Digital Ontologies: The Ideality of Form in/and Code Storage—or—Can Graphesis Challenge Mathesis?

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ABSTRACT

Digital media gain their cultural authority in part because of the perception that they function on mathematical principles. The relationship between digital images and their encoded files, and in other cases, between digital images and the algorithms that generate them as display, lends itself to a conviction that the image and the file are mutually interchangeable. This relationship posits a connection of identicality between the file and the image according to which the mathematical basis and the image seem to share similar claims to truth. Since the history of images within Western culture is fraught with charges of deception and illusion, the question arises whether the ontological condition of the digital image, its very existence and identity, challenges this tradition. Or, by contrast, does the material instantiation of images, in their display or output, challenge the truth claims of the mathematically based digital file?

The attempt to understand the connections that link human thought to its representation through the act of formgiving (in language, image or signs) is central to Western philosophy and aesthetics. In every generation, some version of this question has been posed: If it were possible to understand the logic of human thought, would there be a perfect representation of it in some unambiguous, diagrammatic symbol set of entities and dynamic relations among them? Informed by classical metaphysics and philosophy, this question also has a life not only in contemporary struggles that are carried on in the varied and very different domains of visual art, information design and computer graphics, but also in cognitive science, with its legacy of symbolic logic, artificial intelligence debates and a disposition toward the intersection of speculative and specifiable apprehensions of what constitutes thought.

A corollary, crucial issue within Western metaphysics is whether an idea can exist outside of material form and yet appear to human perception. Are there forms that are grasped by the human mind and even communicable to a community of persons even though they exist without material instantiation—abstract concepts of law, love, justice or spirit, for instance, or rather more concrete-seeming forms within the language of geometry, art or social behavior ("good form")? And does this question take on a new cast when the basic issue of whether an idea can exist outside of instantiation in material form is posed with respect to the digital environment? Is our conception of an image profoundly changed by its capacity to be stored as digital code? Or is the commonality of code storage as the defining condition of digital processing a confirmation of a long-standing Western philosophical quest for mathesis (knowledge represented in mathematical form, with the assumption that it is an unambiguous representation of thought), in which there ceases to be any ambiguity between knowledge and its representation as a perfect, symbolic, logical mathematical form? To provide a framework for my discussion, I want to invoke two somewhat disparate positions within twentieth-century philosophy: Edmund Husserl's notion of the "ideality of Form" and Theodor Adorno's problematizing of the notion of self-identity of form and the social-political implications of same [1,2].

Both of these notions need clarification, at least to the extent of an introductory paraphrase, in order to justify their use as poles of reference for examining the ideological underpinnings on which digital imaging is to some extent premised. Specifically, they are useful as a way to address the assumptions of positivism underlying the authority of digital media as construed in the popular imagination. Though my focus is on the cultural authority granted to such a positivist conception, the premise on which this authority is sustained is a philosophical one, as I hope to demonstrate. A discussion ranging between Husserl's ideality and Adorno's self-identity allows the link between the idea of "data" and the actual materiality of its existence in digital form to be interrogated critically, though this link is often overlooked in the rhetoric of electronic cyberspeak, where data has somehow mistakenly come to carry an aura of immateriality as a feature of its fundamental identity. As a consequence, that identity has come to be conceived of in a relation of identicality—of information to itself. This is always a dangerous notion, Adorno will be quick to warn us, since it precludes any critical intervention in the investigation of terms of being and their reception in cultural frameworks, where they operate in rather more pedestrian guise, rather like gods in mortal embodiment in Greek mythology, since their potency among humans warps the scale of power even in daily practice and then radically and swiftly in disclosure [3].

The working concept of "ideality" in my argument is based on Husserl's suggestion that in the origin of geometry there is an "ideality" of form that can exist outside of material but still be apparent to and apprehended by a cognitive sentience. He makes this argument specifically in reference to geometric forms, whose existence becomes apparent to human sentience and yet is not dependent upon it (as opposed to, for instance, the form of the story of Emma Bovary, which is dependent on human authorship even if it can live as an idea outside of the text). Husserl suggests that the peculiar specificity of geometric forms is that although they become conventionalized within human representational systems, the original condition of their existence is not dependent on human constructs, a topic he explores through the dilemma of "the first geometer," whose apperception of geometric forms is an initial confrontation with their ideality (that is, as forms outside of material).

