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ART CREATIVITY VERSUS COMPUTER MODELS

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ABSTRACT

The present paper focuses on the relationship between art, as a creative activity, and computer technology, especially software techniques. Computers and computer software offer tools and means to help artists create, build, represent, duplicate, distribute or broadcast created objects. But there may be functions of computer software which so far have not been considered: will software be able to help to the understanding of art creativity, in the form of computer models of the process of creation? Such a perspective raises important questions regarding for example the compatibility between the alleged strict automaticity of software and the received idea of spontaneous character of creation.

KEYWORDS

Computer Science; Software Modelling; Artistic Creation.

RESUMO

Este artigo aborda a relação entre a arte, como actividade criativa, e a tecnologia informática, em particular no âmbito do software. Os computadores e o software oferecem ferramentas que procuram auxiliar os artistas a criar, construir, representar, duplicar, distribuir ou transmitir os objectos criados. Mas há funções do software que podem não ter sido ainda consideradas: será o software capaz de apoiar o entendimento da criatividade em arte, sob a forma de modelos do processo de criação? Esta perspectiva levanta questões importantes, nomeadamente no respeitante à compatibilidade entre o alegado e estrito carácter automatizado do software e a ideia adquirida do carácter espontâneo da criação.

PALAVRAS-CHAVE

Computer Science; *Software* de Modelação; Criação artística.

INTRODUCTION

The present paper focuses on the relationship between art, as a creative activity, and computer technology, especially software techniques. Computers and computer software offer tools and means to help artists create, build, represent, duplicate, distribute or broadcast created objects. But there may be functions of computer software which so far have not been considered: will software be able to help to the understanding of art creativity, in the form of computer models of the process of creation? Such a perspective raises important questions regarding for example the compatibility between the alleged strict automaticity of software and the received idea of spontaneous character of creation.

We will first propose a view of what are computer models, and their main features i. e. their binary basis and their algorithmic fundamental constitution, and will show that these features may not be incompatible with the objective of building computer models of creative action, if we are able to satisfy an essential condition: insert discontinuities between algorithms.

In order to discuss the problems of artistic creation, we will refer to the work of the philosopher Ernst Cassirer for an investigation on the relationship of art versus technique, two domains which, although apparently so distant, offer possible ways of encounters. Another philosopher, Raymond Abellio, has proposed a method that he claimed as universal, for a structural and "genetic" understanding of any situation or activity: this approach has been applied to the comprehension of creative processes by projecting them on several axes or couples of opposites like motivation versus inspiration, individual mind versus non individual virtual environment. We will show that the Abellio model, being a genetic (contrary to static) one, may encompass the differences of the two domains. But we will notice that the Abellio model, although very relevant in the description of dynamic (genetic) situations, takes only implicitly into account the discontinuous leaps which are the core of any creative activity. Therefore, we will have to search which scientific and technical recent developments allow for theoretical and practical solutions to that discrepancy between computer software models and the discontinuous feature of art creativity

THE CONCEPT OF MODEL IN THE ERA OF COMPUTER SOFTWARE.

The various meanings of the word *model* started from the idea of *imitation of nature* to reach the status of *representation* of a situation or material activity through abstract and/or virtual means more easily dealt with. The later sense is now widely adopted and still in progress. Let us cite as older examples, which retained some of the character of imitation, the low scale models of planes in a wind tunnel or the flight simulator for the training of pilots. Computer models are several steps ahead in terms of virtuality and will more and more be integrated in physical (and even biological and mental) systems. They can for example, describe water natural resources over a geographical era, and forecast their availability according to hypotheses of climate and demand. They also may forecast mass behavior in special situations (stock exchange, physical environment, etc). More sophisticated models are built up to drive factories in "real time", and will soon pilot vehicles.

Beyond its capacity to treat large amounts of data (big data) computer models have two characteristics which closely concern the subject of their possible use to represent art creativity:

• The computer model is based on the *binary* (digital) representation of any real of virtual data. But we should not infer that that means a reduction to a kind of yes-no simplistic vision of the world: on the contrary, it allows for extreme fine grain representations of reality, limited only by our physical capacities and tools. This is exemplified by computer imaging and digital sound.

