, their number and their precise movements. Movement sequences are created by inserting key positions, while the computer calculates and adds the intermediate passages. This interpolation happens as a mathematical function that calculates the missing value, by using an average of the functional values at its disposal: in this way, the computer automatically creates a smooth movement in-between. Although not unlimited in its pre-programmed possibilities, the LifeForms dancer can thus unrealistically ignore gravity and jump at whatever height, or it can fly and remain in the air. Rather than merely reflecting the acquired habits of the trained dancing body and its possibilities, choreographic composition becomes a rigorous attempt to destroy those habits and obtain unforeseen results.

In Cunningham's computerised choreographies, the quality of movement visibly changes from his previous choreographic tendencies: for example in some of these works, foot work becomes now the main component of the performance, and the positioning and movement of the arms appears as a peripheral element only added afterwards and without any relation to the dance, creating a complex polyrhythm in the dancer's body, with legs and arms moving at their own respective velocity. Torso and head's movements appear then as another stage of choreographic composition, again without any relation with what is happening in the legs and arms: the result is an idiosyncratic, unnatural and difficult march. Deriving from the particular configuration of the computer screen and from the positioning of the dancing models

on it (a positioning that highlights the legs while making the arms somehow peripheral), this 'technologically acquired' stylistic aspect gives the performance an awkward effect. In most cases, the result is an impression of fractured bodies with heads, arms, legs becoming un-synchronised, each limb moving at its own autonomous velocity in a sort of anatomical collage of dancing parts: for example, in Cunningham's computer assisted choreographies, 'it's not uncommon for the dancers to move stage left in a series of successive hop-turns on one leg while their heads circle in the opposite direction' (Copeland 2004: 189), and then '[f]eet planted firmly on the floor provide the foundation for almost impossibly "torqued" bending and twisting of the back and neck,' so that 'the upper body tends to work in disjointed counterpoint to the legs' (Copeland 2004: 194). In other words, a new degree of bodily deformation is obtained, a tendency to 'twist' and 'gnarl' and 'fragment' the body in ways that take it increasingly far away from its habitual physical attitudes. By isolating all the different elements of the performance as autonomous components of an assemblage, and by transforming the human dancer into one of these components, on its turn composed by many other moving elements, Cunningham reverses the usual process of 'humanisation' of the dance stage. This time, it is the human body tending towards the working of the object, of the technical machine, this inverted relation indicating not only the idiosyncratic adaptation of the script by the human body, but also an anorganic becoming of both body and technology, on a common material level of rhythmic interchange.[7]

Although the use of LifeForms is generally considered as a mere extension of the body's perceptual and kinetic training, the digital device reveals a capacity to multiply the possibilities of gestural innovation and creation, allowing the choreographer to obtain new movements: when the movement sequences visualised on screen appear physically impossible, dancers make an effort to discover new ways of realising them, while the choreographer discovers new ways to think or find connections and new imaginative possibilities. From this point of view, LifeForms continuously pushes the body towards anatomical or intellectual thresholds. As Merce Cunningham has argued, the possibilities of human movement are linked to our two legs and to our potentially infinite but actually limited, 'trained' imagination; according to the choreographer, the LifeForms software has exponentially expanded both of them. It is not technology per se, but the man/machine connection that brings forth kinetic

novelty: in Guattari's words, 'it becomes necessary to go beyond the delimitation of machines in the strict sense to include the functional ensemble that associates them with humankind through multiple components' (Guattari 1995: 32). The subjective poetics of choreography becomes an auto-po(i)etics of computerised composition, in which the human/technical connection is animated by a passage of new ideas and new rhythms. Digital algorithms reveal their affectivity by bringing forth new potentials and new stimuli to realise apparently impossible movements and idiosyncratic phrases that push against biological and anatomical laws, allowing the exploration and discovery of previously unknown capacities and the overcoming of past beliefs and ideas. The choreographer/performer/audience space is intensified and animated by the surprise and wonder of an unexpected event: technology and chance suggesting to the dancers how to discover what they can do, with a reciprocal feedback between the choreographer's idea, the technologically created score and its actualisation by the bio-physical apparatus of each different performer. The computer-dice offers thus its myriads of different faces to the dance players, allowing a multiplication of possible throws and combinations and affirming, at every new step or gesture, the whole of chance.

