

## Concerning the Digital

*O*ur fictions warn of the dangers of the digital. In the typical scenario, the technology achieves an autonomy and turns against its users, whose hubris, indolence, or avarice spelled their doom from the start. In the case of the computer, its eschatologies depict its triumph over humans via a simulation so effective that it comes to produce reality itself.<sup>1</sup> Nineteen eighty-four may not have been the totalitarian nightmare that Orwell's book forecasts, but there is nevertheless a profound accuracy implicit in his literary prediction; he sees already in the origins of the computer its telos: a binary machine that dictates reality. "War Is Peace; Freedom Is Slavery; Ignorance Is Strength": the arbitrary reversal of the binary is the province of the computer.<sup>2</sup>

Piling irony upon brilliant irony, Apple chose just this Orwellian image to introduce—in a 1984 television advertisement during the Super Bowl halftime—their new Macintosh computer. Thousands of homogeneous, mindless drones sit before a huge screen filled with the image of Big Brother spouting Newspeak propaganda. ("A garden of ideology [. . .] secure from the pests of any contradictory force.") An athletic woman with shocking blond hair runs into the auditorium and throws a hammer

at the screen, smashing Big Brother and freeing the drones, whose jaws drop, overwhelmed by their new freedom and sudden responsibility for self-determination. “See why 1984 won’t be like *Nineteen Eighty-Four*.” The overt symbolism—intended by director Ridley Scott, working for Apple Computer and the advertising firm Chiat/Day—likens Big Brother to IBM (“Big Blue”), whose market-dominating PC was then only beginning to reach out of the office and infiltrate the homes of the average American. On the cusp of the computer age, as consumers struggled with their uneasiness at the prospect of this almost mythically powerful technology in their homes, Apple allayed their fears by claiming to offer a choice, a computing experience designed with the human in mind.

At last, “a computer for the rest of us.” Never mind Apple’s deliberate disregard for the lesson of Orwell’s fiction, which would likely caution all the more against the allure of a “humanized” computer. Never mind the irreconcilable irony of a television advertisement that uses *1984* to deliver a message of freedom through product purchase. Constructing an interface around the familiar metaphor of the desktop, and tying eye directly to hand through the innovation of the mouse,<sup>5</sup> Apple rendered this appliance so comfortable and nonthreatening that, in its early years, the Macintosh was frequently dismissed as a child’s toy, suitable only for the idle preoccupations of stay-at-home dabblers and grammar school teachers.

However their computer is regarded, Apple’s retooling of the interface characterizes a dominant trend in computing devices, driving both the industry of digital hardware and the aesthetics of computing software. No amount of power, no degree of facility ever seems to be enough: the interface must be made both more vivid and more potent, tempting the fate depicted in those fictions alluded to above. The computing experience will not be fully satisfying until it provides a plenary reality fabricated on the computer, a Virtual Reality (VR).<sup>4</sup> What currently stands in the way of VR is the very interface that is supposed to present the reality; the interface resists our manipulations, gets in the way, calls attention to itself. As such, new media theorists place VR at the end of the tendency they call *immediacy*, the desire to remove all traces of the interface: “[T]he logic of immediacy dictates that the medium itself should disappear and leave us in the presence of the thing represented” (Bolter and Grusin 5–6).

*The presence of the thing represented.* If *Virtual Reality* aims for nothing less, then this accounts for the oxymoron in both phrases. What sort of presence would the thing represented have? It is not a question of

the presence of the representation, the image on the screen, for example, since we already have that. Instead, the thing is supposed to just be there, available, right before your eyes (and nose, and fingers, etc.). No medium, no interface, nothing in between the user and the thing. Presence.

The fear that technology will turn the tables on its users is nothing new, but the myth of unmediated presence as the basis of this machinic revolt is closely tied to the unique capabilities of *digital* technologies. What does the digital add to technology that leads to the dream of pure presence? For this dream is not only the stuff of fiction; the digital has extraordinary properties, a breadth of application that knows no bounds, an accommodation of complexity that dwarfs the calculation abilities of any team of human geniuses. The threat from the digital arises alongside its vast powers. Where do these powers come from? What makes a technology *digital*?

The digital is a logic, an abstract code underlying the technology's effects. A digital camera is digital because it turns light into numbers, encoding a flat image into a sequence of values that represent the color and intensity of pixels. A chip in a toaster is digital because it evaluates certain conditions as discrete quantities (the settings of the knobs, for instance) and alters other conditions (such as which heating elements are on and for how long) according to those evaluations. The computer is digital in that everything it accepts as input, everything it stores, and everything it generates as output are, in effect, numbers. And every manipulation of these numbers follows rules that are determined by logical instructions, reducible (and in fact generally reduced) to 0 and 1, on and off.<sup>5</sup> The computer operates by moving electricity around, through silicon chips and other media, and the "gates" through which it flows are, at any given moment, each either open or closed. Logically, the computer is a huge network of intersecting pipes, and each intersection either allows the electricity to pass or prevents it.<sup>6</sup> It is this condition—this general principle of operation according to an abstraction whose rules are immanent to its code—that defines a technology as digital.

One cannot exactly point to a 0 or a 1. One can point to a condition that counts as 0 or 1, but this condition is a measure of voltage or magnetic field strength or some other physical value. The binary code is thus an abstraction, but it is nevertheless effective, for it governs the operation of digital technologies. Whatever "objects" appear on your computer monitor are representations of digital data, so that "inside" your computer these images or file names or window designs or check boxes are only a

series of numbers, and ultimately a series of binary values. Anything that gets stored on a computer is mediated by this binary code. Any alteration, any processing the computer does, is definable according to this binary code, so that the capabilities and limits of the computer are confined by the possibilities of the binary.

The binary digit, or *bit*, is the brick from which digital order is built. Everything digital is made of 0s and 1s. Bits are strung in sequence, a string of 0s and 1s, and each bit is identified uniquely by its place (order) in the sequence. Often, a sequence is taken in groups of consecutive bits, where each group of  $n$  bits in a row represents a number between 0 and  $2^n - 1$  (just as  $n$  decimal digits [0, 1, 2, 3, 4, 5, 6, 7, 8 or 9] in a row can represent any number between 0 and  $10^n - 1$ ). Groups are usually a standard length (eight bits in a row to make a byte, for example), so that a sequence of bits represents a sequence of (higher) numbers, which themselves represent data. For example, the ASCII standard uses the numbers from 0 to 127 (seven bits for each number) to represent a set of text characters. The numbers 65 to 90 represent uppercase *A* to *Z*, with other numbers set aside for lowercase letters, *space*, various punctuation, and more. ASCII code<sup>7</sup> thus allows any text (or at least any sequence of characters) to be represented as a sequence of numbers, and conversely, any suitable sequence of numbers can be represented as text. Everything digital is made of such a sequence of numbers. A computer performing a search, whether for text or for fingerprints, is simply comparing groups of numbers. Content drops out of the picture: image, music, text—nothing but ordered bits. The digital represents everything according to this same order, and this hegemony is the source of both its great power and its grave danger.

The binary logic of the computer is not the only factor that determines its capabilities. To become effective, to make a difference, the abstractions that define the most essential operation of the computer must be actualized in a material, turned into pulses of electricity whose order generates the interface, lighting up pixels on the screen or monitoring the electrical impulses that indicate a pressed key. The interface thus constitutes a crucial part of the computing experience, transforming between the abstract binary code and the concrete images, sounds, and gestures that represent and generate the digital data. But however they are generated and however they appear, the data themselves and the rules according to which they are manipulated are always contained by the binary code, which determines what can be represented as digital data and what operations can alter those data. The computer captures, works on, and displays only what can be expressed in numbers.

