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Individuation, Art, and Interactivity Starting with Gilbert Simondon

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Abstract. The aim of the article is to show the fruitfulness of Gilbert Simondon's theory of individuation as a tool for analysing the aesthetic-artistic experience made possible by new technologies. Interactivity is the category to qualify those works based on computer systems whose form is determined by the intervention of the user or by signals coming from the environment. The reflection under the profile of aesthetics has long since begun to reckon with Simondon's thought, developing his analyses on the mode of existence of technical objects. Here we intend rather to show how the concepts and expressions at the centre of his theory of individuation are also rich in ideas for the study of an aesthetic-artistic experience in which the category of relation assumes a constitutive value and in which the processual aspect of the artwork prevails over its object dimension.

Keywords: Digital art, Technologies, Interactivity, Individuation, Relation.

FOREWORD

As dendrochronology teaches us, trees are capable of recording what happens in their environment through the annual formation of rings within their xylem. The measurement of their amplitude together with an analysis of their histological constitution represent a code that, if well deciphered, tells the story of the tree and the ecosystem in which it lives: they are thick and distant if the year is favourable, while they are thin and irregular if the living conditions are adverse. The analysis of the signals contained in the series of woody rings therefore documents the state of health of the tree while providing information on those climatic factors – such as forest fires, drought and pollution levels – that most affect it. This is the phenomenon that inspired *Voice of Nature*, the interactive installation designed by Dutch artist Thijs Biersteker¹ which

¹ Founder of the Woven Studio, Thijs Biersteker creates interactive art installations, also referred to as «eco» and «awareness art», which aim to spread a

uses a tree as an interface between environment, viewer, and work. Exhibited in 2018 in Chengdu, one of the most polluted cities in China, the installation is made by applying to the roots, branches, and leaves a system of sensors that monitor environmental conditions through a series of parameters: the level of carbon dioxide, temperature, soil and air humidity, photosynthetically active radiation, and the amount of fine dust. The data collected is then subjected to an algorithm that generates digital rings projected onto a circular screen placed behind the tree every second instead of every year. In this way, the slightest irregularity in the profile of each ring shows in real time the impact of environmental conditions on the health of the plant. For example, increased pollution or traffic jams cause the tree to react immediately, as documented by the sudden ripples that deform the rings projected on the screen as well as the illumination of a red warning light. Moreover, every time viewers touch the bark of the tree, the work reacts, decreasing or increasing its energy level, suggesting how even the most common gesture can affect the climate, such that, according to the artist, «change is at hand».

The work described represents only a possible example of the transformations produced in the contemporary aesthetic-artistic experience by new technologies. These have gone from being simple tools for action to becoming forces which profoundly and relentlessly shape our environmental, anthropological, and social realities, thus modifying our reciprocal relations as well as our understanding of the world and of ourselves. Now, we should avoid two extremes which excessively simplify the matter at hand: on the one hand, those who euphorically claim the centrality of digital worlds, and on the other, those who limit themselves to recognizing their purely recreational and commercial function. Rather, it is a matter of con-

more acute sensitivity to issues such as climate change, air pollution, presence of plastic in the oceans and Anthropocene. At the following link we can see a short video that documents some moments of the installation: <https://thijsbiersteker.com/voice-of-nature>.

sidering the ways in which artistic experimentation critically explores their resources and enhances their creative potential. Indeed, it is in this condition that art, to quote Mikel Dufrenne, reveals itself to be «impregnated with a possible world» (Dufrenne [1981]: 46). A possible world not opposed to the real world as an alternative one, but pervading its texture as a «possibility of the world» itself, which finds in art an ever-renewed actuality, by gathering knowledge, experimenting on perceptions, and soliciting new forms of creativity and fruition.

Interactivity is in this regard the specific category to qualify those artistic operations based on computer systems whose form is determined from time to time by the intervention of the user or by signals coming from the environment². No longer just, or exclusively, an object to be contemplated, the work becomes an open space of encounter and participation which takes shape and evolves thanks to the relationship of mutual exchange with all who access it. An aesthetic-artistic experience emerges in which the category of *relation* assumes a structural value to be investigated in its conditions of possibility and in its implications, starting from the dialogue with those projects that, abandoning the artificial effect typical of simulative and spectacular perspectives, make themselves an inexhaustible *source of the possible*³.

