Vectors of Sense-Production: Deleuze, Hjelmslev, and Digital Ontogenesis

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Abstract

Two recent tendencies in digital-cultural theory have attempted to critique a representational view of computation through an attention to the language that itemizes computational processes. This paper argues that that each of the thinkers aligned with these two broad camps tend to reduce this language to one of two kinds of structure. The first approach sees the structures of computation and digitality as chiefly social; the second sees these structures as an extension of mathematical and philosophical logic. This paper proposes that the task of thinking outside this schema necessitates a methodological approach to computational elaborations of language not in terms of a logic of structure but a logic of sense. Through the work of Gilles Deleuze—by way of linguist Louis Hjelmslev—I introduce a notion of sense suitable for the analysis of the logico-mathematical statements that comprise digitality. I then read two examples from machine learning and computational linguistics research that provide occasion to consider aspects of digitality traditionally elided by the dominant usages of computers in the natural and social sciences. Finally, I conclude with some proposals regarding how we might conceive of the ontogeny of a digital object from this perspective.

Introduction

In digital-cultural theory, two contemporary theoretical tendencies have arisen which seek to exceed a representational view of computation through an attention to the language of digitality. The first of these tendencies consists of thinkers who open up computational vocabularies—executable code, programming languages, network protocols, web ontologies, algorithmic abstractions—to formalist or political readings (Galloway 2006; Cox & McLean 2013; Cramer 2013). For these theorists, it is necessary to assess the pragmatic dimensions of digital language which are inextricable from its use in context. The second of these tendencies moves away from both representation and its critique, eliding pragmatic concerns in favor of situating language within a broader understanding of computation and intelligence (Land 2011; Bostrom 2014; Negarestani 2018). Seeking to elide what they view as the limits to interpretation, philosophy might once again be deployed in order to speculate as to our foundational questions regarding intelligence, the mind, the human.

Both of these tendencies tend to reduce the practical function of language in digitality to logics of structure. A logic of structure, here, refers to a systemic ontology in which a finite set of axioms defines a system's complete space of possibilities; an observer needs merely to identify the system's core axioms in order to exhaust the totality of the system's consequent elaborations through deductive reasoning. Rather than considering digital systems through the above two logics of structure—structures of Foucauldian power and structures of symbolic manipulations—I will argue that digital systems might better be considered according to a logic of sense. Through the work of Gilles Deleuze, Félix Guattari, and Louis Hjelmslev, a logic of sense will be defined in the following section of this paper as that which subsists in logical statements as their expressive potential to act on and transform the states of affairs that condition them.

Drawing from machine learning and computational linguistics research, I will then discuss two models that present opportunities to consider digital technologies in ways that depart from the logics of structure expounded by the two above-mentioned methodologies. The examples provided are not assumed to typify a qualitative leap in the level of technological sophistication possessed by digital systems which in turn necessitates the adoption of an upgraded philosophical or practical toolkit. Rather, the systems discussed here consciously emphasize particular conditions of digital systems that are silently exorcized during their familiar implementations in the natural, social, and computational sciences.

While digital-cultural theory's thinking on language and digitality has principally resided in examinations of tacit power relations or analogies between cognition and linguistic syntax, in the final section of this paper I will argue for a new critical approach which might approach these systems as multiplicitous relations between logico-mathematical statements in variegated states of individuation. In turn, this leads to thinking of digital objects as novel epistemic constructions, inaugurated by incompressible sense-events rendered in linguistic expression.

Method: Logics of Structure and Sense

The method I propose to analyze computational vocabularies, proof-based languages, and the relation between natural language and executable code is adopted from the theoretical framework sketched by Gilles Deleuze in *The Logic of Sense* (1990). Deleuze's text provides the beginnings of a program for the analysis of digital systems in terms of what I will argue is their fundamentally *linguistic-discursive* constitution. Further, I aim to show that Deleuze's account of sense, events, and expression can considered as a way of thinking beyond language and digitality in terms of post-structuralist exegetical approaches to the pragmatics of code as well as views of cognition founded upon structural analogies to language and syntax.