With its logic and its numbers, what the digital offers technology is therefore an order. Heidegger notes that modern technology always orders the world, demanding that it be made available according to this order. Technology sets upon nature to render it “identifiable through calculation” and “orderable as a system of information” (23). Given technology’s affinity for order, it is no wonder that it is so closely allied with the digital;<sup>8</sup> ordering is what digits do best. Refinement, precision, storage, isolation: these are the powers of the digital. Using numbers, *digits*, to measure and count things, we can arrange and alter those things in the abstract. Digits provide a universal standard that is easily transportable, exactly duplicable, and broadly applicable. Analysis of digital data allows the immediate detection and correction of variation across space and time. Accurate predictions are possible in extraordinarily complicated circumstances: just crunch the numbers. The digital implements an immaculate ordering that isolates desired properties and gives verifiable, repeatable, and measurable definitions. The digital thereby amplifies technology’s powers in many ways, stamping the world with an order that is both highly malleable and utterly consistent.

Ordering numerically, the digital represents, but what does it represent? Many different things are digital: what they have in common is their *form*, a string of 0s and 1s. To treat something as digital is to operate on form, as the digital turns everything into *information*. Digital storage, digital images, programs, sounds, data, text: all come as a list of digits, each of which is on or off, yes or no. Whether it is on CD, hard disk, or punch cards, in a vacuum tube or fiber-optic cable, if it is digital, it has the same form: a sequence of bits, where each bit is represented by some (ordered, binary) property of the storage or transmission medium. The digital achieves its breadth of application by dint of its form, but also discovers its ultimate limit in its form. *For the digital has nothing but its form and so can represent only form.* The digital can accommodate a great many things, from operations to objects. But what it takes in each case is always only form. Thus, one can use any digital storage medium to store any digital information. The differences among media (storage density, ease of access, reliability) are nonessential characteristics; all digital media *do* effectively the same thing. As far as the information is concerned, the medium does not matter, since the form is the same in each case.

Form and form alone can be exactly duplicated, whence the celebrated perfection of the digital copy. The digital captures the general, the representable, the repeatable, but leaves out the singular, the unique, the immediate: whatever is not formal. Actuality always exceeds its form,

for it moves along lines that connect singularities; the actual is not a neat sequence of frozen or static moments, but an irreducible complex process that cannot be cleanly articulated in time or space. By contrast with the actual, the formal includes only stasis, only what remains fixed long enough to be measured, determined, specified. Whereas form is definite and can always be represented, the actual can be copied but can never happen again. Purely formal, the digital grasps only form, and so falls ever short of actuality.

Critics of the digital identify its pure formality as a great threat, a danger. The digital is nothing but form, and form can always be perfectly reproduced with the right *formula*, any time, anywhere. A digital world has no uniqueness or immediacy, for it is inherently generic, treating every place as an abstract space represented by reproducible numbers, every object as a type defined by precise values. To live in such a world would be to have reproducible and generic experience; everything in cyberspace, from location to object to event, is a matter of a set of numbers that can in principle be exactly reproduced.<sup>9</sup> But what would it mean to live in a digital world? Just because one's experience involves digital technologies does not mean that one is experiencing the digital. Moreover, one might encounter the digital not only through its technologies but also elsewhere. We must investigate, then, without presupposition, how *we* relate to the digital.

We need not look far to find a guidepost for our investigation, for we already bear an immediate and ancient relationship to the digital. Fingers, those primordial digits, are implicated in much of the activity that makes us human. And, like the modern digital, the ancient digital also derives its power principally from an intimate relationship to form. Digital technologies enter into many aspects of daily life, but fingers cover a far greater domain. Fingers draw, point, crush, connect, grasp, throw, cut, turn, examine, feel, feed, wave, reach, massage, muffle, tie, carry, repel, signal, underline, and more. These activities are not variations on a theme, for fingers introduce a novel relationship to everything they touch; they open a new dimension in each of their endeavors. Their scope is thus even broader than it might at first appear, since they are not only widely used, but used differently in each case. What brings them together is that, drawing or kneading, waving, counting, or grasping, it is by virtue of form that fingers cling to their activities, and primarily through form that they shape the world. Just as 0 and 1 capture the outlines, or formal aspects, of digitized objects, so fingers align their outlines with the outlines of their objects, operating on the world as general or abstract. However, unlike

the pure abstraction of the digital, fingers retain the sensitivity to accommodate all the specificity, the singular contours, that define each actual object over and above its general form. Though there is no common form that fingers manipulate, it is in every case their own form that lends them to their task and connects them to diverse other forms. The form of fingers appears at first glance rather straightforward: fingers are clearly structured or articulated. In fact, they are twice structured or articulated: each is divided from the others, and each is divided in itself. It is this pincer, this double articulation, that gives them such a wide grasp.

More than just the form of fingers, double articulation is the very principle of their form. Which is to say that each articulation is itself doubled, to join heterogeneous elements. Each hand is opposed to the other, but each is also differentiated in itself: the vice formed by left and right hands broadens and refines its reach by the further articulation of thumb from fingers. The thumb is one finger among others, but is also unique among fingers in its opposition to the others. Fingers are united by their mutual opposition to thumb, but divided twice; each is divided from the others at the first knuckle (or, according to the skeletal structure, at the wrist), and articulated again within itself by the other knuckles. Each knuckle lies between heterogeneous divisions, themselves further articulated.<sup>10</sup> These multiple double articulations do not simply divide into two parts, but divide asymmetrically, so that the resultant parts are not at all the same. Left hand and right hand are not indifferent doubles, enantiomorphs,<sup>11</sup> any more than the thumb is simply the opposite number to the fingers. It is not the mere fact of division but the difference in excess of this division that provides fingers with their powers, immense and subtle, over form.

If fingers derive their extraordinary aptitude from their double-articulated form, we might examine more carefully the form of the digital to see if it operates along the same lines. What, besides articulation, does the digital have at its disposal? The binary is nothing but articulation, a simple difference between 0 and 1.<sup>12</sup> And it is a particularly refined articulation, an immaculate specimen: according to the form of the digital, every bit is either on or off. However, as with fingers, this single articulation is not enough. To be effective, the digital requires another articulation. Consider the process of digitization. To apply the binary to an object, it must first be divided into parts—slices of time (samples), or space (pixels), or some other aspect of the thing (pieces, steps, characteristics, etc.). Then, each slice, each little piece, is evaluated according to a determinate

scale and assigned a number. In the case of sound digitization, a sound is divided into small chunks of time (samples), and each sample is evaluated by measuring the air pressure at that point in time. In the case of image digitization, a flattened image is divided into tiny quadrants (pixels), each of which is evaluated as to hue and intensity. Even computer programs are double articulations: a task for the computer is broken down into smaller tasks (subroutines or operations), and each of these is given a value that corresponds to a particular action for the computer to take.<sup>15</sup> There is a first articulation of parts, and a second of values: IP addresses,<sup>14</sup> characters, databases. Computers represent everything in parts, and everything must be divided into parts in order to get it into a computer. It is therefore quite appropriate that the fundamental digital unit is a bit. Even a bit is a small piece, one among others, distinguished from the others by its place in the sequence of bits and within itself by its definite and discrete value, 0 or 1.

