ARTWORKS AS INFORMATIONAL SYSTEMS

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Can we effectively describe artworks in informational terms? This paper discusses this question and its ramifications by analysing Mikhail Volkenstein's (2009) characterisation of art as 'informational systems' and contrasting it with contemporary understandings of information and aesthetics. Overall, the paper argues that contrary to Volkenstein's description, the kind of information conveyed by artworks is not only of an aesthetic kind, since artistic value depends on various other (cultural and economical) aspects. Nonetheless, it concludes that Volkenstein's description of artworks as 'programs' that not only convey but also generate information is a powerful metaphor for addressing current developments in artistic practices.

1 INTRODUCTION

As computational technology assumed all the functions of previous information technologies (ITs) the (ontological) differences between "media" collapsed. The modernist conception of the "medium" as the sole guarantor of the identity of audiovisual expression was called into question by digitisation. What were previously conceived as materially distinct entities are now *simulations*; dynamical representations of data, or *information*. This new regime brought significative opportunities and challenges for art. On the one hand, it forced art scholarship to rethink its (traditionally wary) attitude towards technology, and to engage computation as a domain no longer exclusive to engineering and science. On the other hand, the possibility of simulating and hence freely mixing the tools, techniques and "vocabulary" of pre-computational audiovisual expressions within the *same* environment led to the development of a "hybrid" and constantly changing "new media" (Manovich 2013). The questions of how artworks and artistic practices should be understood under this new informational parading thus remains one of the most pressing concerns for art scholarship

When it comes to understanding the impact of information technology on art and "media", scholarly approaches may be loosely distinguished by their theoretical priorities. There are those who consider analysing technology is the most effective way to understand current shifts in artistic practices; theirs may be called the "engineering" approach (Mitcham 1994). There are others for whom the human factor generally determines the impact of technology; this is the traditional approach we find in the humanities. As a representative of the engineering approach, Software Studies argue the qualities of "new media"—e.g. "hybridisation" and "deep remixability", (Manovich 2013)—are a direct consequence of the modularity and permanent extendibility software. Which, in turn, owes such qualities to the interchangeability of its "building blocks" (Manovich 2013). Thus, according to this view, in order to understand contemporary audiovisual manifestations we should focus on the history and technical nature of its medium, i.e., software. Conversely, current humanistic approaches (heavily inspired in Merleau Ponty's phenomenology) argue that in order to comprehend the effects and nature of Information Technology we should rather focus on how they manifest within our cultural practices.

In this paper I discuss Mikhail Volkenstein's (2009) little known characterisation of artworks as "informational systems" and contrast it with current understandings of information and aesthetics. I begin by briefly recalling the origins of the concept of

"information" while highlighting some key aspects of its meaning in the context of Claude Shannon's Mathematical Theory of Communication (MTC). Afterwards, I summarise Volkenstein's model, before outlining a definition of information based on semantic content. The latter provides a means to circumvent the limitations of Volkenstein's grounding of "artistic information" on aesthetic value, while retaining the most thought-provoking aspects of his model. Namely, the notion that artworks may be regarded as "programs" capable not only of conveying but also of generating new information.

2 INFORMATION

To paraphrase Adriaans and Benthem (2008), the word "information" has an extremely high frequency but a comparably low content; even though we constantly hear and use the term, we rarely ponder what *exactly* we are referring to. This is hardly a surprise, since information can be associated to such a multitude of meanings that it sometimes appears to be a "conceptual labyrinth" (Floridi 2010). In this everyday usage, information serves as an umbrella term for everything we exchange when we engage in acts of communication. Therefore, as philosopher Luciano Floridi (2004) suggests, the question "what is information?"—like the question "what is being?"—belongs to a category of enquiries that one cannot expect to answer through dictionary definitions. Instead, Floridi argues, one should use them as a pretext for philosophical enquiry.

2.1 THE ORIGINS OF THE CONCEPT

Information comes from the Latin *in formare*, which both Cicero and Saint Agustine reportedly used when discussing Plato's Theory of Torms and, in particular, it was used by Cicero when he referred to "representation[s] implanted in the mind" (Adriaans and Benthem 2008, 8). Centuries later, during the early Renaissance the French word *information* began to be used colloquially to refer to such things as "'investigation', 'education', 'the act of informing or communicating knowledge', and 'intelligence'" (Adriaans and Benthem 2008, 8). By the end of 17th Century, the technical use of information had anything but disappeared, as British Empiricists who returned to Platonic sources opted to coin the term "idea", from the Greek word for Platonic Form, *eidos* (Dusek 2006). Only in the first quarter of the 20th Century did information start to attract scholarly attention again, when engineers and researchers Harry Nyquist[1] and Ralph Hartley[2]

1. 1889–1976

2. 1888–1970

3. Shannon (1916–2001) originally published his MTC as an article in 1948 and later, in 1949, as a co-authored book with mathematician Warren Weaver (1894–1978).