Deleuze's logic of sense has a particular relation to the logic of structure. For Deleuze, the logic of structure in language is characterized by the proposition. Sense is irreducible to the structure of the proposition yet inseparable from it. The proposition is defined by the circular relation between its three component parts or dimensions: denotation, manifestation, and signification. Denotation is the dimension that allows for the possibility of the truth or falsity of a statement. It is concerned with indication, or the connection between the words and images selected by a speaker and the capacity of these words and images to characterize a given state of affairs. Deleuze sees the work of logicians such as Bertrand Russell and Gottlob Frege as principally concerned with the establishment of formal denotative methods.[1] Manifestation is the dimension that encompasses the speaker's beliefs and desires. It is concerned with inferences as opposed to denotation's mere deictic associations between propositions and states of affairs. Manifestation allows for denotation to occur by providing the conditions necessary for an utterance, namely a speaker who says "I." Signification is the relation that the words and images chosen by the manifested speaker in a particular statement have to certain general or universal concepts. It connects particular propositions to other propositions through implication or assertion according to the rules of linguistic syntax. In sum, "The one who begins to speak is the one who manifests; what one talks about is the denotatum; what one says are the significations" (Deleuze 1990: 181). Sense is not attributable to any of the three dimensions. Each dimension of the proposition already presupposes the inherence of sense.

Sense is irreducible to the proposition, yet the proposition serves as its ground. Sense does not pre-exist the proposition, rather it "inheres or subsists" (*ibid.*: 21) in the state of affairs that provides occasion for the expression of the proposition to take place. Sense is not merely *given by* this state of affairs, but it is instead something which must be effectuated through an utterance. This production of sense through an utterance is the event. For Deleuze, the event is an ideal and immaterial singularity. Immaterial events align the proposition to the state of affairs that the proposition characterizes. These sense-events are the expressed of the proposition, in that the expressed is an entity distinct from the expression of the proposition and the states of affairs that frame it. Sense-events are the excess of the structure of the proposition that establishes relations between language and things. Every utterance is thus an expressive act involved in the generation of what Deleuze and Félix Guattari later call "incorporeal transformations" (1987: 75–110). Sense does not unite propositions with things but establishes the distance between the two through an articulation of difference. Sense is not the predicate of the proposition or the thing denoted by the statement's expression; it is a becoming.

1 Frege's "Sense and Reference" is an attempt to deal with sense from the standpoint of formal logic. For Frege, sense refers to aspects of a sentence with no reference or proper names with no truth value. See (Frege 1948).

Deleuze's use of expression in *The Logic of Sense* can be further understood in light of his and Guattari's reading of the work of Danish linguist Louis Hjelmslev in *A Thousand Plateaus*. In "10,000 B.C.: The Geology of Morals (Who Does the Earth Think It Is?)" (*ibid*.: 39–74), Deleuze and Guattari base their system of material stratification upon Hjelmslev's semiotic net. In turn, Hjelmslev's net is derived from the semiology of Ferdinand de Saussure; however, in his *Prolegomena to a Theory of Language*, Hjelmslev (1963) alters Saussure's semiology in significant ways. Deleuze and Guattari's "Geology of Morals" seizes upon two of these alterations. The first alteration follows Hjelmslev's reformulation of Saussure's signified and signifier as *content* and *expression*. While superficially parallel to Saussure's (1966) signified and signifier—which refer to the concept and the sound-image, respectively—Hjelmslev's content and expression are rather formed thought and speech, or the utterance.[2] Additionally, both content and expression presuppose one other: if content is not expressed, it is not linguistic, and if expression lacks content, it is not speech. Content and expression are thus both brought into actualities solely through concrete couplings in linguistic utterances, or, as per *The Logic of Sense*, sense-events. Hjelmslev's second major intervention is that of the addition, alongside Saussure's form and substance, of *Purport*. *Purport* is the name given by Hjelmslev to the unformed matter of thought. It is the sub-representative field of potential which sits below language and conditions it as a formed system of signs.

Hjelmslev's conceptual deviations from Saussure's system are a consequence of his radical reconsideration of the very nature of linguistic signs and ultimately language itself. Rather than Saussure's series of signified-signifier correspondences, the inclusion of Purport allows for Hjelmslev to conceive of content and expression as *planes of stratification*.[3] For Hjelmslev, both content and expression stratify Purport into closed linguistic sign-systems. Content and expression, when coupled, mold the amorphous, sub-representative field of strata into a single stratum of discrete isomorphisms between formed thought and linguistic signs. That is why Deleuze and Guattari call Hjelmslev the "Danish Spinozist geologist" (1987: 43). Content and expression are the two attributes to Purport's matter-substance. These radical theoretical departures from Saussurean semiology lead Hjelmslev to rename his linguistic schematism *glossematics*. Glossematics is a system for analyzing the stratification of thought-matter into language.