It is therefore not just the number two, the binary, that gives the digital its power. The number two must itself be doubled, applied twice, to assume its greatest extension. Just to represent a number requires a double articulation: an ordered series of bits occupies two dimensions. For on the one hand, the bits are spread out linearly, each divided from each, while on the other hand, each bit is either a 0 or a 1. Binary numbers have a first articulation (the *n*th place) and a second articulation (0 or 1 in each place).<sup>15</sup>

Though the digital shares with fingers a double articulation and its attendant power, there is a significant difference in the nature of its articulations. Fingers are not wholly distinct from each other, nor is each from itself.<sup>16</sup> Who can say where one ends and the next begins? Fingers exceed their form, and in their actions they touch more than form. They function as digits—indeed they lend themselves by their articulations to counting—but they always overflow that function as well. By contrast, the digital is entirely equal to its form, is nothing but its form. Digital articulations are immaculate, exact. The distinction between 0 and 1 is absolute, and this absolute difference carries over into the differences between two pixels, or two samples, or any two digital data. This confinement, this formalism, is the source of the digital's danger but also of its potential. Its equivalence to form means that our interactions with the digital offer a unique exactitude, robustness, repeatability, transportability, and applicability, but these powers are gained only by a reduction to formal qualities.

The exactitude deriving from the digital's equivalence to its form—the fact that every 0 is just 0 and nothing more—must not be confused with an infinite precision. On the contrary, the digital is calculably imprecise; it measures its object to a given level of accuracy and no further. Rather, what digital exactness means here is that 0 and 1 are, right from the start, completely determined, identical to themselves. Given its value, there is no more to be learned about a digital bit. Between 0 and 1 there is nothing, no *mi-lieu*, no remainder, so that a given bit asserts its blunt edge as the limit of its subtlety. Between two fingers, between any two actual individuals, there is always something more, something fuzzy, something to be determined. An actual individual's borders are never finally fixed, leaving open a space of exchange, neither this nor that; but a digital determination is utterly complete and perfectly divided from its other. Completeness here does not mean that the digital provides a representation of all of the actual object—for it leaves out a great deal—but rather, that it presents its own completeness, its absoluteness or baldness, its total lack of concealment. Fingers and other actual things are always open to question and will offer ever more to a penetrating investigation. But the digital has shown everything in its initial appearance and so provokes no questions, poses no problems, demands nothing of its observer. With the digital, as Apple said in 1984 of its “revolutionary” new computer, what you see is what you get. (Note also the etymology of the word *data*, from the Latin *dare*, to give. Digital data are givens, and are, as such, not open to question.)

The determinate exactness of the digital suggests another perspective from which to regard its shortcomings. There is an inherent difficulty in the process of digitization, for the actual is fuzzy and imprecise, and so does not lend itself without alteration to digital representation. For example, there is no such thing as an actual exact color that would correspond to the standard digital three-value representation of the color of a pixel. To overcome this difficulty, the digital operates by establishing thresholds in the qualitative continuum of the actual. These thresholds mark an absolute distinction, transforming the actual world of continuously varying qualities into the digital world of discrete and exact quantities. By dividing the actual into ranges of quality defined by endpoints or thresholds, the digital makes a range of the actual correspond to an exact value. Sixty-seven percent red, thirty-one percent blue, and ten percent green corresponds to a small range of burnt orange, which may vary slightly over that range without crossing the thresholds (the value of

a single bit) that would alter the percentages. The gap between two thresholds (the *resolution* of the digital representation) is a range of quality; but the digital imposes a uniform value on that entire range which erases the difference of quality in favor of the stasis and consistency of an exact and determinate quantity. Divide and conquer is the strategy of the digital, which reduces the heterogeneity of an actual range to the homogeneity of a digital value but as such allows the exact comparison over time and space of a digital object to itself and to others. The digital, by virtue of its discreteness, establishes an absolute standard of sameness and difference, distinct thresholds that are either crossed or not.

Surely something is lost when heterogeneity is covered by homogeneity, but what gets left behind when the digital divides in order to represent? The digital misses whatever falls between its articulations. The digital has a resolution,<sup>17</sup> and detail finer than this resolution is ignored by the digital's ordered thresholds. This suggests that higher resolution and tighter thresholds approach a complete capture of the object, a digital representation adequate to the object represented. But this suggestion effectively treats the actual world as already digital, a world built from parts, irreducible bits and pieces assembled into the familiar objects around us. On the contrary, what distinguishes the actual from the digital is a haecceity, a "here-ness" or singularity, wherein the actual testifies to its generation. There will always be an excess, always more than the digital can capture, because the actual is not fixed and static, but creative. Actuality is not the sum of elemental facts, as was the positivist fantasy in the first half of the twentieth century, but includes essentially a force of productivity that sets it in motion.<sup>18</sup> What the digital misses, therefore, is not so much what falls between its thresholds, but the creative power of the actual that will always defy fixed or static representation. This missing haecceity is not a further difference, not *something* about the object that gets missed, for any such thing about the object is amenable to digital capture. It is, rather, a productive difference, a not-yet-determined, an ontological fuzziness inherent to actuality itself. Every particular difference left out of a digital representation can be incorporated in the next round, the next scan, the next interpolation, but difference as productive cannot be digitized. The digital makes of every difference something external; it can divide and conquer, but its divisions are always from the outside. According to the logic of double articulation, the first articulation is outside in the sense that it divides a thing from others but not within itself. The second articulation divides a thing within itself, but only by

cleaving it in twain, which still leaves two parts whose internal differences remain within themselves and do not give themselves over to the digital. Neither articulation reaches the creative force of difference, the differential power of the actual.

This is to say that productive actuality is not equivalent to its form; only the abstract, the ideal, can be equivalent to its own form. Though its idealization as pure form places a fundamental limit on the digital relative to the actual, its abstraction is also the source of the digital's great power. Each bit is precisely and immaculately separated from its neighbor; every pixel has a distinct and exact value. A digital datum holds nothing back, no margin or fringe of uncertainty. The digital only deals with problems in this refined domain, where everything is crystal clear. In a conventional computer, a realm of abstraction, nothing is uncertain, nothing is undetermined, and, at least in that sense, everything is perfect. If this falls short of the plenitude of actuality, it has the great advantage of allowing complicated manipulations of huge numbers of elements without confusion and with definite, repeatable, and even undoable results. We can operate on just those parts of an image with a given percentage of red, leaving the rest alone. We can delay a combination of exact frequencies of a sound to alter a voice undetectably, instantaneously, and consistently.<sup>19</sup>

Consistency, measurability, and abstraction are the hallmarks of any standard. If the digital is becoming rapidly ubiquitous, if its application seems to know no bounds, this is due to its fantastic ability to serve as such a standard. As pure form, it provides a standard of measurement and comparison across space and time. By representing the formal properties of an object independently of the object itself, we can effectively compare that object to others or to an established standard without needing any actual experience of the object. Weight, size, shape, texture, color, composition, and other properties can be formalized and carried from site to site or transported electronically to allow distributed cooperation and mechanized labor. With a universal, generic, formal standard, a process can be broken down into spatially and temporally discrete parts that need no longer have anything to do with each other, to create elements that are unrelated until a final assembly. The digital obviates the need for an overseer or a template by abstracting the standard in a set of formal requirements; the standard itself, the form becomes the final measure.<sup>20</sup> And this standard, the form represented by digits, has only the thinnest dependence on any actuality. A few pieces of paper can store all the necessary numbers to represent the full details of huge rocket ships or manufacturing

processes. A compact disc can store encyclopedias full of information in a format that fits in a coat pocket.