• Any computer model is based upon *algorithms*, i. e. virtual processes of step by step operations from a beginning to an end via a finite number of steps. We should not infer that a model will always be a robot or an automatism. A computer model is indeed based upon algorithms, but it has not to be reduced to an algorithm. This is an essential point for any project of modelizing creativity: a relevant software model should encompass various algorithms, combine them, and/or let them be triggered by external or internal events, be such events random, non conscious or stemming from the will of a subject. And let us remark that computer software can modify and enhance themselves (artificial intelligence). In all cases, encompassing several algorithms implies that the model will be capable of jumping from one algorithm to another - otherwise the whole model would be made of only one algorithm, which would reduce it to a robot. As we will here emphasize below, such discontinuous leaps are a mark of any creative action.

ART AND TECHNIQUE, ART AND COMPUTER SOFTWARE

The "neo-kantian" philosopher Ernst Cassirer (1874-1945) dedicated a major part of his work to art, artistic expression, forms and symbols, and beyond that to the relationship of art with other kinds of what he designed as "spiritual" (or cultural) human activities, like Science and Technique. We refer here to a set of Cassirer's writings which have been collected and translated in French by several authors and edited by Pr.

Fabien Capeillères under the title "Cassirer, Écrits sur l'Art» [CAPEILLÈRES, 1995], especially to the text « Form et Technique », which is part of Cassirer's book *Kunst und Technik* [CASSIRER, 1930].

In these works, Cassirer, deeply going into a philosophical investigation of technique as a form of human activity, emphasizes the fact that technique should not be considered as an "applied science of nature" [CAPEILLÈRES, 1995:66] but that it is autonomous as a "form of the technical acting", and therefore must be seen on a genetic perspective rather than on a static one, through its processes rather than by its results. According to Cassirer, technique has a specific meaning which he called a "spiritual[1] trend». What matters here is the *technical* behavior, where desire and power of will play a prominent role. But technical behavior, as such, must confront a world of objects, and it has to be aware of the configuration of that world and get a knowledge of it.

The modern tools of technique take a growing distance from imitation of nature and invent their own ways: this obviously is the case of computer tools and models. Those tools direct themselves toward the world of possible occurrences. They are concerned not only by what is but more and more by *what may be.*

Here we are at a turning point of Cassirer's thinking about the relationship between technique and art, when he writes "the center of gravity of the technical form is apparently shifting more and more from the theoretical domain toward that of art and artistic creation" [CAPEILLÈRES, 1995:94; *our translation from the French text)*. Like art, technique is a *poiesis,* i. e. a process of doing and making. Like art, technique orients itself toward a future, it obeys a law of anticipation.

Cassirer confirms our attempt toward a confrontation of art and technique by emphasizing their common features, however we should not forget their differences, and tend to an impossible synthesis of these two domains of activity. Those differences are visible, according to Cassirer, in their different way of operating. The life contents of artistic creation always aim at creating sense and meaning, at what Cassirer call an expression which is always intertwining a global (or total) - i. e. non individual - spirituality with an individual soul. On the contrary, technical creation always aim at a separation of the creator with the objects created by his technical craft.

If we intend to bring closer computer models and art creation, we will have to be prepared to a sort of *chiasma*, of crossing of two roads. The structural approach of the French philosopher Raymond Abellio will help us in that endeavor.