4. As Floridi (2004) argues, this name is misleading, since MTC is a theory of information *without* meaning, although not in the sense of being meaningless, but rather in the sense of *not yet* being meaningful. Therefore a more suitable name would be 'theory of data communication'.

5. As understood within MTC, the word 'information' does not refer to what *is* being said, but to what *could* be said (see Weaver 1949).

6. Data which are computable and interchangeable and whose smallest units Shannon chose to represent as binary symbols by the name of 'bits' (see Gleick 2011).

7. Shannon's and other information theorists' aim was to address problems related to the *communication* of information and not so much with its reception. Hence, '[i]n the standard [information] theory the receptor has very limited capabilities: all it can do is distinguish one letter from another or one coded symbol from another.' (Volkenstein 2009, 158).

8. After all, at the most basic level what computational devices do is perform calculations and remember the results (see Guttag 2013), without concerning themselves with their meaning.

9. 1912–1992

10. In truth, outside of theoretical models, most systems are open, meaning that they interact with other systems.

speculated on the possibility of quantifying the transmission of information or even "intelligence" (see Byfield 2008). The work of these two pioneers would later serve as inspiration for Claude Shannon's (1980) groundbreaking *Mathematical Theory of Communication*[3] (MTC), the first successful method for describing communication in probabilistic terms and the stepping stone of contemporary "information theory"[4].

2.2 INFORMATION AS A QUANTITY

Contrary to some interpretations, Shannon's MTC does not provide an all-encompassing definition of information, but rather a formal description of the physical constraints governing every instance where "not-yet-meaningful"[5] *data*[6] are transmitted (see Floridi 2016). Shannon's goal was to determine the ultimate level of data compression, and what the ultimate rate of data transmission was. He was, in his own words, attempting to measure "the accuracy of transference from sender to receiver of a continuously varying signal" (1980, 8). Conceived as a mathematical function, Shannon's formalisation ought to apply to *any* instance of communication. Thus he had to regard what was being transmitted (i.e., "the message") under purely quantitative terms. This implied ignoring the semantic contents of the message and treating the information it carried solely as a "raw" (Floridi 2004, 51), "dimension-less" (Ben-Naim 2008, 203) quantity. It follows that MTC is fundamentally a study of communication limits and of information purely at the *syntactic* level, meaning that it was conceived to deal with the *transmission*[7] of data—the symbols and signals that carry information, and not with "information" itself. That is why in contexts where semantic value is not a priority, such as in computation—computers are after all syntactical devices[8]—MTC is a more than adequate method of analysis.

3 THE ARTWORK AS AN INFORMATIONAL SYSTEM

At the end of his little-known 1986 book, *Entropy and Information*, late Russian biophysicist Mikhail Volkenstein[9] (2009) delineated an informational approach to artistic creation. Essentially, Volkenstein claimed artworks not only convey but also *create* new information, hence they represent open[10] "integral informational systems". Integral because—as with living organisms—all of the their features are essential for their proper functioning, and any change in their internal structure can potentially damage their meaning. Artworks are not isolated systems; once "liberated" they acquire a "life" of their own (Volkenstein 2009, 187),

establishing new relationships with the world and with their potential audiences while, simultaneously, maintaining a constant relationship with their creators. Volkenstein (2009, 187) points out that regardless of the medium, "artistic information" is open and available to anyone, therefore every person is entitled to say if they like or dislike a given artwork. In order to evaluate an artwork in a "competent" and "serious" manner, a person requires what Volkenstein (2009, 188) calls a "thesaurus", that is, certain background knowledge and aesthetic sensibility that allows her to adequately process the information contained. Therefore, the *value* of artistic information is "of an aesthetic kind", and it is ultimately determined by the way it influences a sufficiently prepared audience.

3.1 LOSING AND PRODUCING ARTISTIC INFORMATION

Reception of artistic information involves both a partial loss and an "enhancement". Every instance of communication is potentially subjected to the interference of noise[11], often due to the physical and environmental conditions surrounding the transmission. Given the unsurmountable gap between the mind of the artist and the minds of her audience, a certain amount of information conveyed by an artwork is bound to dissipate in the process of being received. For Volkenstein (2009, 187) such loss is "inevitable" and "trivial". What is not trivial is the fact that the artwork "activates or *programs* [emphasis added] a stream of associations, thoughts, and feelings in the consciousness of the receptor" (Volkenstein 2009, 188) thus stimulating the creation of *new* information by him or her. It is here that, according to Volkenstein, rests the value of an artwork.