It is not just that the digital provides a standard that can be readily reproduced and replicated and that allows for easy and unequivocal comparison. It is also that the digital *is itself* a standard, a standard form for representing objects, for storing, manipulating, analyzing, and transmitting information. The digital is able to accommodate a huge variety of different kinds of information, but in each case, it stores it on the same media, transfers it over the same lines, and manipulates it according to the same rules. The same analyses that reveal information about images also tell us about sounds and other data. A database, stored as digital data, can be analyzed using the same statistical techniques regardless of what data are actually in it. The notion that everything should be or can be digital is increasingly popular, and it is a dream of a universality whose proportion is matched only by such significant innovations as writing, language, and money. Besides these, what else is as broadly applicable as the digital?<sup>21</sup>

This sense of the digital not only as the representative of standards but as itself a standard for representation relates to the “inherent mutability” of digital content.<sup>22</sup> Digital discreteness, its exactness, and its pure formality mean that digital data are indifferent to their content, so that a digital representation of a sound can be seen as well as heard.<sup>25</sup> Digital data can be isolated from the data set, manipulated independently, and then restored, while evidence of this selective tampering can be erased.<sup>24</sup> These sorts of arbitrary and selective operations are vastly powerful. Consider just the power of search-and-replace in a document, or the possibility of rapidly sorting the millions of lines of text on the Internet by their relative relevance to specified digital criteria. Search engines routinely retrieve sorted lists of relevant websites in fractions of a second. The standardization necessary to allow such operations is made possible by virtue of the formal simplicity of the digital. There is no content to complicate things, to resist manipulation—nothing that requires special consideration.

So the digital achieves its vast extension and extraordinary powers by virtue of the purity of its form. It also risks by that same purity a significant impoverishment of our world. To avoid the danger of the digital while reaping its benefits would be the ideal circumstance, but we do not yet know whether this is possible. To tease out the advantages from amidst the hazards, we must inquire still further into the genealogy

of the digital. Where does the digital go astray? How comes the abstraction by which the digital breaks its connection to the actual? Or perhaps we should ask the converse question: how do fingers succeed (where the digital fails), maintaining a connection to the actual while operating at the same time in the realm of form? Let us take a further step into the conceptual and etymological history of the digital.

*Digital* discovers its origin in the word *deictic*. This is a current if uncommon word in modern English, used primarily in logic and linguistics. In logic, a deduction is deictic if it demonstrates its conclusion directly, as opposed to, say, a *reductio ad absurdum*. Linguists designate a word deictic when it is used to point out or indicate something, as is the pronoun *this*.<sup>25</sup> In both cases, and in its Indo-European root (*deik-*), the deictic is a showing. But not just any kind of showing is deictic; the deictic does not show by example or reference, but directly. It shows what is already here before us, the immediate, the present. The word *this* epitomizes the deictic precisely because it always and only refers to the immediate: this here now. In his study of *this*, Hegel provides a useful analysis of the nature of the deictic and points the way toward an understanding of its digital progeny.

In the opening pages of *The Phenomenology of Spirit*, Hegel discovers that *this* has two moments and passes dialectically from one to the other.<sup>26</sup> On the one hand, *this* is the immediate and singular experience of whatever is before you; *this* refers to the concrete being-here of *this here now*, to brute experience. On the other hand, *this* also has a mediated, abstract, and universal character: *this* refers to nothing in particular since it refers to anything at all that happens to be before you. We cannot be satisfied with either of these moments, says Hegel, because both are effectively empty.

The singular moment is empty because it has no form; whatever *this* is, as soon as it becomes definite and takes on a particular form, that is, as soon as it becomes something *for us*, it is no longer *this* but is now *that*. *This* refers only to what *is*, not to what just was. As Hegel points out, the truth of the concrete experience of an object is in that very experience. *This* is the immanent affront of sensation, and it bears no description, no form that would mark a distinction in this immanence; *this* has only an immediate and fleeting existence.

The universal moment is empty because it lacks any content; to be universal is not yet to be anything in particular. *This* just refers to whatever is before you at the moment. The universal *this* is thus a

placeholder, the general form of whatever can be before you, but without any specific content. Lacking content and utterly general, the universal moment of the deictic cannot even be said to be a form. Rather, as the form which might be any form, the universal moment of the deictic is the very form of form, the form whose only content is form. Likewise, without form, the singular moment of the deictic is not even a content but is the content of content, that which gives content to be formed: one moment of the greatest abstraction, *this* that might be anything, and another moment of the greatest concretion, *this* that is only the immediacy of experience. Form of form and content of content, the deictic passes from one empty moment to the other. As form does not meet content in the deictic, its articulations never take hold, they do not endure, but mark in a moment only the entirety, the being-present of that moment. *This* does not extend beyond its immediate and instantaneous context, and Hegel is compelled to pursue truth beyond the deictic.

To make a lasting articulation, to spill over the immediate, the deictic must effect the meeting of form and content, which is to say, it must become incarnate. An articulation that lasts, a *this* that endures requires a deictic made flesh, for where else but in the flesh does form meet actuality? Fingers retain the two moments of the deictic, but no longer as immaculately separate; fingers inhabit and admix two worlds, the material concrete and the abstract formal.<sup>27</sup> To fingers, *this* is both the concrete object whose surfaces they meld with in a direct contact and the abstract object whose points they align with, fingertip and knuckle arranging forces to a suitable shape and size, according to the form. Fingers thus hold on to *this* while it remains *this*; they pin down the abstract in the real, forging a direct contact with the actual in order to meet and manipulate form. Any hand can throw a ball, steer a wheel, or knead bread, for every hand shares the same form, applicable by virtue of that form to each object. But every hand leaves behind its singular fingerprints, attesting to the actual meeting of surfaces, to the haecceity that the formal application of fingers does not evade. From the deictic, digits inherit an intimacy with both form and actuality, articulation and haecceity, and fingers do not touch the one except in and through the other. Fingers thus occupy the liminal surface between form and the actual (but also between our insides and outsides, passion and action, sensation and activity, etc.).

The digital retains from fingers an intimate relation to form but severs all ties to actuality, excluding from its pure formality all contact with haecceity. The move from digits to the digital is clearly a process of

abstraction, but at what point in this process is content or the actual left behind? In order to count with them, we align fingers with objects in the world. Fingers measure an amount, they are matched against whatever needs counting, be it figures on a hilltop, trees in a grove, or other fingers. In this alignment, fingers become placeholders, tokens that stand for the objects they count;<sup>28</sup> and manipulations of those fingers yield results that apply to the counted objects.

Note that in this usage fingers lose their internal difference. As tokens or representatives, one finger is as good as another, and my fingers are equivalent to yours. If there is still a distinction, it is the merely formal distinction of place: as counters, second and fourth fingers do not differ in themselves, but only in the order in which they are assigned. When the finger is removed from the hand to become a line on the ground or on paper, when the finger no longer points to what is before us, but rather, to an abstract or absent case—the general—then we are no longer employing its singularity or haecceity, but treating it as a member of a species, an arbitrary digit, one among others. Soon enough, fingers give way to other tokens (stones, beads, dollars), signs, and sounds, and these various practices of counting constitute numbering *per se*, which grounds itself in fingers but encompasses a variety of tokens and their uses. (In this sense, phylogeny recapitulates genealogy, for children learn to use numbers along these same lines.) Not only is every finger, as a counter, equivalent to every other, but tokens are generally interchangeable, and we choose to count with signs, sounds, or material tokens based purely on convenience, for the end is the same in any case. Each of these things loses its specific content, its haecceity, when it is used for counting, to become a general representative, not of an object to be counted, but of a step in the process of counting.

