Digital Objects' Aesthetic Features. Virtuality and Fluid Materiality in the Aesthetic Education

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Abstract. The growing and ubiquitous presence of digital objects raises issues of interest from the points of view of both Aesthetics and interaction design. In fact, such issues concern the perceptual dimension that defines our relationship with digital objects, the reconfiguration of the sensitive experience that their development implies, their hybrid ontological status, and their possible role in developing innovative forms of aesthetic education combined with design thinking.

In the contemporary debate, digital objects are intended – on the one hand – as designed objects that incorporate and employ digital technologies [1–3].

On the other hand, they are interpreted as virtual bodies, interactive digital images that become a phenomenon of the binary representation of an algorithm which interacts with a user [4]. Within the former perspectives, digital objects display a quality that broadly belongs to technical devices, meaning their openness to forms of interactivity, and their sensitivity to contingency. In the latter, the features of intermediacy and virtuality are considered the defining characteristics of digital objects. The growing complexity of digital objects is, in fact, re-defining the relationship between materiality and distance, provenance and pertinence, suggesting an interactive conception of agency that allows forms of aesthetic experience in which imagination, sensibility and intuitions can be displayed within relational structures. By showing the results of a research project focused on digital materials and their transformation, which involved children aged 8 to 11 years old, this contribution aims to discuss the possible role that such objects can play in developing new forms of aesthetic education.

Keyword: Digital technologies · Aesthetic education · Digital objects · Reggio Emilia Approach

1 Digital Objects and Virtual Bodies

1.1 A Wide Variety of Materiality

Digital technology has significantly altered society, media, design and, overall, the perceptive experience during the past decades. Due to the pervasiveness of digital technology and the ongoing digitalization of current cultural products and services, the emergence of digital objects establishes novel and interactive relationships between devices and subjects.

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The growing and ubiquitous presence of digital objects raised issues of interest from the points of view of aesthetics and design [5]. In fact, such issues concern the perceptual dimension that define our relationship with digital objects and the reconfiguration of the sensitive experience that their development implies. On the one hand, Nygaard Folkmann's perspective [6] aims to inscribe the aesthetic of digital objects within a post-material perspective[1]. With post-materiality, the author does not imply that the digital objects tend to abandon materiality in order to become dematerialized. Instead, such a perspective regards the possibility of considering material objects as points of interaction with the options provided by digital technology within a continuous transgression of their material boundaries (Figs. 1, 2, 3 and 4).

Fig. 1. A figure of the object that the group of children drew an and then realized with the technique of clay.

In this perspective, digital objects can be intended "as designed objects that incorporate and employ digital technologies, the virtual objects and the related concept of digital materiality designed objects that incorporate and employ digital technology, regardless of their origin as either born digital objects or digitized objects" [6, p. 4]. The fact that digital artefacts can take on a wide variety of materialities, such as digitalized analogue media, digital re-production of physical objects, interactive images, and virtual

[1] In "The Aesthetics of Imagination in Design" [7], Folkman focused on the notions of "possible, imagination and aesthetics", and proposed to intend design as a medium capable of triggering imaginative processes that evoke possibly concretize new possibilities.

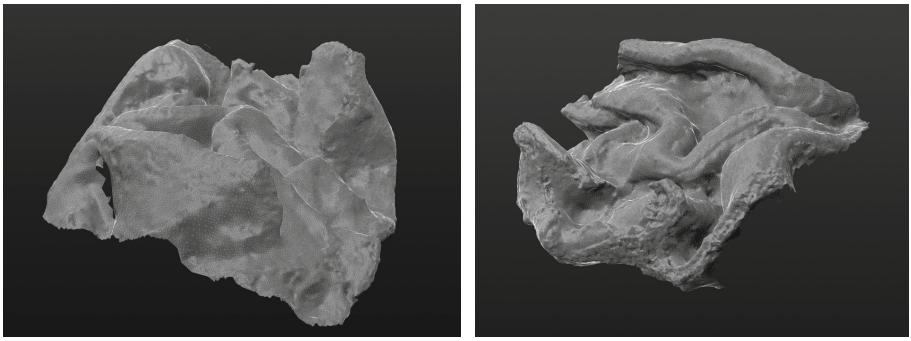

Fig. 2. Metal mesh was used to re-think the same object with another material, then scanned.