THE GENETIC STRUCTURE OF CREATIVE ACTIVITY

Raymond Abellio (1907-1986) developed a new approach for the understanding of any evolutive situation through a dynamic ("genetic" in Abellio's terms) structure, in his book *La structure absolue, Essai de phénoménologie génétique* [ABELLIO 1965]. This methods starts by representing the situation by four "poles" organized in 2 axis, each one opposing two of these poles which are antithetic but complementary. The dynamics of these poles yield resulting effects which are represented on another axis perpendicular to the first two ones. The global representation of that genetic structure is a sphere with four poles in the equatorial plane and two more in the vertical axis. This structure that Abellio calls "absolute", and that we prefer to define as "universal", is exemplified by Abellio, in his writings, on various situations, both individual (experiences of his life) and non-individual (in history, society and geopolitics). We have presented an epistemological and methodological study in a communication to the *Rencontres Raymond Abellio* [VERNEY, 2011]. José Guilherme Abreu has given, in several sessions of that seminar, comprehensive and detailed presentations of applications of the Abellio structure to situations in the domain of public art, particularly in "Structure Absolue et Recherche Transdisciplinaire en Histoire de l'Art". [Abreu 2010].

[1] In Cassirer's words, « spiritual » refers to profound aspects and activities of human mind, and especially to cultural domains. The word « spiritual » should be understood in a philosophical point of view, no religious connotation being asserted (neither negated for that matter).

Before attempting to apply that method to the problem of art creation, let us give a few words of introduction.

Raymond Abellio said that the adjective « absolute » by which he qualified his approach was a kind of provocative statement against the relativistic attitude of most structuralist scientists at the time he wrote his book. For him the "absolute structure" is the prototype of any structure, of any method. However, such an "absolutist" approach which appears a little more than provocative in his writings, raises epistemological questions that are not yet entirely clarified. For this reason, we call that structure "universal" as an indication that it might be applied in any domain, but relatively to such a domain. Since the Abellio's thought approach is global and "genetic" it lends itself to several interpretations. Some of them are spiritual and even theological, as denotes the title of the last party of La structure absolue, some others more methodological. Ours may be qualified of epistemological as we target an understanding of our understanding, which is the reason of our interest in creative activity, and practical in so far as we tend to apply it in a field like computer software.

On Figure 1, a simplified representation of the Abellio structural model as a sphere, where the horizontal "equatorial" plane contains the four opposite poles, and the vertical axis contains the outcomes of the creative cycle and the actions from the environments.

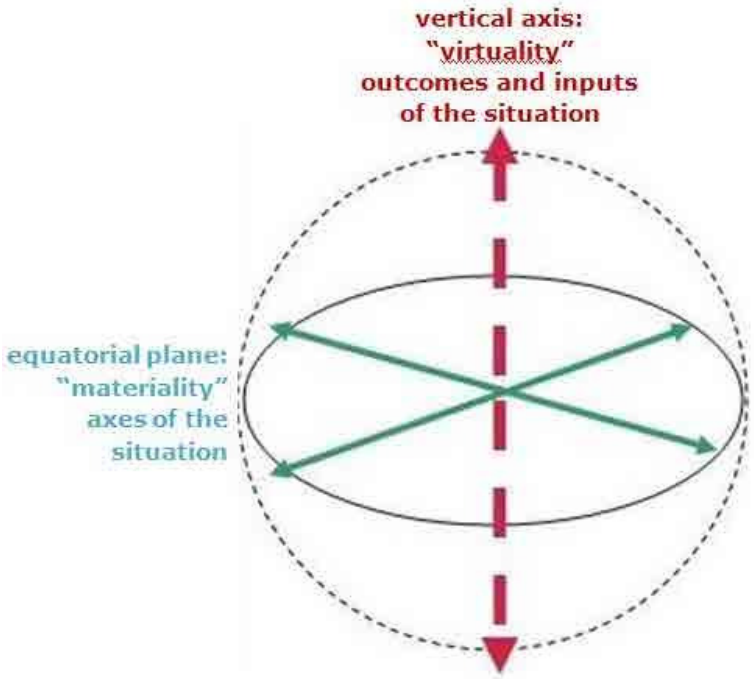

Figure 1 - The model of a universal structure (from Raymond Abellio).