Not just anything could serve as the basis of numbers; neither tails nor teeth fit the bill. The possibility of aligning fingers with countable objects is not invented from nothing, but derives from their form. Prior to counting, we discover in holding hands the align-ability of fingers, the way in which they match each other to the point where they are almost indistinguishable. (Hand-holding is possible by virtue of the multiple articulations of fingers, but also by virtue of the complementarity of left and right.) Where I impress my fingers in clay, there your hand too will find a grip. The manual manipulation of form is almost always generalizable: what one hand can do another can soon learn, primarily because the hand operates almost entirely through its form, and we all share this

same form. Alignment is thus given as part of the hand, so that the hand, by its nature, already directs us toward the abstraction of counting. (Alignment relies also on the liminal character of fingers, noted above. Fingers could not become alignable objects if they were too close to us. Though part of the body, the hand is also *at arms length*, so that one can see and otherwise experience one's fingers as external objects to be manipulated, aligned with other even more distant objects.)

With this genealogy of the digital in mind, we can appreciate more perspicaciously its deficiency. When the digit is itself abstracted, it loses touch with the actual and so renders all difference extrinsic or formal. The digital still makes two articulations, but it substitutes in both cases an external, formal difference for an actual, productive one. The difference between 0 and 1 has nothing to do with 0 or 1, either of which, when taken as a digital bit, is strictly nothing. The difference between 0 and 1 is external to them both; it is just a formal difference, and what it divides is itself only form. Whereas the fleshy articulations of fingers divide heterogeneously, leaving always an actuality to be further articulated, the digital makes two only by repeating one, which is why there is no positive difference, no internal difference between 0 and 1; they are exactly the same, only formally distinct, and could be wholly interchanged in the digital technologies that make use of them. The second digital articulation, of the object into parts to be measured, is also a means of making difference external. As far as the digital division goes, there is no difference remaining internal to the digital object. It is entirely comprehended by the formal distinctions that represent it.<sup>29</sup>

This analysis demonstrates the further conclusion that the digital is hermetic. Whereas the deictic remains in a context, necessarily operating in an already shared space, the digital, which makes two only by repeating one, no longer points outside of itself. It is a binary that is effectively not doubled, a binary that refers only to itself, which confirms Baudrillard's digital interpretation of the twin towers of the World Trade Center.<sup>50</sup> Certainly, the digital is doubled, and more than once, but, lacking any actuality and with only formal difference, its doublings never leave the plane of the digital to point beyond it.<sup>51</sup> Imprisoned in its own domain, the digital does not refer or show directly (which is the hallmark of the deictic), but merely represents. If it refers at all, it refers to the generic—not to a particular actual, but to a species of the actual: a type. The digital makes contact with the actual only by accident or convention and only through the mediation of the nondigital. Which is why digital signature, digital

time-stamping, and other techniques that attempt to mark a digital object as unique are so problematic.<sup>52</sup> The digital is never unique, never singular. It represents but does not present.

This understanding of the sources of the digital's power and the extent of its limitations allows us to look anew at the danger it poses. Indifferent to content and material, the digital renders everything it touches in the pure abstract form of form. When the digital is our means of approaching the world, when we apprehend and interact with the world through the digital, then we risk reducing everything to its form. In the digital, all differences become formal differences, all value becomes formal value. We can measure, quantify, and compare everything in the digital world, all according to a single, universal, formal standard. Human beings, apprehended as digital, are nothing more than a sum of formal characteristics: a digital résumé, a set of statistics, usage habits, sites visited, target marketing groups, a digital voice print, a digital signature, a digital image, homepage, ISP, IP address, screen name. Digital art foregoes aura by default, to become generic, reproducible, equivalent to its representation. The digital world does not offer a new experience each time, does not unfold itself to reveal unique forces gathered from the depths of history, for a digital object is static and without history; it offers instead the promise of generic and repeatable experience, measured by bandwidth, buyable by the byte.

This conclusion—that the danger of the digital is a reduction to form—should come as no surprise, for it is just this fear that thinkers of the digital have expressed in their commentary. Distrust of the digital resonates in the popular imagination, and skeptical questions are reiterated and codified in an endless stream of books and articles on cultural theory and technology. (Most of these questions relate to the Internet and to computers, as those technologies are the best representatives of digital technology in general.) Does the digital impoverish our experience of the world? Do computers, in spite of their promises of enrichment, actually offer only sad simulacra of reality, flattened images of finite resolution, 1024 × 768 pixels, at 120 Hz? Is the excitement and danger of fleshy human contact a thing of the past, replaced by low-risk encounters in chat rooms and Multi-User Domains (MUDs) where only data pass from one person to another? Does the Internet narrow our daily experience, confining us to predetermined possibilities and outcomes? Is choice now only a matter of the selection of one of a finite number of links determined by the website designer? Does the Internet tend increasingly toward corporate

control, the capitalist model, where the digital is just another form of money, a general equivalent that serves to define and measure all value? Does the digital, by guaranteeing the absolute equivalence of every copy, destroy the preciousness and fragility of art, obliterate beyond memory the singularity of the “live”? These are the pressing questions of the digital, posed in the margins of the mainstream by unlikely comrades: academics, intellectuals, the elderly, artists, Luddites, the Unabomber, naturalists, environmentalists, the disenfranchised, communists, and other crazies. Their warning cries are loud enough to hear, if one listens. And each of these many questions derives from the central question: does the digital reduce experience to pure form, making every difference effectively equivalent or homogeneous?

Not to worry, assure the champions of the digital, only good things can come of it:<sup>53</sup> the affordability of digital technologies, the decentralization of the Internet, its unregulable character that defies national borders and subverts existing law—all ensure that the Internet and its associated technologies will serve populist interests, will bring a richer world to a greater variety of people, will break down the distinctions of class, ethnicity, and access to information that adhere so closely to national boundaries.<sup>54</sup> From one perspective, browsing the Internet presents the user with finite and limited choices, predetermined by the web designer or DHTML code; this limitation is consistent with the pure formality of the digital as analyzed above. From another perspective, the Internet appears to transcend its digital medium to become an organic aggregate, rapidly changing its nature as more users contribute more parts, as new technologies and techniques create new means of interacting, and as production tools fall increasingly into the hands of inexpert users. Artists push the limits of digital technologies, stretching them to do things impossible only yesterday and creating a demand for the greater bandwidth that seems to make of the Internet a more palpable, more material, more detailed, and more real experience. Though much digital technology is advanced by corporate interest, and though the bulk of Internet use is guided by corporate concerns, there is also the possibility, frequently dangled before us, that the Internet enables grassroots organization, that it allows small, geographically dispersed communities to gather members and share ideas, that it disrupts the bond between power and wealth by making potent tools inexpensive and available to many, and that it encourages elective participation, the subjugation of standard categories of identity, community-based politics, self-determination, and autochthonous organization.