1. ART AND INTERACTIVITY

Before tackling the issue from a philosophical point of view, it would be appropriate to outline the main characteristics of interactive art, also taking into account some lines of reflection that ani-

² Samuel Bianchini and Erik Verhagen suggest calling such artworks «practicable», meaning with this term their capacity to encourage and welcome the concrete involvement of the viewer to generate and activity that may transform the works themselves as well as their audience (Bianchini, Verhagen [2016]: 1-22).

³ In the field of aesthetics this conceptual core has been developed with originality by Roberto Diodato, who has devoted pioneering studies to the phenomena of interactivity and virtuality. See Diodato [2012; 2015; 2021].

mate the debate between artists and theorists. A practice now consolidated in experiments open to technological innovations, it began in the 1950s, finding fertile ground in *cybernetics*, which was the first to combine a theoretical analysis of interaction processes with their reproduction by means of machines (Kwastek [2008, 2016]).

Wiener defines cybernetics as the study of «control and communication in the animal and the machine» (Wiener [1965]). This definition contains the very foundation of the discipline, proposing a method that can be applied in a uniform way to the analysis of the behaviour of both living organisms and machines, both considered systems governed by the same physical laws. More precisely, it is a question of elaborating a linguistic code that makes it possible to deal with phenomena such as *generation, processing, and transmission of information* in space and time, which intervene in the natural and artificial mechanisms responsible for the self-regulation of machines and living organisms. Of great interest in this respect is the principle of *negative feedback*, i.e. the signal that allows a system to adjust its action according to the results obtained. It is based on information that from the output of a circuit returns to its input, transmitting the system's state of operation: if this differs from the established objectives, the system is able to modify its operation until the desired result is achieved. Now what is important for the discussion is the fact that in the study of a technical system, cybernetics is interested in its *operational* aspects rather than in its internal composition or the properties of its constituent elements. The technical object is considered as an organised whole, capable of regulating itself and evolving, reacting to the impulses coming from the external world according to an active exchange of energy, and establishing with it relationships similar to those that a living organism has with its environment. As William Ross Ashby states, cybernetics «is a “theory of machines”, but it treats, not things but *ways of behaving*. It does not ask “what is this thing?” but “*what does it do?*”» (Ashby [1957]: 1).

It is precisely from the concept of «behaviour» that the reflections of Roy Ascott, one of the pio-

neers of interactive art, began in the 1960s (Ascott [2003]: 109-157). He credits cybernetics with having brought about a radical change of scenario in the aesthetic experience. Compared to traditional forms of fruition – defined as *deterministic* in that they are based on a plot of meanings clearly defined by the artist and transmitted to a more or less passive user – cybernetics, according to Ascott, introduced a *behavioural tendency*, sanctioning the passage from the work's typical characteristics of completeness and unity to a mode of existence that requires from time to time activation by the user's intervention. The work thus loses its *thing* connotation and becomes more and more an «open-ended process», suspended «in a perpetual state of transition, where the effort to establish a final resolution must come from the observer» (Ascott [2003]: 112). In fact, if the general setting of the aesthetic experience remains in the hands of the artist, «its evolution in any specific sense is unpredictable and dependent on the total involvement of the spectator» (Ascott [2003]: 112) which is all the more decisive the greater the degree of variability provided by the technical system. Described according to the coordinates of cybernetics, the aesthetic-artistic experience is thus configured as a «retroactive process of human involvement» (Ascott [2003]: 112). The principle governing the interaction of the artist-work-spectator system is the cybernetic principle of *feedback*:

The artefact/observer system furnishes its own controlling energy: a function of an output variable (observer's response) is to act as input variable, which introduces more variety into the system and leads to more variety in the output (observer's experience). This rich interplay derives from what is a self-organising system in which there are two controlling factors: one, the spectator is a self-organising subsystem; the other, the artwork is not usually at present homeostatic. (Ascott [2003]: 128)