The glossematic view of expression is in accordance with Deleuze's use of term in *The Logic of Sense*.[4] Expression—the utterance that effectuates the sense-event—is the

2 Though Hjelmslev states that content and expression can only be defined reciprocally—and even that the terms are arbitrary and may be swapped—we can conclude from his discussion that content refers to formed thought, whereas expression refers to speech: "If we *think* without speaking, the *thought* is not a linguistic *content* and not a functive for a sign function. If we *speak* without thinking, and in the form of a *series of sounds* to which no content can be attached by any listener, such speech is an abracadabra, not a linguistic *expression* and not a functive for a sign function" (Hjelmslev 1963: 60).

3 See also Hjelmslev 1954.

4 Deleuze and Guattari indeed state that Hjelmslev's semiotic net is "not linguistic in scope or origin" (1987: 43) in their attempt to transpose the net onto their system of material stratification. For the purposes of this

contingent stratification of unformed thought-matter that *always could be other than what it is*. Deleuze says that all signifying structures need an excess; he refers to the empty circulatory square of signification as opposed to the comprehensive enclosure of airtight sign-systems. Expression, viewed through this logic of sense, always alludes to what it is not, and what it could be, namely Purport. Purport is the sub-representative plane of consistency which exceeds the structure of the proposition and acts as the vector of sense-production; the structure of the proposition is the machinery through which sense reproduces itself. Sense is the heterogeneous potential of expression to stratify Purport and then exceed this contingent stratification. It is the surplus of expression that generates incorporeal transformations on bodies and things. That surplus is the pure virtuality in which sense subsists as it becomes actualized in concrete events: "it is the task of language both to establish limits and to go beyond them" (Deleuze 1990: 8). Purport is of paramount importance to digital ontogenesis, and it renders digitality incommensurable to the logics of structure impressed upon it by critical philosophy.

Transgressing the Literal

Geneviéve Teil and Bruno Latour stake their paper "The Hume Machine: Can Associations Networks Do More than Formal Rules?" (1995) on a provocative question: "Is it possible to use the idea of networks to successfully reconstruct the logics that the concepts of forms and structures only give us very partial access to?" Implicit to the question is the authors' betrayal of a disillusionment with social-scientific research reliant entirely upon formal and quantitative methods. Here, Teil and Latour are entering a well-established debate in sociology between researchers who adhere to the quantitative and mathematically-influenced tradition of Émile Durkheim and those who adhere to the qualitative and phenomenologically-influenced tradition of Max Weber and George Herbert Mead.

Both sides of this debate are familiar with their own past advantages and shortcomings. Quantitative sociologists had the advantage of being able to provide richer narratives and predictions about actors through taxonomic classification and mathematical optimization. The statistical and demographic tools they used were well-suited for obtaining a broad, macroscopic understanding of individual cases. But decisive numerical outputs came at a cost, as quantitative sociology surrendered its apprehension of much of the nuance presented by social outliers or actors whose behavior displayed ambivalence. Qualitative sociologists, on the other hand, were able to link social actors through informal associations and networks. A more fluid approach, these means were better equipped for dealing with large amounts of

paper, I will be adhering to Hjelmslev's *linguistic* use of the term "expression." This conforms to Deleuze's use of the term in *The Logic of Sense* more so than the later material–geological connotations of the term as used with Guattari in *A Thousand Plateaus*.

data where actors exhibited ambiguity and heterogeneity. At the same time, the practical efficacy of these analyses was limited due to their illustrations of simple co-occurrences between a model's elements.[5]

Teil and Latour unapologetically side with the latter camp. They believe that representational architectures founded upon strictly formal-logical and structural rules are only able to merely refer to or summarize concepts, abstractions, and even facts. Rather than buckling and giving way to the quants, their paper aims to explore the possibilities hitherto ignored by computational means of techno-social analysis. They want to test whether modern computers might render this quantitative-qualitative trade-off not so cut-and-dry. They thus submit that computers need not necessarily be quantitative rather than qualitative in execution, and they propose the construction of a system that would operate in terms of a multiplicity of poor associations as opposed to a decisiveness of strong construction.[6] This would free contingent and elemental parts from their relegation to mere instrumental roles in the construction of a whole that subsumes them.