The first part of the structure operation consists in finding the key features - called "poles" in Abellio's writings - of the situation currently studied. They should be distributed on the two perpendicular axes, as opposites on each axis. Several systems of poles may be relevant, depending upon the perspective adopted. In our model of creative activity, let us choose the artist and his work in progress. Any of the four poles may be considered as initially active: we will choose the artist as the initial active one. The artist is actively directed toward the work to be created, which is, at that step of the cycle, an internal image or vision (Fig. 2, phase 1). The that image "turns itself" to the material domain by and through which the work has to be builk up: for example the marble, or the wood for a sculptor, a set of devices for a plastician artist, and so on.

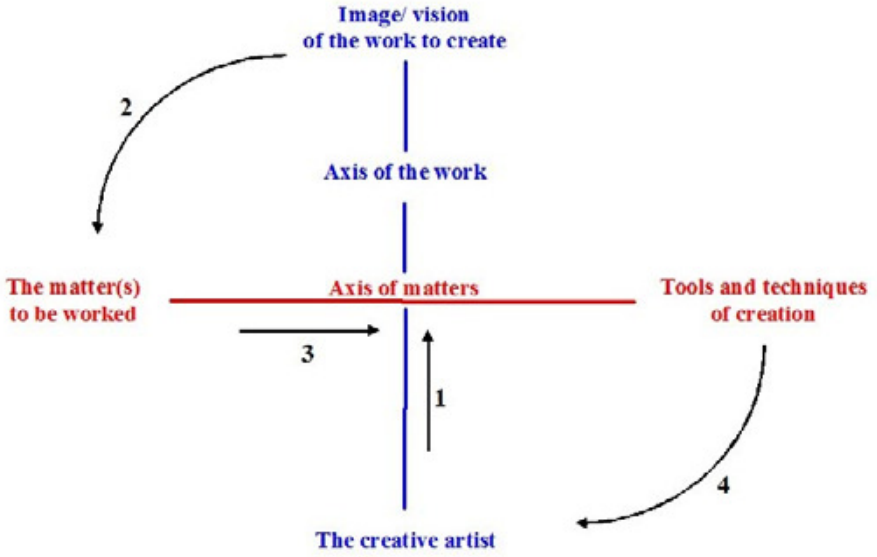

Figure 2 - The dynamics of creative work.

Abellio uses the phrase "turns itself" to emphasize the fact that the work in the creative process acquires an autonomy, a proper momentum toward its realization, momentum which may be considered as issuing from the author's desire or will, at least at first sight. The idea of *rotation* present in that expression and in the geometric configuration of figures 1, 2 and 3, is the first outline of a fundamental operation of any creative (or intuitive) process: a discontinuous leap occurring between two relative levels of reality, one more virtual, the other more concrete. Abellio had an acute sense of the nature of such an operation which is at the core of our research work.

In the third phase (Figure 2) of the creative cycle, the matter to be worked on asks the artist to use tools and techniques to process the creation. Then in phase 4, those tools are taken back by the artist to modify, and hopefully enhance, the image of future creation. Abellio remarks that any one of the four poles of the structure may be considered as initially active or non active, generating various cycles of different issues. This how the Abellio's universal structure can be applied as an heuristic approach to lived situations.

José Guilherme Abreu has developed a complete and illustrated application of that structure to the cycle of artistic creation, in a contribution to the 2015 session of *Rencontres Raymond Abellio*, entitled « La Connaissance comme l'un des Beaux-Arts : la suite Vision-Action-Art chez Abellio ». Abreu shows that the series of paintings *Pygmalion and Galatéa* (1875-1878), by English artist Edward Burne-Jones, is a visually symbolic embodiment of the cycle of creative processes, which starts from a Vision to reach Art through Action.

Like Abreu shows on the Burne-Jones' series, the creative cycle is not limited to the dialectics of four opposite-complementary poles: it has outcomes emerging from that dialectics. Therefore, the schema of Abellio's method includes a "vertical" dimension which bears a upward pointing arrow symbolizing the emergence of a sense, or meaning outcome (qualified in Abellio's thought and most probably also in Cassirer's thinking, as "spiritual"), and correlatively a downward arrow, sign of an "immergence" of new tools and techniques, and new material forms. Fig. 6 in José Guilherme Abreu's text, figuring the Burne-Jones' painting entitled *The soul attains*, clearly illustrates the upward and downward movement that we represent in a more abstract form in our Figure 3.