3.2 THE VALUE OF ARTISTIC INFORMATION

How valuable the information created by an artwork is depends largely but not entirely on its singularity and irreplaceability. In other words, it lies in its *informativeness*. The more novel and unexpected the information an artwork generates—i.e. the less redundant it is—the more valuable it will be. But regarding this point Volkenstein (2009, 188) makes an important caveat: whereas for information theory redundancy is normally equated to repetition, in the context of art the equivalency cannot stand, since many artworks use repetition precisely as an aesthetic device. Conversely, a uninformative and hence redundant artwork will be one that exhibits cliche and banality, or whose existence is due solely to technical prowess. Nonetheless, Volkenstein does

11. That is, 'unwanted data' (Floridi 2016) received along with a message and with the potential to impede its adequate apprehension.

concede that public reception of artworks is subject to historical and even personal fluctuations. In other words, that yesterday's mediocrity may become today's masterpiece and vice versa. Hence, great artworks are those to which we "return" repeatedly over the course of our lives and that always seem to offer something new, for true "genius", argues Volkenstein (2009, 190), "is unlimited informativity".

4 INFORMATION AS SEMANTIC CONTENT

What makes MTC such an effective tool in the context of information technologies (namely its disregard for semantic content) makes it comparatively limited from the point of view of art, the humanities and even biology (see Volkenstein 2009). Scientific (quantitative) models tend to neglect granular detail because operating at a higher *level of abstraction* allows them to explain phenomena in more general terms. In the context of art, however, the assumption is that every artwork constitutes a unique instance regardless of the fact that it may share some qualities (physical or otherwise) with other artworks. When we approach works of art we do it with a hermeneutical intent attuned to granular detail. Thus the question is, what benefit does talking about art in terms of information when the very formulation of this concept seems to disregard its most crucial aspects — namely, semantic content and its reception? Luckily, as Shannon (Shannon and Weaver 1980) himself recognised, MTC's reductive characterisation of information is by no means the only one available.

4.1 THE GENERAL DEFINITION OF INFORMATION

Most fields related to information science now tend to agree upon an operational definition of information based on semantic content (Floridi 2011a). According to this "General Definition of Information" (GDI) semantic contents may be considered information if and only if they are composed of "well-formed meaningful data"[12] (see Floridi 2004; see also Floridi 2011a). Along with rejecting the possibility of data-less information, GDI requires data to have some form of representation (e.g. binary digits) and also — given the nature of current computational technology — physical[13] implementation. Now, regarding the question of how or why data are able to carry meaning in the first place is, according to Floridi (2004), one of the most difficult problems for semantics. Nonetheless, he also notes than in fact the issue "is not *how* but *whether* data constituting information as semantic

12. The definition of 'data' is itself contentious. Data is the Latin translation of the Greek word, *dedomena*; it is the utmost unit to which information may be reduced. In its singular form, 'datum', is a fact concerning some *difference* or lack of uniformity within some context, e.g. the perceptible difference between two letters in the alphabet, or the difference between the presence or absence of an object (see Floridi 2004; Floridi 2011a). That is why sometimes information is characterised as 'a difference that makes a difference' (see Byfield 2008).

13. It is important to note, however, that physicality does not necessarily entail materiality (see Floridi 2010).

14. Prior to its discovery, Egyptian hieroglyphics were indecipherable; the discovery of the stone provided an 'interface' to access their meaning; this however did not affect their semantics (see Floridi 2004).

15. Consider a musical score or a piece of software, neither of them may be successfully described as being true or false.

16. Aesthetics, of course, is a problem in its own right and no single definition can be an all-encompassing one.

content can be meaningful *independently* of an informee" (Floridi 2004, 45). Examples such as the Rosetta[14] stone and the growth rings in tree trunks show the answer is that meaning is not — at least not exclusively — in the mind of the human subject (see Floridi 2004).

4.2 TWO TYPES OF SEMANTIC INFORMATION

Seen as semantic content, information comes in two major types: instructional and factual. Instructional information — also known as "imperative" information — is the kind one might find in stipulations, orders, recipes or algorithms. Certainly, all these instances have a semantic dimension, since they have to be interpretable and therefore meaningful. But, unlike those categorised as factual information, they cannot be correctly qualified as being true or false, only perhaps as being correct or incorrect[15]. Instructional information does not convey specific facts, nor does it model, describe or represent ideas; it merely helps to "bring about" (Floridi 2016) (factual) information. For its part, factual information (also known as "declarative" information) is the most important of the two kinds of semantic content, but it is also the most common way in which information *as* information "can be said" (Floridi 2004). Factual information "tells the informee [agent] something about something else" (Floridi 2004, 45), for example, the location of a place, the time of the day, an idea, a fact, etc. To borrow a metaphor from Floridi (2004), factual information is like the "capital" or centre of the "informational archipelagos", since it provides both a clear commonsensical grasp of what information is, and links all other concepts related to information.