Now, the distinction proposed by Ascott between *deterministic art* and *behavioural tendencies* is certainly reductive as well as open to criticism in several respects. First of all, it could be

argued that any artistic operation reaches its full completion in the presence of an audience. It realises its expressive value by offering itself to perception, is enriched by the plurality of meanings attributed to it, and grows in depth in the judgments it is subjected to. However (and this is what the essay in question intends to underline), what is important is the *reciprocal* and *dialoguing* relationship that arises between the work and the user, transforming the latter from a simple subject of a contemplative experience into a priority term directly involved in the realisation of the work. In fact, there are at the basis of the interactive event not only systems of meaning to be interpreted or forms of empathy with the work, but also *process calls* to which the user is called to respond with his own initiative. For Ascott, two conditions are necessary to produce behavioural art: «that the spectator is involved and that the artwork in some way behaves» (Ascott [2003]: 129). This practice would later find its chosen medium in the computer, which should be understood as a *set of behaviours* rather than as a mere thing.

The advent of digital technologies has further extended the possibilities of participation, which have become the subject of constantly updated taxonomies designed to measure the degree of interactivity of different technical systems. Under what conditions does an installation receive stimuli from the user or the surrounding environment? To what extent is the evolution of the work determined in advance and to what extent is it possible for the user to influence it? Does his or her intervention limit itself to selecting a series of options predefined by the technical system, or does it, on the contrary, affect the very parameters that govern its development? These and similar questions guide the attempt to establish a classification scale that, on the basis of technical and structural conditions, establishes the limits and potentialities of interaction processes.

Without alluding to the appropriateness of these taxonomies, let us take the example proposed by Ernest Edmonds, an artist and pioneer in the field of digital studies (Candy, Edmonds [2011]). He divides works of art into four cate-

ries based on the intensity of the relationship that can be established between the work, the artist, the viewer and the surrounding environment. The first category includes «static» works, such as a painting or sculpture, which are characterised by the fact that they do not change in relation to the behaviour of the viewer or environmental stimuli. In another group are «dynamic-passive» works, so defined because, although tending to change, they do not react to the actions of the user, who in turn is relegated to the passive role of witness. In contrast, environmental factors such as temperature, sound, and light are responsible for the change; their influence is however regulated by mechanisms within the work and therefore predictable. It is only with «dynamic-interactive» works that the contribution of digital technologies becomes evident, offering the viewer the possibility of directly influencing the evolution of the work. A feedback relationship is formed between the work and the user, whereby the latter's actions provoke a direct and immediate response from the work, as occurs at an elementary level thanks to the techniques of recording body movements and sound. Like Ascott, Edmonds also believes that is possible, on the basis of algorithmic scripts or the set of rules used to instruct the computer programme, to introduce a component of *unpredictability* within the general scheme of action and reaction⁴. This is what happens in «dynamic-interactive-varying» systems capable of recording interactions with users, learning their gestures and movements and, on the basis of this experience, modifying not only the rules in the stimulus-response relationship but also its own

⁴ A classification of interactivity based on the degree of unpredictability provided by the computer system has also been developed by the artists Laurent Mignonneau and Christa Sommerer, who define as «non-linear, multi-layered, multi-modal» that interaction which, instead of being programmed and therefore predictable, is produced in a new way each time the user comes into contact with the work. This is made possible by *growth algorithms*, capable of recording every variation in the intensity of the user's intervention (Sommerer, Mignonneau [2005]: 837-851).

evolutionary behaviour. If the work is constantly changing on the basis of past interactions, its configuration at a given moment can never be completely predictable.

In the wake of Edmonds' analysis, the study of interactivity related to the degrees of unpredictability of the technical system has also been addressed by the concept of «emergence» (Seevink [2017]). It is correct to allude to *emergence* whenever formal or conceptual novelties arise that were not foreseen by the system of origin, such that the emerging totality does not coincide with the sum of its component parts. *Novelty, unpredictability, heterogeneity* and *non-deductibility* with respect to the context of origin are the distinctive features of emergence. Now, it may certainly seem odd to speak of an *emergent phenomenon* in reference to the interactive work of art, i.e., to attribute such properties to the computer system, an entity endowed with a finite and above all determined nature. However, it demonstrates an attempt, worthy of attention from a conceptual point of view, to interpret those unprecedented forms of aesthetic experience made possible by interactive digital technologies.