But if geometric forms exist independent of human perception of them and, in fact, are not changed or altered by

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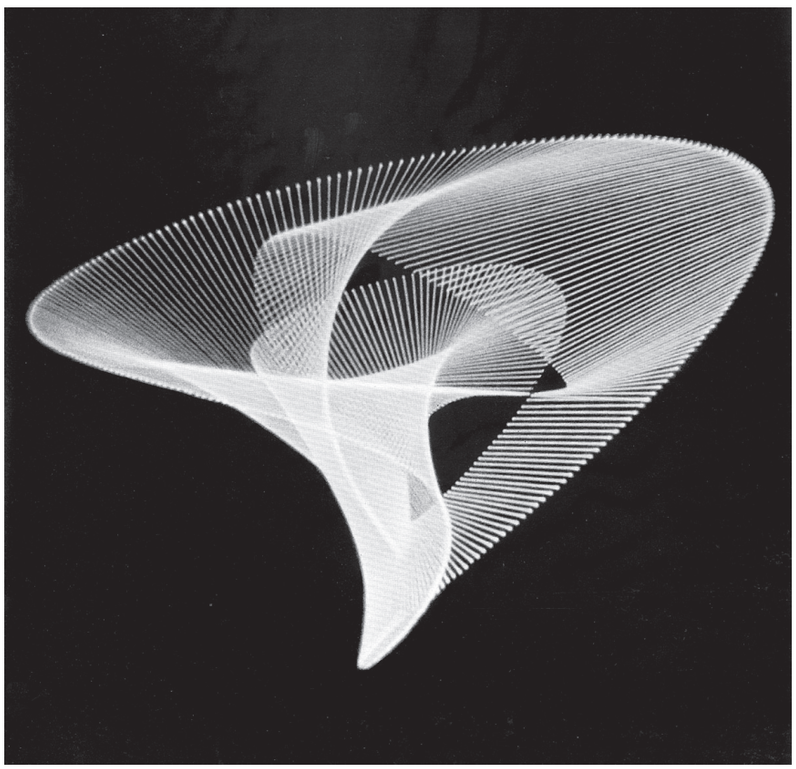
that perception from their ideal form, then does that ideality necessarily fall into the category of "self-identity" or "unity" of form, which is anathema to Adorno? It is anathema because when empirical and/or positivist logic invades culture to such an extreme that representation appears to present a unitary truth in a totalizing model of thought, then that leaves little or no room for the critical action or agency that are essential to any political basis for agency.

These two frameworks define the poles within which I will examine the premises on which "mathesis" functions in current conceptions of digital data. I suggest that there is an underlying, or even overt, positivist ideology in the way the myth of digital code is being conceived in the public imagination. Further, this gives validation to digital representation on the basis of that premise in a way that forecloses interrogation of that premise. My double agenda is to disclose the ideological assumptions in the way the ontological identity of the digital image is posed and to suggest that graphesis (embodied information) can challenge mathesis. Or, to paraphrase, I assert that the instantiation of the form in material can be usefully opposed to the concept of image/form and code storage as a single, unitary truth. The crucial point is that this is true even of the digital itself, not merely of what it represents; thus I would strongly assert that the real materiality of code should replace the imagined ideality of code.

To focus this discussion, I want to concentrate on the issue of digital images, since many of the questions about the truth, fiction, or simulacral identity of digital imagery have been asked in the name of the presumed distinction between traditional darkroom photography and digital photography. I want to compare, for instance, a recent digital image by artist Peter Campus with the fictions produced by those two young, early twentieth-century adolescents Frances Griffiths and her friend Elise Wright, whose paper cutouts of fairies, expertly photographed by them in a garden setting, passed as sufficiently real to elicit great debates. *Alice and the Fairies* (1917) is just such an image, in which the inconceivability of deceit is linked as much to cultural expectations about the innocence of adolescent girls as it is to the credibility of fairies' actual existence in English gardens. Peter Campus's *Wild Leaves* (1995), with its digitally manipulated visual information, is more simulacral than fictional (it is about surface image as effect, not narrative credibility), but it is a mere half-step from the photographic antics of the young women to those of Campus. Any number of critics have pointed out that there is much more continuity than discontinuity in the shift from darkroom to digital [4]. The notion that photographic truth was based on a pure, unmediated representation of a "real" referent was shattered even earlier than Griffiths' and Wright's loss of innocence, since the use of multiple exposures, multiple negatives and alterations of the plate in blatant reworking of the metaphysically endowed-with-truth "light" let in by the lens, as well as careful manipulation of the exposure and print, were all tools of the photographer's trade almost from its origin in the early nineteenth century.