5 EXPANDING VOLKENSTEIN'S CHARACTERISATION

5.1 NOT JUST "AESTHETICS"

Volkenstein's equation of "artistic information" with aesthetics is problematic for two reasons: first of all, it presupposes the definition of the latter — which he does not provide; secondly, as a contemporary phenomenon, art has become too complex to be understood solely under the category of "the aesthetic" (Stecker 2010). Oversimplifying, aesthetic objects or phenomena may be described[16] as those whose formal qualities or "meaningful features" trigger experiences (pleasurable or otherwise) which may be appreciated "for their own sake" (see Stecker 2010, 289). Argu-

ably, having aesthetic value continues to be a necessary requirement for something to be considered "art", but it is by no means a *sufficient* one. Contemporary understandings no longer regard art as the necessarily autonomous and self-contained dominion High Modernism portrayed (see Greenberg 1999), but as a transversal endeavour concerned with the whole range of human experience[17], from socio-political to cognitive and metaphysical preoccupations. It thus follows that the kind of information conveyed through art cannot be merely "aesthetic" or even "artistic" for these are only a couple of layers or *levels* at which any given artwork may be observed. By substituting "artistic information" with "semantic information", Volkenstein's characterisation receives a significative update, offering a more general—more "model-like"—understanding of artworks.

5.2 ART AND SEMANTIC INFORMATION

Arguably, artworks are at the very least instances which "point at" or call our attention towards "something" interesting in the world. Whether that "something" is interesting or relevant, is always open for debate and interpretation. Many works of art are content with merely conveying their sheer presence—their "aboutness"—without attempting to offer any specific kind of "discourse". Other artworks assume (or at least purport to assume) an open position; their aim is to make a direct or indirect commentary about a state of affairs, or to provide a number of elements for the audience to reflect upon said state of affairs. All of the former are instances where some form of semantic information—to repeat: well-formed and meaningful data—is conveyed; but they are also instances where more information may (hopefully) be produced. Volkenstein's model offers a useful way to characterise this process: the metaphor of the artwork as a program

5.3 THE ARTWORK AS A PROGRAM

Volkenstein describes artworks structurally as complex integral informational systems, but functionally as *programs* which, upon being read trigger the generation of information that was not previously contained in them. This simple metaphor allows us to imagine our relation with art in a more contemporary manner. We may perhaps describe the artwork as a "bootstrap loader" that launches our "thesaurus" (see section 3), thereby allowing us to generate ideas and connections that we could not

17. As a contemporary practice, art is much closer to philosophy than was previously conceded, but while the latter may be thought of as the ultimate form of 'conceptual engineering' (see Floridi 2011b), I would argue art may be described as *conceptual tinkering*.

have imagined otherwise. We may also think of an artwork not as a pre-compiled program, but more like a complex "script" which may be run through a myriad of interpreters and produce an equally different number of outputs. Which could include value judgements ranging from total lack of interest to considering the artwork a true masterpiece, or perhaps feeling the need to utter the proverbial "my two-year old child could have done this". Nonetheless, like all metaphors, this one has limitations too. Unlike computers, our interpreting abilities are not limited to performing numerical calculations and remembering their results; we humans establish complex semantic associations without even trying. As interpreters, we "choose" which information present in the artwork we pay attention to and which we ignore. Our interpretations are shaped by our mental and emotional states, by our intellectual and personal backgrounds, and by the very historical and cultural circumstances surrounding our engagement with artworks.

CONCLUSIONS

We have seen that Volkenstein's model is a good example of how artworks may be portrayed in informational terms. We have also seen that GDI offers a useful way to avoid circumscribing artistic information to aesthetics and therefore making Volkenstein's model more compatible with current understandings of art. Regarding artworks as complex systems which, at the very least, "say something about something else" does not by itself explain how or what kind of information a given artwork might convey, nor does it solve all problems presented by aesthetic experiences. But it does help us remember that artworks are not magical objects, and that they bear similar organisational properties as other complex systems. From an ontological perspective, Volkenstein helps us to think of artworks as particular configurations of information, but also as hermeneutical "programs" with potentially endless outputs.

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