Through this brief exposition, it is already possible to see how the debate coming from media studies proposes an in-depth *theoretical analysis*. In particular, there are three points to be fixed in the examination of the phenomenon of interactivity. First of all, the *relational structure* of the work, to be understood more clearly as a system that is constituted and develops in the interaction with a user. The work thus becomes a field of relations between elements, individuals, and events, both real and virtual. The individual parts of the system, i.e., the artist, the viewer, and the work, have no value outside the organized totality to which they give rise, but only in relation to each other. Secondly, far from having a stable and regular structure, the relational fabric that makes up the system presents an intrinsic dynamism. It takes the form of a constantly evolving *event*, produced by the elements that occasionally are received by the technical system or that emerge unplanned. A third point is the fact that this dynamic process

is *not entirely predictable* in its development, let alone its outcome.

2. INDIVIDUATION AND INTERACTIVITY

The relevant place where the above concepts find an effective synthesis is Gilbert Simondon's philosophy⁵. In short, it is characterized by an understanding of reality as *process* and *relation*. From his perspective, everything that exists must be interpreted as something that occurs and this occurrence is in turn determined as an inexhaustible process of interaction. «Realism of relations» is the expression used in his doctoral thesis entitled *Individuation in Light of Notions of Form and Information*, where Simondon specifies that by «relation» one is not referring to «an *accident* relative to a substance but a *constitutive, energetic and structural condition that is extended in the existence of constituted beings*» (Simondon [2020]: 75-76). It is a question of rethinking the relationship between *relations* and *individuals*: whereas in the classical paradigm of ontology individuals with their properties are put before the relations that derive from them, the approach proposed by Simondon gives relations the possibility of establishing individuals themselves. In other words, there is no autonomous and self-sufficient substance capable of undergoing changes or establishing accidental relations with other individuals. Rather, the processes of relation underpin it and bring it into being.

What arguably makes this speculative framework applicable to the study of the *aesthetic-artistic experience based on interaction* is the fact that the concepts developed by Simondon make use of his research in the field of *technique*⁶. It is pre-

⁵ On Simondon's *theory of individuation*, see the monographs by J-H Barthélémy [2005; 2014].

⁶ Reflection under the profile of *aesthetics* has long since begun to reckon with Simondon's thought, especially developing his analyses of the mode of existence of the products of technology, the focus of his complementary doctoral thesis. Exemplary in this sense is the resumption made by Pietro Montani [2007; 2014]. For a con-

cisely this that accounts for the originality of the French thinker in the context of twentieth-century philosophy. Far from any Heideggerian suggestion, Simondon relinquished the well-known interpretation of technology as a means subordinate to knowledge or as an instrument of action, opting to study it, rather, as an original form of human participation in the world as well as a fundamental dimension of collective existence. From this point of view, technical reality deserves to find a place within culture and even to be integrated into philosophy, thus becoming a fertile *seed of thought*. It must be made clear, however, that this approach does not lead to a simplistic *philosophy of technology*. Here, a genitive circumscribes a scholastic knowledge that renounces, in the name of the analysis of a specific set of entities, its ambition of universality and its reflective spirit. On the contrary, as stated in a text written with the aim of creating a research group on cybernetics:

Philosophy is not a domain of thought separated by borders from other neighbouring domains, with which it coexists in harmony or in contrast. [...] The philosophical programme entails as its only obligation the opening up of the reflexive system: it is thus a welcoming function thanks to which the domains that human existence discovers to be affected by a problematic character are recognised, made to emerge and subjected to the test of thought. (Simondon [2016]: 35-36)

The opening up of the reflexive system allows technique to be understood in terms of its own conceptual apparatus along with its ontological implications. Consequently, what has mostly been expelled from reflection, being considered in a prejudicial way as a simple servant devoid of problems, interiority, and autonomy, now reappears equipped with a philosophical character. This obliges philosophy to modify its basic notions and to redefine itself using what technology teaches it. Indicative of this approach is the fact that

cise account of the applications of Simondon's thought in the field of aesthetics, see article of V. Bontemps [2018]: 37-59.

Simondon finds in *information theory* «a notion that would be valid for thinking individuation in physical nature as well as in living nature and, afterwards, for defining the internal differentiation of the living being that extends its individuation by separating vital functions into physiological and psychical functions» (Simondon [2020]: 244). The notion of information has the merit of highlighting the dynamic character of form, overcoming both the *hylomorphic dualism* of a substantial form applied to an external matter and the tendency towards stability and degradation of the potentialities studied in *Gestaltpsychologie*. Here, on the contrary, individuation is understood as *energy modulation*.