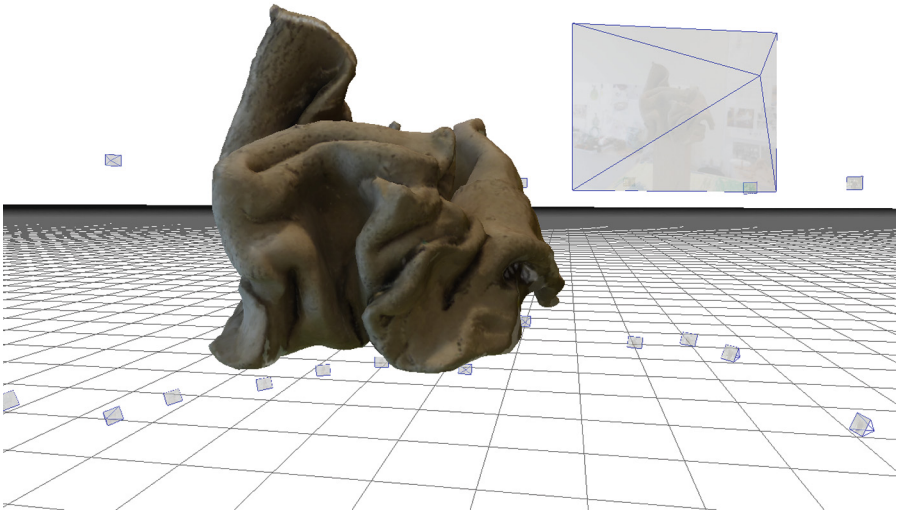

Fig. 3. Result of the scanning and further transformation process realized with the digital modelling software.

environment, defines new forms of "fluid materiality" [8]. The concept refers to the process of translating things into different material states and forms that others can expand [9]. When allowing a significant degree of interactivity, digital technologies can define conditions of aesthetic experience in which imagination, sensibility and intuitions are displayed within relational structures. This aspect has been addressed by the Italian philosopher Roberto Diodato, who recently developed and discussed the notion of the virtual body:

"With the expression 'virtual body,' we can refer to an interactive digital image, which is, therefore, a body–image: an image perceivable as such not only by sight, i.e., the phenomenalisation of an algorithm in binary format in the interaction with a user.

Fig. 4. Result of the 3d printing process and comparison with the original object realized by the children with clay.

Digital images are all those objects–environments with which a user can interact through biorobotic prostheses capable of producing 'immersive' experiences" [10].

According to the author, the expression 'virtual body' can refer to an interactive digital image which is, therefore, a body–image: an image perceivable as such not only by sight, i.e., the phenomenalisation of an algorithm in binary format in the interaction with a user. Digital images are all those objects–environments a user can interact with through "biorobotic prostheses capable of producing 'immersive' experiences" [8, p. 1]. Discussing the concept of virtuality in the paper, the author further argued that, to contextualize the syntagma "virtual reality", it is necessary to avoid attributing the word "real" to an extension that makes it correspond with "entities". In everyday speech and philosophical discourse, we distinguish between what is real and what is apparent or illusory. Real would thus be what people "normally" perceive in the awake state, which is how we can tell reality from "virtual" reality. The author argues that it is possible to consider presence in virtual environments as an illusion of non-mediation (a perceptual illusion of non-mediation), and, in correlation to this, to understand non-mediation as revealing the degree of presence. In fact, when disclosing margins of indeterminability and a significant degree of interactivity, the virtual devices can foster the creative and imaginative features in a relational environment. In this theoretical perspective, the concept of relation characterizes a constitutive category of an epistemological and ontological field. To define the concept of system and relation, Diodato [4] refers to Ludwig von Bertalanffy's "General System Theory", where the latter stated that "A system can be defined as a complex of interacting elements. Interaction means that elements, p, stand

in relations, R, so that the behavior of an element in R is different from its behavior in another relation, R" [11, p. 55].

Commenting on this quote, the Italian philosopher wrote that Bertalanffy's definition accounts for the axiom that the whole is more than the sum of its parts. According to a such axiom, on the one hand, the so-called parts cannot be explained, or, more precisely, their behaviours cannot be explained in terms of their properties, in terms of what they are taken to be in themselves as if they could be isolated from the whole of which they are parts. On the other hand – when juxtaposed to those of the individual pieces – the characteristics, properties, and behaviours of the whole or "complex" appear to be "developing" or "new." Therefore, the Austrian biologist considered a system as the sum of components with its interrelations has to be conceived of as being constructed immediately, meaning without an intermediary. A system is fundamentally complicated in and of itself. Therefore, according to the Italian philosopher, it is necessary to investigate the nature of the "complex" and of its composition, specifically how the latter can be said to be, chronologically and by nature, prior to the "parts" or "elements" of the complex and in what sense the interactions are institutionalizing the parts and the relations constituting the elements.