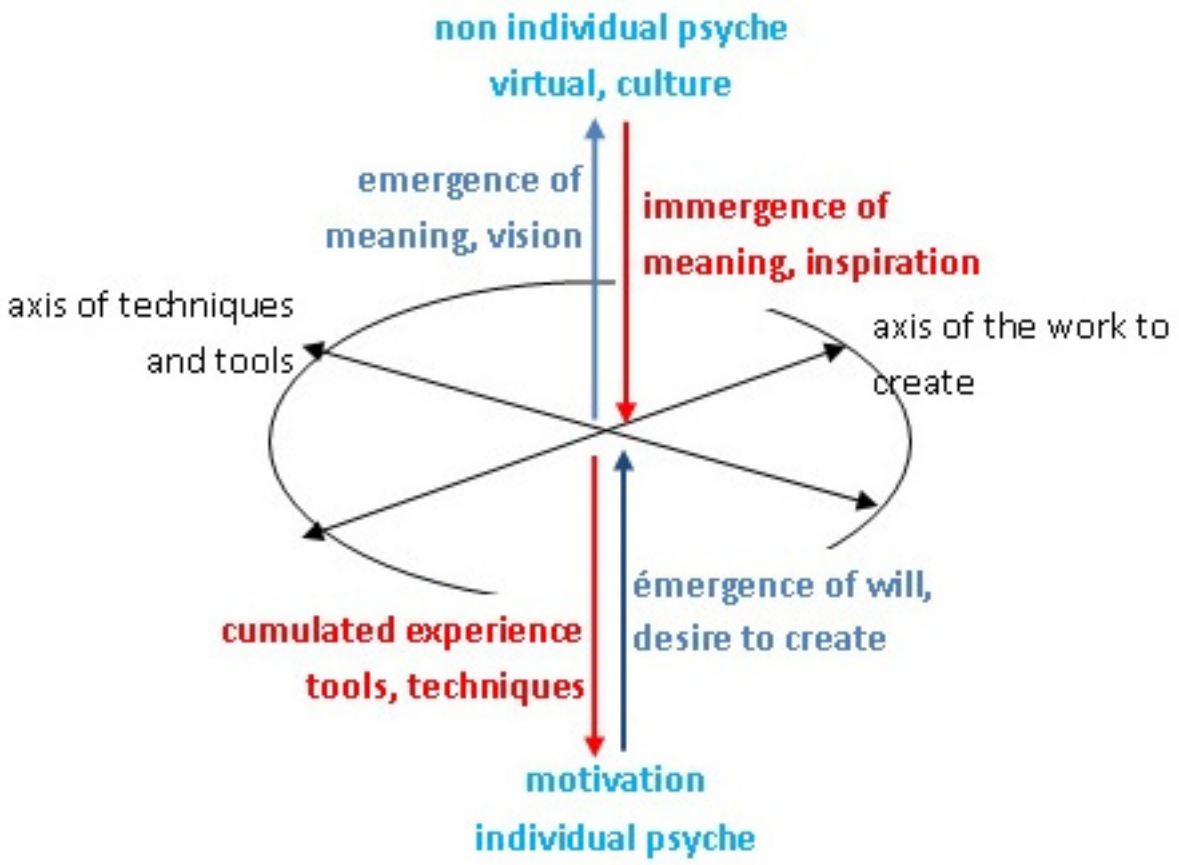

Figure 3 - Emergence of sense and « immergence » of tools in the creative cycle.

Note: the word "immergence" is the transcription of a rarely used French word which describes the operation of embodiment more accurately than the word "immersion".