Fig. 1. Jack P. Citron, *Digital Graphic from a Curve Generating Program*, computer graphic image, early 1970s. (© Jack P. Citron)



This argument can be pursued and nuanced, following Hubertus Amelunxen's discussion, by contrasting the two types of mimesis defined by Plato: eikon/likeness and semblance/simulacral and the distinctions these terms allow in the discussion of photographic imitation of light/life as truth [5]. In brief, the contrast is between the indexical traces of actual light and the codes of verisimilitude that come to occupy a position of cultural authority dominating ideas of what truth "looks like." I am not particularly concerned to pursue the upped ante and constant trumping of the realm of increasing degrees of virtuality and hallucinatory reality that continue to evolve. The skills and entertainment-industry values that successfully deceive (some of) the senses raise philosophically charged questions. But I want to pursue the simpler, more fundamental question of assumptions about the truth value assigned to digital images as code.

Unlike traditional photographic "truth" (darkroom or digital varieties), the "truth" of the digital image is not, I would argue, posed as an index to the instant of exposure or as encoding the experience of "natural" visual perception as it has been familiarized by the camera. As has been well established in critical discussions, the digital image, photographic or not, is removed from the mechanics of production in which that metaphysics of light is linked to the punctum moment of revelation that connects it indexically and temporally to reality. But nonetheless, the digital image is (popularly and fundamentally) conceived as a truth of another kind that is premised on a deep conviction about the

relations of reason and truth, a rational link between mathematics and form, in which the identity of a mathematical formula is supposed to exist irrefutably, absolutely, as an indisputable truth. This is the positivist premise, the foundation of a digital ontology linked to a belief that mathematical code storage is equal to itself, is a truth that is based on identity irrespective of material embodiment.

Now, it is interesting to step back from this and approach the question of representation of thought as form through another trajectory, one in which the link of truth and form is posed as a relation of identity. In the first decade of the twentieth century, Annie Besant, a psychic, produced a series of drawings of "thought forms" (published in a 1905 volume with the same name [6]). There is a distinct naïveté in this work, seen from historical perspective, and yet there is also a purity in her conviction that thought is form and can be directly manifest. Her work, conceived within a late-nineteenth-century sensibility that extended into the early 20th, took its points of departure from a discourse of the "psychic" that embraced telepathy, magnetism and the role of a medium. She saw, or at least presented, this work as a set of images that attempted to understand and represent the ontology of form as a direct expression of mind. Her images suggest that the representation of thought must be situated within a human context for its form to be understood. The forms might transcend any individual's existence, and be generalizable into a typology of universals (her categories—radiating affection, animal, grasping affection, watchful anger and jealous anger—are typical of her time, a legacy of a theory of types and forms, combined with a vocabulary of late nineteenth-century psychology) [7]. But underlying her work are precepts that unite the research she pursued to that of cognitive science, with its quests for generalizable precepts that might be elaborated in a typology of forms and processes.

Besant's visual forms, schematic and modeled, have a formal resonance with a number of early computer-generated graphics, such as the simple images produced by Jack P. Citron in the 1970s [8]. In their minimal, skeletal form, these graphics have a pristine innocence that makes them attractive to revisit, especially as they embody one major strain of computer graphics work. Citron's *Digital Graphic from a Curve Generating Program* (Fig. 1) is an image in which the algorithm preceded the visual image, and the mathematics and logic of thought that created both algorithm and its manifestation were conceived of as thought beyond the philosophical frame of human subjectivity. The Citron image stands in relation to the algorithm as the Copy does to Idea (eidolon) in a Platonic scheme (it might even be construed as Plato's more debased Phantasm, which is a copy of a copy, if the algorithm is considered the first order of representation of an ideal form), since presumably Idea has a stable, fixed existence that suspiciously resembles an algorithm (or precedes it) in our thinking.