Notes

[1] The title of this article was inspired by Gilles Deleuze's questions 'What is having an idea in something' and 'What is having an idea in cinema?', which he addresses in a 1987 conference at the FEMIS (École nationale supérieure des metiers de l'image et du son).

[2] More specifically, in the composition of the dance script, numbers can be used for example to calculate, measure and describe the orientation of the limbs' movement in three dimensional (Euclidean) space according to the Euler angles (Pitch, Roll, Yaw) with an axis rotation, assigning to these parameters sets of three digit numbers from 000 to 360 (a full circle being 360 degrees) in negative and positive numbers, with clockwise and upward movement direction for positive numbers, anti-clockwise and downward direction for the negative ones. Numerical values can also be used to describe the path a movement takes and its direction (line, angle, rectangle, curve, circle, spiral, twist, zigzag, release, arbitrary, translation), or the effort related to

movement dynamics (direct/indirect, strong/light, sudden/sustained, bound/free), measuring all these properties with numerical values, for example varying from -10 to +10. These numerical sets give identified values to what is technically defined as the body's 'Degrees of Freedom' (DOFs), the limited rotational and kinetic possibilities delineated by anatomy. In the articulated anatomy of the human body, DOFs work at every joint, generating local movements in a coordinated (or un-coordinated) system of disparate independent points connected by the limited frame of the body and by the limitations of physical laws (gravity, mass etc). See Gough.

[3] On differential and integral calculus, see Deleuze 2001, and Deleuze and Guattari 2002a. See also http://en.wikipedia.org/wiki/Calculus

[4] In the same way, in his dance formula 'Afotek', which he describes as an understanding of both techno and Congolese dance as physiological dimensions of mental postures, Ran Hyman talks about the 'nature' of rhythm as something that is not counted but already 'in' the body. As a 'collective thought and action enlivened by a critical desire', the expression of rhythm through the contaminating mixture of digital sounds and tribal dance steps unravels therefore outside any right, previous understanding of our intentions, transforming dance into a vibrating series of interruptions and disturbances in our linear cognitive and communicative productions. Our understanding of rhythm as a springing of non-predictable complexity into the linear flowing of pattern also resonates with Olu Taiwo's definition of the rhythmic text: 'the texture complete with all its cross patterns and improvisational communications that identify the character for the rhythmic event'. See Taiwo, 1998.

[5] According to Maurizio Lazzarato, in its impossibility to synthesise continuous qualitative durations and to reproduce the virtual/actual rhythmic circuit as an unprogrammed emergence of novelty from an open-ended field of potential, the digital nevertheless manages to simulate the process of actualisation at an infinitesimal scale, synthesising discrete numbers and multiplying their possible combinations. See Lazzarato 1986.

[6] An example of this choreographic method is represented by *Torse*, a composition in which everything is decided by chance, by the 64 hexagrams of the I-Ching. The performance is composed of 64 movement phrases, each one conceived as a number (for example the phrase one implying the performance of one movement, the phrase two of two movements etc), each shift defined by weight changes: standing on one foot counts as one, but bending a knee is two because the body weight shifts once, so that in the phrase number 64 there are 64 weight shifts. In the same way, space is divided in 64 squares. By tossing coins, the choreographer decides how many dancers will perform a particular phrase in a particular square. See Cunningham 1990.

[7] From a different point of view, in Asa Unander-Scharin's *The Lamentations of Orpheus* the computer generated choreography (developed with the Motographicon software) moves an industrial robot by trying to give it a human-like, organic quality. See Menicacci and Quinz 2001.

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