CONTINUOUS PROCESSES VERSUS DISCONTINUOUS LEAPS IN THE CREATIVE ACTIVITY

Any creative activity implies moments of discontinuity, of leap into the unknown, moments with no measurable duration, when the actor of creation does not sustain any more a continuous progression but is forced to create something new, to leap into the unknown. Such a moment is when a sculptor's chisel skids from its usual experienced moves and suddenly gives the marble block a really new form or when the music composer introduces in his partition an alteration (sharp or flat) which slightly but completely changes the mood of the tune.

The creative action therefore is a string or concatenation of continuous phases (that we call processes) that are the algorithms of a computer model, and *discontinuities* or leaps which so far has rarely been taken into account in computer models. We are aware that the terms "string" or "concatenation" do not really translate the sudden, abrupt, disturbing and generally unforeseeable character of any discontinuity. Even if the creator's experience of his craft, his sensations in the course of his work, may make him more sensitive, he next leap is generally surprising. And the environment - material, cultural, virtual - may at any moment upset the whole process, bearing failure or success as well.

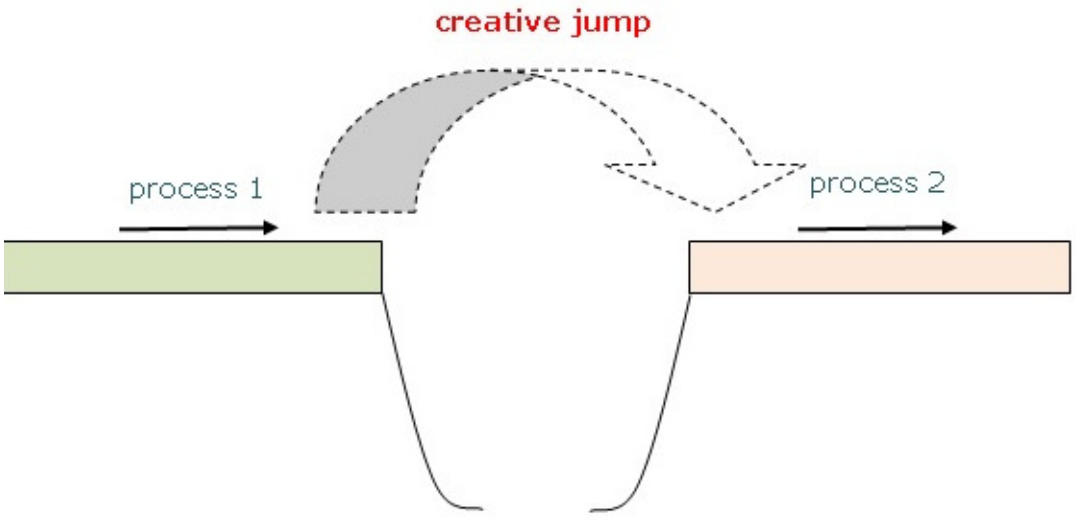

Figure 4 - Creation is an athletic course over obstacles and gaps.

Discontinuous leaps are at the core of any creative activity. Do they invalidate the genetic model inspired by Abellio? Some authors considered the discontinuity as a blind spot in Abellio's thinking, like the philosopher Carlos H. do C. Silva in his contributions to the 2010 and 2014 sessions of the *Rencontres Raymond Abellio* [SILVA 2010], [SILVA 2014]]: Carlos Silva calls a discontinuity a "schism", emphasizing the idea that separation and rupture is intrinsic to life, and should be an essential feature of the universal Abellio's if it achieve the status of a genetic model.

We should however investigate this alleged blind spot, since the unifying and totalizing goal of Abellio's thinking may mask the underlying and intrinsic discontinuities present in the universal structure.

Such discontinuities are implied in the rotations of the equatorial plane (Figure 2, phases 2 and 4), since those operations perform in fact leaps from a mental image of the creation to the material level of tools, or inversely from the handling of tools to a new creative spring, that is in both cases a radical change of the psyche attitude of the artist.