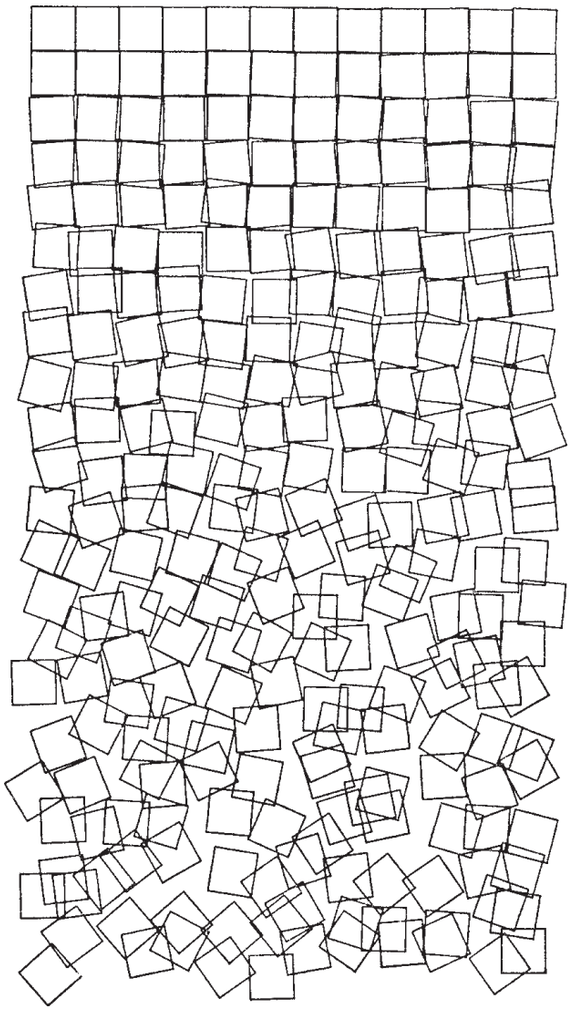


Fig. 2. Georg Nees, *Gravel Stones* (*A random number generator causes the increasing swaying of the squares*), computer graphic image, early 1970s. (© Georg Nees)

Thus Citron's idea is radically different from Besant's in both kind and form, content and ontological condition of being, but in its capacity to function schematically, as a form with a graphic identity that presumes to be a manifestation of ideal form, it has much in common with Besant's work.

It is true that, as a digitally produced and manipulated entity, Citron's algorithm is also stored in material, lodged in silicon, through a sequence of instructions and address codes, but like the "ideality" of Husserl's geometric forms, these algorithms seem to be capable of appearing to sentience, of being apprehended, outside of a material form—as thought.

Interestingly, Citron's work presents another aspect, since it engages with the theme of algorithm and distortion as a process of deformation from the mathematical ideal of a geometric form through distortion and manipulation of its formulaic stored condition. This theme was the subject of a number of other works from the early 1970s, almost as if the very essence of the problem of form as mathematical ideal and form as instantiation were paradigmatic issues for computer graphics. Georg Nees's

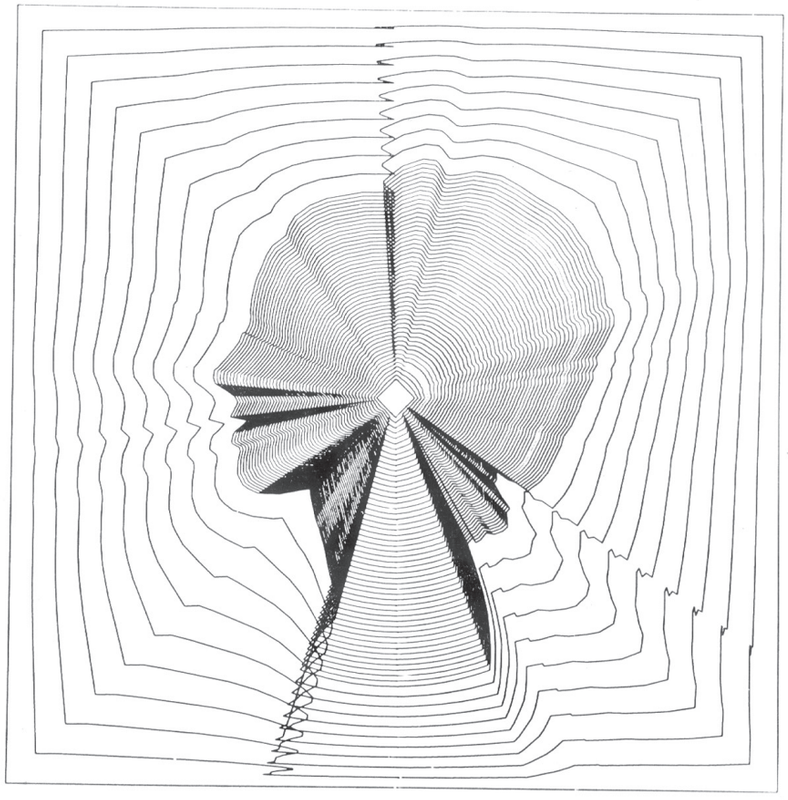


Fig. 3. CTG, *Return to Square*, computer graphic image, 1971. (© CTG)