2 The Issue of Immateriality and New Forms of Aesthetic Education

2.1 From the "Systems Esthetic" to the Aesthetics of Communication

Bertalanffy's systemic perspective was decisive as well in defining Jack Burnham's reflection on the concept of "Systems esthetic". In 1968, the Journal Artforum published an essay written by Burnham, titled "Systems esthetic" [12], where he stated that a polarity was developing between the finite, unique work of high art, such as the painting or sculpture and the conceptions which can loosely be termed "unobjects".

With the term "unobject", he referred to environments or artifacts that resisted prevailing critical analysis, such as outdoor works, gallery kinetic and luminous art, mixed media, presentations and happenings. The "unobjects" should not be mistaken for abstract and non-objective art, as the evolving "Systems aesthetic" was related to a process of transition from an object-oriented culture to a systems-oriented one, where the change did not emerge from things, but from the process of their creation. Against the fetishism for craftmanship, Burnham argued that the systems aesthetics, by striving to reduce the technical distance between the society's productive means and the artistic output, did deal with the issue of boundary concepts in a revolutionary fashion, since it is limited by conceptual focus rather than material ones.

Burnham's view was based on the idea that the artist is a perspectivist who, while assessing systems, considers the system's objectives, constraints, structure, input, output, and associated activities both inside and outside the system. Furthermore, in his view, whereas the structure and limits of an item are often stable, a system's consistency can change across time and place, with its behavior being influenced by internal and external factors: "by the fact that most systems move or are in some way dynamic, kinetic art should be one of the more radical alternatives to the prevailing formalist esthetic" [12,

p. 33]. In 1970, Burnham curated for the New York Jewish Museum the exhibition "Software. Information Technology: Its New Meaning for Art" and attempted to draw comparisons between projects using technology for information transmission and those that employed language as material. In the catalogue introduction, the curator wrote that the exhibition was aimed at providing "the mean by which the public can personally respond to programmatic situations structured by artists" [13, p. 71].

The capacity of artists to conceptually connect the scientific field of cybernetics with the aesthetic discourses was crucial to apply the cybernetic science to artistic problems. In fact, several artists used cybernetics as a model for aesthetic investigation and as a paradigm for redefining the idea of art itself by drawing metaphorical connections between the two fields of study. Such perspective emphasized the artistic process, as opposed to the product, and highlighted the environment or context as opposed to conventional subject matter or style, by putting art into motion, using the concept of feedback, and invoking interaction with the viewer, creating a point of intersection between cybernetics, art, and aesthetics.

For example, the new media artist Fred Forest, co-founder of the Art sociologique and of the "Communication Aesthetic Group", was among the first in France to use video and closed-circuit television in his art[2]. In Forest's poetics, the artist should aim at developing an open system that allows the viewers to become co-authors. In his view, the work itself does not exist as a stable representation of reality that the public may view as an aesthetic object (or anti object). Instead, it is an instance of information in flux that briefly arises through direct "immaterial" contact. The issue of immateriality was addressed as well by Mario Costa, the co-founder of the Group for an Aesthetics of Communication. Costa's concept of immateriality [14] consisted in the negation of the difference between a foreground of material nature and a background of spiritual nature in artworks, and took the distance from Lyotard's perspective and his idea of "representing the unrepresentable" through art works. The issue of the immateriality in the aesthetic of communication was in fact addressed as well in the exhibition "Les Immatériaux", curated in 1985 by Jean-François Lyotard, which linked the post-modern condition with the tendency toward dematerialization. Pierre Moeglin [15] criticized the exhibition by stating that the process of dematerialization, rather than through material artworks, would have been better expressed by presenting works that no longer concerned the final product, but rather the process.

The issue of immateriality was tackled as well by the French philosopher Paul Virilio, who argued that technological developments in the fields of transportation and communication had produced a new world where speed was the guiding principle. In an interview published in 1988, Virilio and Foster addressed their approaches to modern communication and aesthetics, and the former stated that the world can no longer be represented through a sculpture, or the fixed image of a painting, and its right representation consists in the speed of the movement, in the juxtaposition of sources of information, the simultaneous heterogeneity of its physical and electronic supports [16].

[2] Martial Raysse produced the first video display in France two years earlier, in 1967.