Discontinuity is also present in the vertical axis of the structure: in Figure 3, the arrows "emergence" activate the motivation of the artist toward creation and the arrows "immergence" represent the inspiration of the artist, if he is receptive to the nurture proposed by the environment. Here is confirmed the fundamental character of "acting toward possible outcomes", that Cassirer and other thinkers have assigned to art creation.

IS THE DISCONTINUOUS LEAP COMPATIBLE WITH COMPUTER MODELS?

If any discontinuity is by nature unforeseeable - at least by the subject of creative activity - this excludes its presence in the course of an algorithm, which is a continuous process. A step is indeed a kind of leap, a small leap, but a leap is more than a step, with a greater risk involved.

Let us however notice that in the course of an algorithm, the passage from any step to the following is governed by rules of mathematical logics which guarantee that the algorithm is "well formed". Moreover, the computer technique (called "compilation") guarantees the possibility of a step by step executable program. But this technique does not a priori exclude occurrences of bugs or external data which may block the algorithm, or induces it in an "infinite loop" which actually can only be interrupted from outside of the program. Such events are of course also manifestations of life through lethal discontinuities.

Is there ways and method to insert discontinuities in computer models? Modern researches on that large domain suggest that it is possible to develop such approaches.

On the theoretic plane, the French mathematician and philosopher René Thom (1923-2002), creator of the *catastrophe theory*, devoted a large part of his work on how discontinuities may be generated from continuous spaces, and built up a sort of catalogue of mathematical discontinuities in the context of general theory of *morphogenesis* i.e. genesis of forms (THOM, 1972), (THOM 1974). These works have been continued by other scientists like Eric Christopher Zeeman.

In the large field of computer science the problem of discontinuity has necessarily been investigated since the beginnings of this science, sometimes leaning on older mathematical work, but generally oriented by the technical needs. This problem is a key to image and pattern recognition, since discontinuities (of colour or other visual features) are the borders of forms, and such investigations have been developed in artificial intelligence.

In a pretty different perspective, issuing from mathematical physics and quantum theory, a theory and technique of *quantum computing* has been developed, with the goal of building new type of computers which could solve problems with intrinsic discontinuities, similar to those that physicists study in al domains of the infinitely small. See, on a software point of view, *Quantum computing* by Eleanor Rieffel and Wolfgang Polak [RIEFFEL, 2011].

Those research works let us consider the possibility of computer modeling of the creative processes containing discontinuities. The following list is only suggestive and not exhaustive.

• Apply morphogenetic theories to the question of discontinuities in artistic creation, knowing that those discontinuities have specific features: they occur *in the course of time*, and they concern different levels of reality and human awareness, between the mental (or psyche) level and the physical world. Forms should not be considered only as objective imitations of nature, but also and essentially as part of the "life of spirit", according to Cassirer's expression.

• Continue artificial intelligence research with the goal of taking into account different levels of reality, mainly the level *forms* and that of *meaning*, which we may temporarily call *virtual.*

• Investigate the question of quantum computing with the aim of finding out discontinuity operators and their probabilities of occurrences according to the initial and present environments of the creative cycle.

• Another and correlated perspective of research would be that artists might participate in testing experimentally models of creation. This would not mean that artists should enter a robotic process but, that they might benefit from some kind of "flight simulators".

CONCLUSION

The present paper has shown that computer models are not incompatible with artistic creativity, based upon philosophical investigations and modern scientific and technical research. We are aware that such an approach raises unavoidable questions. Here are some of them:

What is the general benefit of such research?
What will be the benefits for the creators?
Are there risks of such research?

For the time being, we have obviously no complete answers to these questions, but let us remarks that, in a research in progress, some perspective are still blurred as uncertain. But the general benefit is likely to enhance the knowledge, and, in our opinion, to prepare a change of paradigm, that is a science capable of taking into account, on more relevant ways, psyche and the virtual worlds. Such change of paradigm may

certainly involve risks, but they might be somewhat minimized by the very rebellious and unruly character of any creation.

Regarding the benefits that artists might get from such research, this question could only be answered by exchanges with the artists themselves, in various types of creative activity.

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