Gravel Stones (*A random number generator causes the increasing swaying of the squares)* (Fig. 2) maps a distortion in a regular pattern caused by introducing the random element that deforms it, and the Japanese CTG group's 1971 *Return to Square* (Fig. 3) is almost a poster image for the nice comfortable fit between the ideality of the square as order and the process of debasement by which it is transformed into a (material) image.

The algorithmic representation of the geometry is the pure code, the ideality; and the material graphic representation demonstrates the degradation that affirms the old Platonic hierarchy of Idea and Copy and Phantasm.

But there is a fundamental flaw in this mode of thinking about form in an opposition of algorithm and graphic manifestation, or of geometric idea and encoded algorithmic equivalent. And this is that it is the manifestation into substance, the instantiation of form into matter that allows some thing, any thing, to be available to sentience. This is true for the conceivably inherent visuality of a square, but also of the sort of imagery made by scientists to visualize heretofore unseen phenomena, such as views of physical or chemical substances at the atomic and subatomic level. The presumed ideality of actual (!) molecular structures is made apparent as an image.

It might pass as a convenient fiction through which we can gain access to the mathematical "truth" of the image, but the digital image of something that is fully simulacral, such as the monster frog from Peter Gabriel's video "Mindblender," refuses any easy analogy of algorithm and reality as a fundamental unity. The existence of the image depends heavily on the display, the coming into matter, in the very real material sense of pixels on the screen. If, in one instance, the graphic display is manipulated by the algorithm, then, in other instances, the display becomes the site for manipulation of the algorithm. In a weak, organic analogy to snowflakes, or some new-age Heraclitan observation, it is fair to say that no two pixels are alike and that the instantiation always bears in its material embodiment the specificity that makes for difference from the code.

Which brings me to the crux of the matter. What is the "information" invoked or suggested in any of these instances: the information of an algorithm, a geometric form, an imagined molecule given visual expression, a simulacral monster image whose algorithmic reality, such as it is, follows from the manipulation of data in visual form on the screen? In the visual practice of an information design, in which graphic artists create schematic versions of the history of philosophy using motifs of an imagined solar system, or thermal conductivity is mapped with fine, schematic precision, the assumption is that the information precedes the representation, that the information is other than the image and can be revealed by it, served by an accurate visual presentation. But form is constitutive of information, not its transparent presentation.

Perhaps the most compelling, chilling image that I have come across in thinking about these issues is a computer-generated graphic by the artist-scientist Melvin Prueitt, created also in a pioneering phase of such work [9]. It is a nocturnal image of a field of snow, unbroken and undisturbed, a terrifying (to my mind) image of digital purity manifest in its full sterile wholeness, as if the image is a completely pure, pristine visual manifestation of code. It is not, of course, as a glance at an image of any plotting pen or computer output device, laser jet or printer, would make clear. The very acts of production and inscription, the scribing of lines of difference that create the specificity of an image, demonstrate the making of the form as an act of differentiation from the mathesis (code). Whatever the "ideality" of code may be, even if it were (as it is not yet at least) directly available to sentience in some unmediated way, it is in the encounter of matter and mind that form is produced as thought (and thought as form).

This becomes even more important, however, in thinking of the way the code lurks behind (pick the metaphor of spatial and/or temporal relation that describes some presumed anteriority and independent existence for the algorithmic basis) the Prueitt image of snow. Code, however conceived, cannot be construed as "pure" if purity suggests some independence from a material substrate or instantiation into material. Code is also, always, emphatically material, not pure.

So, does the digital encoding of form as information, as data, as patterns of binary code ultimately shift the understanding of what a "form" is toward the realm of "mathesis," that tradition of logic envisioned by Leibniz that is still driving cognitive, epistemological and technical inquiry beyond the twentieth century? I would argue that the "ideality" that Husserl envisions is highly gen-

eralized and reductive, a mere category and placeholder within the cognitive system (even if assumed to exist in some ontological sense outside cognition), rather than a replete and specific "form" in the sense that the word is understood by artists. This line of argument allows that the idea of "graphesis" (defined as knowledge manifest in visual and graphic form) contains an understanding of form as replete, instantiated, embodied, discrete and particular.