Whence arise these optimistic possibilities? How can technology based on a sterile medium of pure form give rise to any sort of freedom, spontaneity, or creativity? Perhaps these hopeful promises are merely the duplicitous propaganda of those corporate interests that champion the Internet in order to make the bitter pill of global capitalism easier to swallow. (Positive rhetoric surrounding digital technologies is both populist and individualist, appeasing at once the cynical left and the reactionary right, who suspect all technology of being means by which dominant forces control dissent and enforce appropriate behavior.)<sup>55</sup> Undoubtedly, there is much hype in hypermedia, but the promises proffered for digital technologies are not wholly empty. On its own, the digital is indeed confined to abstraction, sacrificing fertility for perfection, innovation for predictability. But the digital is not on its own, as it engages constantly with the human world of actuality. For all its sterile purity, for all its immaculate distinctness, the digital maintains a border with the actual, a border where its perfection breaks down, its definitiveness gives way to the productive ambiguity of the actual. This liminal space of transformation, where the abstract melts into the concrete, is the digital's fuzzy boundary, and whatever vitality, whatever creativity inheres in digital technologies, will be found in this interstitial zone.

For the digital by itself is sterile, static, and unproductive. Inert and ineffectual in isolation, the digital only becomes effective when it crosses that zone of ambiguity to become actual, a transformation that draws a line of contact between the digital and the human. Utterly useless by itself, the digital is put to use always by virtue of additional technologies that mediate between digital and actual. It is no accident that programmers, whose hands are most sullied by the digital, produce what they refer to as *code*: the digital is always a code, and as such, it requires a *decoding* before it can be used. A computer program running in the digital bowels of a machine will do nothing, have no effect, until that machine is connected to monitors, modems, keyboards, mice, speakers, scanners, printers, and so on. To run a program, the abstract code that represents it must be turned into electrical current, which flows through logic gates on silicon chips, ultimately imposing magnetic charges on the surface of a hard disk, or sending electronic instructions to a cathode ray tube that shoots a beam of electrons at a sensitive computer screen, or monitoring the electrical signals generated by the optical sensors in a mouse. An image coded in digital data has no effect on the senses until it is transformed from a formal digital representation into an actual visual presentation. These processes

take place in the gap between digital and actual, between abstract and concrete; what goes on inside a computer or on a silicon chip in a CD player is both actual and digital, corrupting each of these realms by mingling them together. Trapped in the abstract, the pure digital operates at a remove from the vicissitudes of concrete, material existence, and this distance lends it its qualities of perfection: repeatability, measurability, transportability, and so on. But the digital's divorce from the actual is also a constraint, denying it any direct power. To make its power felt, to operate in the world, the digital requires prosthetics, and therein we glimpse the *saving power*<sup>56</sup> of the digital: this essential transformation, connecting digital and actual, guarantees that we will always have at least the opportunity to intervene in our experience of digital technology, to restore some of the actuality that is stripped away when things are reduced to their forms.<sup>57</sup>

To safeguard the saving power of the digital, we must attend to this passage, to the ambiguous space of transformation from digital to actual and actual to digital. Occupying this space are all those technologies that constitute what is commonly called the interface. The interface effects passage back and forth from concrete gestures, images, and sounds to abstract forms, coded as bits. It mediates between user and computer and so is itself a hybrid, retaining characteristics of both the abstract and the concrete in the same material. (At the junction of formal and actual, the interface is thus an extension of the finger.) Not only does the interface convey the user's intentions into the realm of the digital, it also requires that the user tie her- or himself to that realm. In order to use digital technologies, one must begin to become digital, aligning one's own articulations with the spatial, temporal, and logical articulations of the interface. Computer software does not execute the wishes of the user without the user first shaping those wishes into conformity with the interface. Digital technology determines in advance which commands it will respond to, in what order they must be executed, how far it can go and in which directions. Desires that are not expressed in terms of these preestablished possibilities simply cannot be carried out. Computer users must organize their thoughts and goals into files and operations on those files; digital artists must generate their artworks in accord with the menus and tools of the software they use; users of the lowly VCR must think in terms of time slots, linearity, succession, inputs and outputs.

In other words, the user programs the interface, but the interface also programs the user, who must behave according to its strictures. Conforming to the interface, the user submits to its formal reduction,

gives her- or himself over to the digital. The interface is thus the realm of intervention, wherein we can call attention to the digital's pure formality and attempt to rectify it. It is the monitor, the digital-to-analog converter, the keyboard and mouse that determine the ways in which we accede to pure form when we interact with digital data. By challenging the interface to offer a more human experience, we fend off, at least for a moment, the threat of digital reduction. Ongoing refinements to the interfaces of digital technologies reveal the blunt edges of the underlying digital data, demonstrate the limits of the digital resolution, and highlight the repetitive or categorical nature of the tasks that can be performed. When the interface improves to the point where the medium draws attention to itself as digital, the digital data must then be reorganized or refined to take advantage of the superior interface. This dialectic of interface and data also implicates the user, who may have to reconfigure her or his senses in order to detect the digital origins of her or his experience. (Motion artifacts in digital video are generally overlooked by viewers who have not learned to see them, just as aliasing and jitter in digital sound are not heard by listeners who do not know what to listen for.) By comparing the digital always to the very experience of the actual—live music, oil painting, a roller coaster—we keep the pressure on it, push it to greater achievement, force the digital to open rather than foreclose possibilities. The digital is alive only where it is challenged, where the pipe that passes from the digital to the actual bursts its seams to carry the digital beyond itself, show its limits even while surpassing them.

This dialectical project of interface enhancement supports the information industry's strategy of built-in obsolescence. Today's computer can do great things, but it is seized by a discourse that presents it also as a step in a direction, a promise of even greater things to come. The goal of increased transparency or realism—which drives the progress of interface technologies—is universally held but does little to circumvent the homogeneity that digital technologies bring to experience. The most lifelike video screen and the smoothest multichannel audio will still offer each user a uniform experience: the same formalities, the same possibilities, the same pseudocreativity. The most effective challenge to the digital targets this uniformity, and we pose this challenge by designing interfaces to encourage originality. Humanizing the interface means more than just increasing detail in texture maps and customizing data gloves to effect a more accurate fit over the user's hands. A more human interface is one that is widely distributed, open to radical alteration, and usable by non-

experts, whose diversity would foster competing standards and generate original uses of the technology. When many people instead of an elite few create digital content, the breadth of their desires and tastes resists the uniformity that standardizes the digital, and they pose an inherent challenge to the commercialization that straitjackets the Internet for its purposes. The possibilities mentioned above for enrichment of our lives by the Internet and other digital technologies—providing a forum for the creation of new communities, promoting grassroots organization, encouraging individual contribution—all of these possibilities are augmented and secured by more human interfaces. The key to vibrant and rich digital technologies is to make sure that content is never under the dominion of a single standard, that authors are various, tools multiple, and progress unpredictable. Only by ensuring that the digital remains an open, decentralized, accessible, loose grouping of technologies and approaches can we keep it from homogenizing our experience of the world.

At the conclusion of “The Question Concerning Technology,” Heidegger, suspecting perhaps that the saving power he describes is somewhat inscrutable, points to a tangible and practical domain in which to pose the question of technology: art. Art is akin to technology as a site of revealing, but it also challenges technology, for it is not content simply to order the world as ready for use. This unique relation to technology makes art the domain in which to cultivate and nurture the saving power. The arts are still more germane to questions of digital technology, as aesthetic matters demonstrate a particular sensitivity to formal reduction. What digitized painting retains its aura? What concert breathes on a compact disc? At the same time, the promise of the digital is especially tantalizing in the realm of art; the digital offers extraordinary new powers to manipulate image and sound. Three-dimensional design, image and film editing, sound synthesis, music recording, and many other arts have all been wholly altered by digital technologies, which have streamlined traditional operations (kerning, noise reduction, video titling, etc.) and introduced completely new possibilities (selective motion blur, granular synthesis, arbitrarily complex transitions, etc.). By its nature, art pushes its media to their limits, relying for its effect on the greatest precision, exploiting the highest resolutions, appealing to the most refined sensations. As such, it challenges the digital to exceed itself, holding it to the most subtle standard of human experience. Moreover, art does not tolerate homogeneity, for it succeeds only by a fierce and determined originality. Inherently inventive, art explores the unlimited possibilities of its media

to open unexpected dimensions and inaugurate new aesthetics. Where art meets the digital, there will be a most revealing test of the digital's limits. And the essential novelty of art assures that the digital will continue to be called into question.