As a next step, an examination of the sequence of arguments is needed through which Simondon justifies the recourse to informational categories for the analysis of individuation⁷. In practice, his strategy comprises the separation of the notion of information from its original technological context, where it is conceived as the transmission of a message between two distinct poles – the *sender* and the *receiver* – on the basis of a pre-established code. Consequently, it becomes *genesis* or the *taking of form*. This, in turn, takes place when heterogeneous and incompatible orders of magnitude enter into communication with each other. Information occurs when «that which emits signals and that which receives them form a system. Information is between two halves of a system in a relation of disparation. This information does not necessarily pass through signals [...]; but it can pass through signals, which allows for realities distant from one another to form a system» (Simondon [2020]: 393).

In the above passage, we can observe the attempt to attribute a *constitutive value* to *relation*. More precisely, it is a question of removing the relation from the static order of predication, which presupposes the existence of already constituted individuals, and of assigning it an *ontogenetic function*. To do this, Simondon hypothesizes

⁷ For a detailed reconstruction of the reform of the concept of *information*, see Bardin [2015]: 21-35.

a sphere in which neither individuals nor relations yet subsist in a fixed form. *Pre-individual* is the term that qualifies this sort of degree zero of being, from whose womb individuation springs in an interminable process of correlations. Using the conceptual apparatus of thermodynamics, Simondon defines the pre-individual state of being as *metastable*. As is well known in thermodynamics, an equilibrium of relative stability is referred to as metastable, where a system remains so until it is supplied with a sufficient quantity of energy capable of breaking its initial conditions. Similar to a system in metastable equilibrium, the pre-individual is populated by potentialities and dynamic forces in tension with each other; it possesses a reserve of energy that guarantees becoming, but at the same time requires an efficient cause to generate transformations: «the original being is not stable, it is metastable; it is not one, it is capable of expansion starting from itself; the being does not subsist relative to itself; it is constrained, tensed, superposed on itself, and not one. The being is not reduced to what it is; in itself, it is accumulated, potentialized» (Simondon [2020]: 369). Within the pre-individual being, energy potentials are distributed asymmetrically, characterized as they are by an original duality of orders of magnitude and an initial absence of interactive communication.

With respect to this *potentialized incompatibility*, information is that which initiates a mediation between the disparate orders of magnitude, resolving the pre-individual heterogeneity and creating a system that integrates what was initially incompatible: «The polarizing singularity initiates in the amorphous milieu a cumulative structuration that spans the initially separated orders of magnitude: the singularity, or information, is that in which there is communication between orders of magnitude; as the initiator of the individual, it is conserved in the latter» (Simondon [2020]: 94). This is the essence of the aforementioned *realism of relations*. In extending by analogy the informational categories to the study of individuation, Simondon shifts the focus from a purely statistical analysis (aimed at calculating the possibilities of reproducing in a given point a message formu-

lated in another point) to the consideration of the interaction between the signals produced by the sender and the receiver. The latter, unlike what happens in the technical model, does not exist in isolation as a pole waiting to receive signals regulated by a code from a sender. Rather, it is a sphere in metastable equilibrium, which is structured when information puts the forces in tension within it into communication, actualising their potential and thus initiating a real change of state. Hence, individuation lies in the passage from an initial incompatibility to the progressive creation of relations and compossibility between terms, which only by connecting in a state of interaction achieve their individuality.

Following this description of Simondon's theory of individuation, some clarification is helpful before addressing this model in the analysis of *interactive aesthetic experience*. Firstly, the interactive dynamic that Simondon places at the origin of individuation corresponds to a form of causality that is completely foreign to deterministic mechanism. In order to be received by a system in a metastable state and trigger a process of interaction within it, the incoming signals must be *compatible*; at the same time, «the state of entelechy is not fully predetermined in the bundle of virtualities that precede it and preform it» (Simondon [2020]: 258). It should also be emphasized that the tensions that populate the pre-individual being are not completely exhausted in the emergence of the individual, but remain in it as a «charge of undetermined, i.e. of pre-individual reality that has passed through the operation of individuation without being effectively individuated» (Simondon [2020]: 352). The expressions used by Simondon are significant in this regard: «critical», of «relative indeterminacy of the result», «of highest uncertainty» describe the instant in which singularities that function as information encounter a system charged with potential energies (Simondon [2020]: 258)⁸. This charge constitutes a residual potentiality, i.e., an energy reserve responsible for constantly

⁸ On the relationship between *chance* and *determinism* in individuation processes, see Morizot [2016].

nourishing the development and transformations of the individual through the exchanges it has with the environment. As a result, the individual is, prior to establishing relations with other individuals, in himself the «theatre and agent of an interactive communication» (Simondon [2020]: 50).