As a final contrast, consider a neo-classical image of *The Invention of Drawing*, of the act of formgiving, by eighteenth-century painter Karl Fredrich Schinkel. The image inverts (perversely) Pliny's tale of Dibutades, the daughter of the potter, tracing the outline of her departed lover and changing it into an image of female beauty objectified and reified as an ideal by the male gaze. This is an image of aesthetic form-giving as inadequate copy, as lesser truth than the real. Then consider an advertisement for Johnny Walker Red Scotch, from the late 1990s. In the ad, a sockless but well-heeled young man sits in khakis and topsiders on a deck, beachside, with his laptop computer open in front of him. On his screen is a wireframe image of a dolphin while in the background we see the beast itself, leaping up and out of the Johnny Walker Red sea. The image on his screen and the image of the "real" dolphin emerging from the waves don't match. Their directions, temporal moment, and other details are out of synch. But which is bringing the other into being? In this instance, the visual image confuses the hierarchies of original and copy. The computer graphic seems to generate reality or, at the very least, function on an equal, autonomous level as a form-producing environment. Paul Virilio, in *The Vision Machine,* creates a specter of a sightless visuality, one in which image exists as uploaded signal in the codes/currents of a closed system of information processing, a "non"-visible legibility of information readable by and for machines [10]. In such a situation, form is only code signal, material in its own existence, participating in the production of some "other" sentience than the human. Whether such contexts have use for or attend to the materiality of code storage is a matter for open speculation.

But what is at stake is not the question of whether there is a "truth" to this idea that the stored "code" exists and can be made use of without graphic manifestation, and that it is stored materially. What is at stake is that this idea pushes the cultural status of the digital to a place of mythic "mathesis," in which the sense of an inevitable and seamless interchangeability replaces the idea of a differentiated and resistant material instantiation of form.

Such arguments have implications in how the transformation of "form" from traditional media and representational systems into digital formats do or do not privilege aspects of these forms as "information" to be encoded (what gets lost in translating a text into ASCII format, for instance). The tension between mathesis and graphesis returns us to the problems of form pondered by Adorno. His critique of instrumental rationality can be aptly brought to bear on the ways in which digital media depended upon an unquestioned assumption of mathesis as their premise for understanding information. If "form" is conceived in mathematical terms, it can be absorbed into an absolute unity of essence and representation, while if "form" is conceived in terms of graphesis, then it resists this unity in part through the specificity imparted by material embodiment. This materiality cannot be fully absorbed into (or made one with) the "ideality" of form as idea, ideal or "pure" code. Digital media have their own materiality (and material history to be sure), but it is in the gap between mathesis and graphesis that the resistance to the totalizing drive of the digital can be articulated.

I return, for a final moment, to the Prueitt image of digital snowfields, in which, as Amelunxen says of such work, the algorithmic-numerical image is separated from its origin so that there is "no shadow" cast by the space between origin and image, original and manifestation [11]. The crisis is not, as commonly discussed, a crisis of the copy, of originality, or of authenticity or truth. No, the argument that must be made is for an investment in reinscribing, always inscribing, form into matter. This act situates representation in human cultural and social systems where the condition of materiality permits and/or requires critical considerations of the ways material form participates in and helps replicate cultural mythologies. In the case of digital images, this is a mythology in which code passes for truth, as if the easy and complete interchangeability of image into code and back into image is driven by a myth of the techno-superiority of mathematical premises. As a cultural myth, this is a "truth" so fundamental it is never (or rarely) questioned. In mathesis, code presumes self-identity as a premise, with no critical distance, in a system in which everything is reduced to data and equivalents. Mathesis makes this claim, and when it makes this claim within the cultural realm of representation, then it needs to be beaten back into its place—a kind of whack the mole approach to overreaching ideology—since its claims presume a premise that brooks no interrogation. Graphesis, on the other hand, is always premised on the distinction between the form of information and information as form-in-material. Graphesis is premised on the irreducibility of material to code as a system of exchange; it is always a system in which there is loss and gain in any transformation that occurs as a part of the processing of information.

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