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## Notes

- 1 Films that play on this theme include *Virtuosity*, *Lawnmower Man*, *The Matrix*, *Existenz*, *A.I.*, *2001: A Space Odyssey*, and *The Thirteenth Floor*.
- 2 Of course, Orwell's most direct target was the totalitarian state. But *Nineteen Eighty-Four* is haunted by the nightmare of technology, without which the totalitarian state is unthinkable.
- 3 Apple Computer did not invent either the desktop metaphor or the mouse, but introduced them in a personal computer.
- 4 Friedrich Kittler, in his brilliant analysis, "There Is No Software," aims the computer at the converse phenomenon: instead of reality becoming computerized, the computer becomes a reality; instead of immersing ourselves in a virtual world of representations, we will have computers that genuinely present themselves. This is possible only when computers begin to operate, like "real" entities, through a connectivity of all their parts, every molecule a bit. But real entities are as much noise as signal, and the two cannot be sharply distinguished. Thus, this immediate computer would have to operate by virtue of its noise, not in spite of it, and would be subject to all the errors and accidents that everything else must endure.
- 5 The code according to which today's computers operate is called "binary" because the smallest logical unit, a bit, can have one of two values, generally referred to as 0 and 1. Though binary logic is almost universal in digital technologies, there is no reason in principle that a computer could not take as its basic unit an element that could have one of three possible values (ternary logic), or four (quaternary), or any arbitrary number. The current prevalence of the binary is a historically contingent result of the technologies available during the development of the computer, technologies that behave as binary gates, allowing or preventing the passage of electricity. Ternary or other non-binary systems would require different sorts of hardware to implement. It is notable, though, that while nonbinary systems might offer advantages in terms of rate of calculation or density of storage, they are logically equivalent to binary systems and offer no advantage in principle. A binary system can perform the same computations as a ternary system.
- 6 Technically, many parts of the computer distinguish not between the presence or lack of electricity but between one voltage level and another—or, as will become apparent below, between a volt-

- age level that falls between two thresholds and another level that falls between two other thresholds. What is digital about this situation is that, however it is materially instantiated, it can still be thought of as on or off, 0 or 1. The means of representing these two values is left up to the engineers, who determine which physical method to use according to the engineering requirements of the application.
- 7 Each of the terms represented by the acronym ASCII (American Standard Code for Information Interchange) is characteristic of the digital in general. Below, I explain how the digital is a standard and a code, how it is inherently information, and how it facilitates its interchange. That all of these digital characteristics are especially pertinent to America is an intriguing proposition left to a more sociological analysis.
  - 8 The digital is now the mass cultural paradigm of technology, so that older, “predigital” technologies, from tweezers to plastic, are rarely called *technology*.
  - 9 Walter Benjamin famously argues a similar point about the experience of watching a film. In a film, he says, the perspective has already been chosen by the director, so that each member of the audience sees the same object, and we consequently identify with the camera more than with the actors. Following this logic, the subject of a (hypothetical) purely digital experience would identify with a digital perspective and a binary logic. On the Internet, we ourselves become digital and, as such, generic and repeatable.
  - 10 In their chapter from *A Thousand Plateaus*, “The Geology of Morals,” Deleuze and Guattari explain double articulation with the image of a lobster, articulated twice and each time asymmetrically. The lobster has one large and one small claw, and each claw has one large pincer and one small. The present essay owes a great deal to Deleuze and Guattari’s chapter.
  - 11 Otl Aicher stresses that the ascent of handedness left one side of the brain underutilized, which excess fueled the development of language and analytic thought in early humans (23). Handedness, and its implicit asymmetry, are essential, if not inviolable, human traits.
  - 12 It must be understood that 0 and 1 are not the numbers (zero and one) that we usually associate with those symbols, but are defined by their role as binary digits. Unlike the difference between the digital 0 and 1, that between the numbers zero and one is by no means simple.
  - 13 Further examples abound. The difference between pixel-based Photoshop and vector-based Illustrator (image-editing programs from Adobe) boils down to the question of how they divide their objects into parts: Photoshop represents objects as a bunch of points (pixels) distributed on flat layers, while Illustrator represents objects as a bunch of line segments with start- and end-points (vectors). In either case, the object is divided into parts (points or lines), and each part is assigned specific values.
  - 14 An IP address is an Internet protocol address, a four-part number that, something like a street address, identifies each node on the Internet, including each attached computer. Clicking a link on a webpage sends a message to a Domain Name Server

- (DNS) with the Universal Resource Locator (URL) of that link; the DNS uses a look-up table to find the IP address of that URL, which it passes along to the server, which in turn sends a message to that IP address requesting data. The four parts of the IP address specify the location pointed to by the link in a hierarchy that hones in on the intended node. The message sent also includes a return IP address, so the responding server knows where to send the data back to.
- 15 Double articulation applies not only to the binary but to other means of representing numbers. Numbers are generally written using digits, each of which occupies a place and represents a value. Even the most brute representations of numbers—such as the concatenation of symbols that Gödel employs in his incompleteness theorem—rely on at least two distinctions, one of place and one of value.
- 16 Does the finger begin at the knuckle, or the wrist, or the neural nexus? Fingers are attached to their neighbors not only by a web of flesh but by a neurophysiology that links them together and permits no immaculate cleavage.
- 17 The digital generally operates in more than one dimension, and it can have a different resolution in each dimension. Digital sound has a time resolution determined by the sampling rate, as well as an amplitude resolution determined by the number of bits used to measure each sample. (These resolutions are not strictly achieved in digital sound representation because practical matters, such as jitter and sample-and-hold drift, get in the way.) Likewise, digital photography divides an image into pixels of a certain size and assigns each pixel a color and intensity. Visual detail finer than this size and more subtle than these color and intensity distinctions is simply left out of the digital representation.
- 18 In *Difference and Repetition*, Gilles Deleuze analyzes this force as the *virtual* and examines its relation to the actual. The colloquial usage of *virtual* to refer to anything that happens on a computer could hardly be more opposed to Deleuze's concept.
- 19 Even more common: select from your database just those people whose surfing habits suggest that they are middle-income, suburban, foreign car owners and send them all an e-mail custom-tailored to their interests. This is easy for computers not just because they can store and manipulate a lot of data at once but also because every datum is separate, every value exact, every judgment final. Give a computer a digital criterion, and it can apply it in every case, without fail and without ambiguity.
- 20 This again raises the specter of the digital's danger: a process guided by a formal standard is not subject to the intervention of human goals, since the goals have already been determined in the form. To follow a standardized procedure or to manufacture a part according to specifications with small tolerances means that the producers themselves have little to do with creation of the product, which is instead a result of the process. Innovation becomes less likely, as processes are broken down into steps, so that few people have an overview, and individual steps are performed not with a human goal in mind, but with only a specification. Originality, variation, and aura all fade in favor of replication, tolerance, and suitability.