3. ART AND INDIVIDUATION

Simondon's indisputable merit is in having rethought the traditional theme of individuality in an innovative way, refuting the ontological primacy of the category of substance in favour of a theory of *relations*. Here are the principal steps of his argument: far from being a term constituted in itself, the individual is identified, rather, as a provisional result, as a moment of arrest of a permanent process of individuation. This, in turn, is nothing more than an *interactive communication* between different orders of magnitude of the same system in a state of metastable equilibrium or between different metastable systems. Thus, what originally constitutes an inessential category and a non-defining predication of an autonomous substance now becomes that which sets the conditions and mode of existence of individualities. Instead of succeeding the terms it links, it is itself the operation through which the individual terms, entities, or subjects take shape.

Now, following Simondon in his theory of individuation makes it arguably conceivable to achieve a precise understanding of the phenomenon of *interactivity* at the *aesthetic* level as well. It goes without saying that we do not intend to superimpose Simondon's concepts on the main components of interactive aesthetic experience, arbitrarily transporting a thought operation from one sphere of reality to another, but rather to investigate their *heuristic value*. This working hypothesis is based rather on a method that Simondon himself defines as «analogical», i.e., a thought that detects *identities of relations* and not relations of identities, specifying that these identities of relations concern identities of *operative relations* and not identities of structural rela-

tions. It is therefore by overcoming theoretical and structural rigidities, replacing them in turn with processual equivalences, that it becomes possible to describe interactive *aesthetic experience* in terms of *individuation*.

The aesthetic-artistic sphere is an experiential horizon in which the meaning of experience itself, which emerges in the encounter between the user and the work, takes place. The work of art, indeed, does not impose itself self-referentially as a mere spectacle offered to an inert contemplation, but requires rather a receptive attitude which, called into question by the work, enters into intimacy with it, understanding its language and penetrating its expressiveness. Therefore, neither subject nor object is at the basis of aesthetic experience, but rather the *chord* between subject and object; not a term, but a relationship, necessary and always presupposed, outside of which the individual terms are devoid of meaning. It is therefore by virtue of its constitutive interactivity that it is possible to speak of aesthetic experience in terms of *individuation*, conceiving it, more precisely, as the privileged place of individuation of meaning. The user and the work, existing only within the mediation that unites them, represent, to say it again with Dufrenne, «the conditions of the advent of a sense, the instruments of a *Logos*» (Dufrenne [2000]: 16).

Now, this general scheme acquires an operational character in the field of those computer environments such as interactive installations, whose dynamic structure is nothing more than the product of a relationship. Roberto Diodato notes that such artistic operations exist only «as the encounter between digital writing and bodies that are sensitive to it, hence as constitutive interactivity. This allows to conceive of the relation (i.e. the encounter) as in itself capable of constituting entities – independently of specific relation properties – hence to develop a – until now mostly uncharted – ontology of relations, as acknowledging an addition to the world's furnishings» (Diodato [2021]: 62). In such a configuration of aesthetic experience, relation becomes the main category, assuming a value of being: on closer inspection, in

fact, it is not a question of a relation *between* individuals, or between substantial terms (however dynamic and internally enhanced), but of a relation that *individuates*.