2.2 Material Engagement Theory and "Digital Materiality"

The idea that the emergence of new technologies can imply a shift from a structured and causal order to a relational one perspective finds a parallel with Montani's interpretation of Malafouris' perspective known as MET – material engagement theory [17]. In this theoretical view, which focuses on the human predisposition for creativity and technological embodiment [18], the design intent is considered as an aspect emerging within a material engagement process which can be applied as well to symbolic practices related to digital objects [19]. The high degree of plasticity that characterizes digital objects constitutes – not despite but on the basis of their virtuality – a material aspect that strongly influences our technical creative attitude, which fully inscribes them in the dialectic of meta-operativity.

The growing complexity of digital objects is in fact re-defining the relationship between materiality and distance, provenance, and pertinence, suggesting an interactive conception of agency, that allows forms of aesthetic experience in which imagination, sensibility and intuitions can be displayed within relational structures.

2.3 From Virtual to Physical Object: Towards New Forms of Aesthetic Education

By defining agency as an interactive process that uncovers the hidden potentials of the world environment, the Material Engagement Theory discloses new insights on the possibility to foster children's sense agency by developing forms of technical creativity and interactive imagination. The Reggio Emilia Approach, by focusing on visual and expressive languages as a means of inquiry regarding the affordances that various materials and technologies express on different representational and symbolic levels, fosters the development of aesthetic education models which promote children's interactive agency and imagination [20].

The possibility of using technology in collaborative settings that foster forms of active participation, acknowledging the different affordances expressed by hybrid objects within relational structures, offers new possibilities for the development of aesthetic experiences that needs to be further designed and developed. The last part of this contribution focuses on a research experience that aimed at exploring such possibilities. The research experience, promoted by the University of Modena and Reggio Emilia and by the Reggio Children Foundation within the framework of a national research program[3], involved two classes attending the fifth year of the primary school. The experience was aimed at the development of innovative forms of aesthetic education that combine design thinking, aesthetics and digital objects.

The group of children involved in the project explored the possible connections between digital and analogue materials by combining, in the atelier of the State Primary School at the Malaguzzi International Centre in Reggio Emilia, both the technique of sculpting clay and a 3D sculpture application, named Sculptris, that offers a variety of digital materials for sculpting and printing the result of the project1 in 3D.

[3] The research project was titled "Cluster – Educating City, with the goal of investigating how digital technologies can support children's learning and creative processes (https://www.frchildren.org/en/research/projects/cluster-educating-city).

They initially drew an object, and then they worked with the technique of clay, which they were investigating at the time.

Then, a metal mesh was used to re-think the same object with another material, each time exploring the different affordances that materials and media can express, the immediate (salient) and hidden (supervenient) emergences that different objects evoke.

The group then scanned the object and moved to digital modelling software. In "sculpt" mode, users are offered the possibility to shape and re-thing an object. The interface of sculprtix is intuitive for children to navigate and offers a rich variety of different modelling functions. The application provides a variety of virtual materials to sculpt, and at any point, users can also send their work to a 3D printer using STL (Standard Triangulation Language) universal format. The digital realm was a resource and a material that enhanced children's play, and their ideas, allowing them to give shape to their project by broadening their range of action and expressive possibilities.

Finally, a 3D printer has been used, transforming the concept of an artefact. The object has been scanned, converted and re-materialized. In this physical and virtual setting, the experience drew on both the digital and non-digital properties of things. It moved fluidly across boundaries, exploring the potentialities that different forms of materiality suggest.

2.4 Conclusions

The processes of remediation allowed today by digital technology resources cause a profound re-negotiation of the sensory experience. In our view, such a re-negotiation process, if characterized by an instance of active articulation, can open relevant and innovative opportunities in the relationship we establish with the world environment through the emergence of enhanced forms of technical creativity. In fact, the heterogeneity of the virtual materials allows interactive procedures of reuse and re-organization according to new rules. The described aspect relates to the possibility of developing connections that arise from different interweaving forms of materiality that sustain a continuous process of remediation and re-interpretation.

Furthermore, the exploration and realization of forms of expressions that link together different forms of materiality can contribute to configure one of the possible developments of aesthetic education in the digital age.

On the one hand, the unprecedentedly combinatorial processes connecting different forms of materiality could allow new forms of intertwining between different channels of expression.

On the other hand, the interactional nature of contemporary digital devices, configured as authentic environments of experience, allows to imaginatively explore the meta-representations that problematize the distinction between real and virtual, therefore sustaining the development of new forms of aesthetic education.

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