- Processes are judged according to their degree of conformity to the standard rather than the use to which their results are put.
- 21 Is this not the dream of the virtual, to dispense at last with actuality and live in a world that is both preservable, transportable, robust, etc., as well as rich and full, inexhaustible and (comfortably) surprising? Imagine, an “undo” function for real life.
- 22 Lev Manovich analyzes this inherent mutability briefly in his chapter on cinema and the digital (304).
- 23 This translatability is not merely theoretical but is put to extensive use. There are systems to monitor data as sound, which allow human operators to hear differences that might escape visual or statistical detection. The Macintosh program Metasynth allows users to create new sounds by manipulating and “listening to” images.
- 24 Consider the controversy surrounding network television coverage of the millennial celebration in Times Square: some networks digitally excised an image on a billboard behind the televised journalists and replaced it with a digitally superimposed network logo. This operation was performed in real time and was undetectable to the viewing audience. Such selective editing occurs with increasing frequency as digital tools proliferate: radio and television stations compress their programming to make them shorter and allow room for more advertisements; photographers, video artists, and filmmakers touch up their images, collapsing, as Manovich points out, the difference between photograph and painting; entire scenes are digitally created or recreated, with photographic realism, often in real time, and in general without any acknowledgment of the unreality of the portrayed situation. The virtual melds smoothly into the actual, unremarked.
- 25 *Indicate* is, like *digital*, an etymological descendant of *deik-*. So, even, are *dictate*, *teach*, *index*, and *judge*, to say nothing of the entire *dictionary*. All of these words have in common a showing or saying, a presenting.
- 26 Hegel refers to the *hic et nunc*, the here and now, as substitutes for the *this*. Note the etymological connection between *hic*, here, and the root of *haecceity*, here-ness.
- 27 A digit exists at once in the abstract and the concrete. The question of whether an animal has digits is measured by its extension into the abstract. A body part only becomes a digit when it can be used to point, to refer to something outside of the animal, and therefore to distinguish between the immediacy of sensation and the abstraction of inside and outside. A dog’s snout is closer to a digit than is its paw, for a dog points with its snout but never with its limbs or claws. (The raised paw and bent elbow of a pointer suggest that, in fact, a pointing dog points with its entire body, since the double articulation necessary for pointing does not inhere in the snout by itself but only in relation to the horizontal axis along its back and the difference between snout and tail.)
- 28 *Token* is yet another word rooted in the Indo-European *deik-*.
- 29 It is true that every actual instance of the digital requires an actual difference, a difference that has an inside. The difference between adjacent pixels on

- a monitor or magnetic bits on a hard disk is substantive, it has an *inside*, which is why disks are sometimes unreadable and monitors blurry. But to the extent that these are understood as digital data, there is only a formal difference between the two values, a difference that is nothing but the distinction of opposition. The digital is pure form and so replaces internal difference with just another external difference; it folds form back on itself.
- 30 The airplanes that shattered the twin towers thus struck a blow against not only the corporate capitalism that the towers represented as symbols of commerce but also against that other element of globalization, information technology, so closely tied to the binary digital. See Baudrillard 135.
- 31 Confined to their own plane, digital representations can never differ except formally. Even when two digital things are different, even when a copy is imperfect, or when two digital things are wholly unrelated, their difference is still something digital. This means that comparison is always decisive; two digital things are always either exactly the same or not the same, and if they differ, we can say exactly how much and in which parts. But this also points once again to the great limitation of the digital. Digital difference is never really all that different; it is just more of the same, more of the digital. The digital is confined to a plane, restricted to 0s and 1s, and it can never, without external aid, leap off of that plane and into the ever more subtle world of the actual.
- 32 In digital representation, the specification of an original, as opposed to a copy, must be contrived by adding something extra to the digital data. Digital watermarking is a technique by which an encoded message or signature is interspersed among the data of a digital image or sound so as to be deeply embedded but also undetectable except by means of technologies specifically designed to read the encoded signature. The scms copy-bit is a code added to digital representations of sound that instructs scms-equipped technology to refuse to copy the digital data representing the sound. Public-private key systems are cumbersome means of (mostly) guaranteeing authorship of a document or restricting access to it.
- 33 Proponents of the Internet and other digital technologies need hardly argue their case. The Internet long ago escaped the confines of the academic and military enclaves that birthed it, and with the exception of those marginal kooks mentioned above, it has universal support from mainstream and corporate culture. Even so, Internet boosting is not uncommon, whether in its defense or as zealous celebration.
- 34 Evidence of this utopian attitude toward digital technology is not hard to come by, as such praise is ubiquitous in popular culture. Gordon Graham offers a critical perspective, but nonetheless details some of these utopian promises.
- 35 Whatever liberation the Internet offers, it has thus far succeeded in spreading and enforcing a universal mass culture. Internet access has become the touchstone by which technologies are measured and standardized. The result is a homogenization of computer technologies: the Windows operating system, the Microsoft browser (Internet Explorer), standard refresh rates

and resolutions of monitors, standard ports for peripherals (USB, IEEE 1394, DB9 serial ports, SCSI), standard keyboard layout, etc. Based on these technological standards are further standards of design and aesthetics: layouts of buttons, pull-down menus, frames, etc. With universal technologies and a standard “look and feel,” computer use also tends to converge onto a common terrain, in spite of the diversity that rhetorically, at least, defines the spirit of the Internet. (Microsoft: “Where do *you* want to go today?” Apple: “Think Different.”) Not only do we all use the same browser and word processor, we shop in the same places (Amazon.com, Outpost.com, eBay.com) and gather information in the same places (CNN.com, ESPN.com, Yahoo.com). Guided by uniform tools, users settle into a uniform, unsurprising experience.

- 36 The notion of saving power, as well as many other terms and approaches in this essay, are appropriated from Heidegger’s essay, “The Question Concerning Technology.” Though the present essay is not Heideggerian in its subject matter or its conclusions, it does employ many of Heidegger’s methods of analysis. For instance, both essays attempt to discover the essence of their objects by way of an etymological analysis, and both pair this etymology with a kind of genealogy. Furthermore, just as Heidegger shows that modern technology is a debasement of a premodern or authentic technology, so this essay finds that the modern digital, as exemplified in digital technologies, is a debasement of a prior authentic digital, the digital of the finger. Finally, both essays locate this debasement in the ontological conditions of

human being: Heidegger claims that *Ge-stell* (usually translated as “Enframing”) is an aspect of the world that calls especially on human beings but does not originate in them. Likewise, the present essay claims that the will to abstraction is not a choice that humanity has made, but is the fundamental condition of being human, a condition inherent in fingers, which are already abstract and concrete at the same time. Abstraction, or form, is not just an epistemological possibility, but is a real aspect of the world. The danger arises when the abstraction loses touch with the concrete, when its contact with the concrete becomes entirely mediate. This is what happens to the digital in digital technologies: the digital stands at a remove from the actual, and so becomes known only by its effects.

- 37 When it enters the actual, the digital cedes the perfection of abstraction and opens itself to the possibility of error. A purely digital bit is always exactly 0 or 1 as long as it confines itself to the abstract, but when it is stored on a hard disk or sent over a wire, the 0 or 1 may be corrupted by the vicissitudes of actuality. Made actual, a bit can lose its rigid boundary and cross the threshold that defines it as 0 or 1 to become illegible or mistaken or ambiguous. Which is why computers and digital technologies are perfect in principle but fallible in practice. Hard drives generate errors due to magnetic interference or electrical spikes; monitors blur pixels when their CRTs no longer aim properly; mice send erroneous data when their optical sensors become dirty or cracked. Such failures can befall only what is concrete, only what is more than just a pure abstract form.

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