From a technical point of view, the interactive work of art is based on the exchange of information and energy between the users and a computer system made sensitive to human intervention and to signals coming from the environment in which it is located. The user communicates with it through peripherals and sensors and this exchange is made possible by time-sharing programs, thanks to which interaction with the central processing unit of the system can take place in real time. The work thus acts as a mediator of a relationship that it establishes, integrating the intervention of users or environmental signals within its own energy regions, putting into communication different orders of magnitude and scales of reality, which only in it and through it are organized to form a system. Let us reconsider in this perspective the case studies examined at the beginning. The technical system receives input from atmospheric phenomena and puts them into communication with the intervention of the public, according to a process programmed to be very flexible, so that the images projected on the screen are not predetermined but evolve in an ever new and different way depending on the interaction between the tree, the surrounding environment, and the users. At least two types of individuation can be grasped in it which are firmly intertwined: that of the plant organism – which achieves within itself a mediation between an environmental order (composed of soil and atmosphere) and a molecular one – and that of the technical system – which amplifies this identification and puts it in communication with the users and the surrounding public space. At the same time, in integrating the ecological process with the technical one, the artwork functions as «theatre» and as an «agent» of ever new individuations, encounters, and interactions, thus opening the horizon of a *possible* way of life, more conscious and respectful towards the environment.

Communication, structural becoming, metastability, and selectivity of the technical system

are all characteristics that allow us to think of the aesthetic-artistic experience in terms of individuation and to bestow on *interactivity* the role of *individuating principle*. Let us consider now the last aspect, *unpredictability*. This character represents a fundamental requirement for both the creation and the fruition of the interactive work. The relative unpredictability of the technical system is, in fact, the factor that makes it possible to distinguish a form of interactivity that is superficial, in which the evolution of the work is determined in advance and the intervention of the user is limited to selecting a series of pre-established options, from a more sophisticated form which instead renders the work incomplete, always awaiting the intervention and constructive collaboration of the spectator. We have seen with Simondon that the interactive communication at work in the processes of individuation is subject to a *margin of indeterminacy* which simultaneously subtracts it from necessity and makes its outcome unpredictable. With this expression, he defines the becoming connected to individuation as an intermediate operation between *determinism* and *indeterminism*. In a fully determined system, there is no exchange between structure and energy; it remains identical to its initial state and cannot serve as a theatre for further individuation. In other words, it is a system with no potentialities and no internal resonance, i.e., no exchange between the orders of magnitude that constitute it, and therefore incapable of individuation. On the contrary, an indeterminate system has such a high internal resonance that changes occurring at one level extend to all the others, each time triggering a structural change that deprives the system of any form of identity or unity. Determinism and indeterminism, however, are only abstractions or opposing cases. The becoming of a system is instead given by the way in which it modifies its structure over the course of time. This is possible when the system possesses a relative identity and coherence in relation to itself and if its structure is in metastable equilibrium: only in this case, Simondon argues, «the system can *diverge*, i.e. it can receive information» (Simondon [2020]: 389).

Is it possible to find a similar margin of indeterminacy in the interactive communication at work in digital environments? The problem is far from being fully developed and indeed requires a study that combines conceptual analysis with a comparison that is always open to contributions from new technologies. According to Diodato, «the philosophical word referring to said unpredictability is contingency: interactivity is given if the environment is contingent, and conversely the environment is contingent if interactivity is actually given», where, taking up the Scotist meaning, contingent is said to be «an entity or event which in the very moment it is could also not be» (Diodato [2021]: 67). With this assumption, it is not currently possible to attribute an effective contingency to those interactive systems produced by the most recent experiments. The evolutionary behaviour of the system is not only conditioned by the perturbing agents but also and above all by its internal organization, i.e., by the way in which the computer programme occasionally selects, registers, and processes user interventions or the environmental signals. Although the influence of the user interactions on the technical system is not entirely predictable, its internal principles of evolution and variation are in any case governed by an algorithmic component that defines the rules according to which the inputs are processed and transformed into outputs. Once established, this component is not subject to change; it is rather the stimuli that vary over the course of time, which, as we have seen, can be of a different nature as well as undergoing potentially infinite combinations. In this way, each interaction does no more than actualize a *possible future* of the system, which, although bringing novelties that cannot be completely calculated or foreseen, is nevertheless within the range of performances allowed by the system itself. This still partial and relative unpredictability, that is this margin of chance at work in interactive systems, is nevertheless a question that still needs to be explored. This is in fact the primary objective of interactive digital art, which is increasingly aimed at fostering interaction between the user and the computer environment – not only in real time, but also capa-

ble of modifying the initial state of the technical system in a non-premeditated way. It is not, however, a question of achieving a simple technological prodigy, designed to simulate a living thing by means of technical individuation, but of the necessary condition for the increase of the *relation's* institutive power.

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