They call this system the Hume-Condillac Machine. The Hume-Condillac Machine is a rudimentary attempt to build a program with an absolute minimum of instructions and constraints. It is thereby starkly opposed to the use of computers in cognitive neuroscience, in which models are employed as functional, mechanical representations of the human brain, and abstract predicative diagrams are simply provided to the system by the researcher. Teil and Latour want to show that a machine's innate facility to render local and specific connections between addresses already instantiates these concrete diagrams themselves. Such is the computer's vernacular. There is therefore no need for an overarching structural logic or macro-design governing the assembly of such a machine: "Is the computer blind? Then so are we. Does the computer have no formal rules to start with? Neither do we. Does the computer not deal in abstractions? Neither do we. Does the computer just feel its way from trial to trial, from circumstance to circumstance? So do we, and we don't ask any more of it" (Teil & Latour 1995).

The Hume-Condillac Machine analyses text. While it has no prior knowledge of the input data, using text permits that each input datum assumes the form of a discrete keyword. Teil and Latour feed a corpus into a crude micro-computer. This computer is suitable for handling only a small amount of data; if successful, the logic of this compositional bricolage could be mapped onto more fortuitous systems with plentiful processing power. In order to strictly register associations between data, the machine must not read sentences as sequential conferrers of meaning. Instead, each input sentence must be transformed into a non-sequential

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[5] An inquiry into the epistemological, rather than purely methodological, underpinnings of this debate can be found in (Bryman 1984).

[6] Teil and Latour's move toward addressing the epistemological status of structure in computation mirrors ongoing high-level debates in machine learning, such as that between Gary Marcus and Yann Lecun, regarding whether or not today's deep learning systems need more or less innate structure. See (Marcus 2018) and Marcus and Lecun's debate moderated by David Chalmers (Marcus, Lecun, & Chalmers 2017).

diagram of keywords. For this transformation, Teil and Latour use Candide, a primitive French-to-English statistical machine translation program designed to operate through alignments between words. According to its designers, Candide's transformations are designed to make "coordinating phrases resemble each other as closely as possible with respect to length and word order" (Berger et al. 1994: 160–161). Sentences become networks. The sum total of these networks is then itself the analyzed corpus.

Each keyword in the network is assigned an address in the computer. The iterations of each single address are rendered in binary code and itemized on a list. The associations between pairs of addresses are then assigned a variable; if, say, word e_i and word e_j co-occur, they are assigned to connection variable *C*. *C* is then given a consistency coefficient *X*; *X* is assigned a value between 0 and 1. An association's *X*-value can thus be defined by as $Ce_{ij} = X$ where $0 \leq X \leq 1$. Crucially, *X* is based on the *strength* of the co-word occurrence, and here strength is not merely established by quantitative co-occurrence frequency. Rather, the system takes into account frequent co-occurrences between infrequent words, classifying these associations with a high coefficient value alongside frequent co-occurrences between frequent words. Dependent keyword links are thus classified solely according to qualitative connective strength as opposed to a deference to quantitative metadata such as number of co-occurrences.

The Hume-Condillac Machine operates according to a non-sedentary and nomadic distribution. The opposition between a sedentary and non-sedentary distribution is central to Deleuze's logic of sense and his wider ontology.[7] A sedentary distribution corresponds to the ontology of Aristotle's taxonomy. In the Aristotelian framework, beings are partitioned into species and genera, and each individual being correlates to a discrete location in the taxonomy based on its possession of particular fixed and immutable properties. The taxonomic space inhabited by each being contains the totality of the properties attributable to it. Sedentary distributions are functionally analogous to the use of predicates in first-order logic: a being's actions and attributes are subsumed under the fixed identity from which they necessarily follow. A nomadic distribution, by contrast, cuts across this spatial and territorial distribution of attributes. Here, the ontological prioritization of fixed properties is destabilized; nomadic distributions are necessarily opposed to an ontology that sees the world as populated by fixed subjects and stern predicates. Instead, a nomadic distribution speaks to a non-spatially-bound conception of pre-individual singularities in a perpetual process of becoming. Ontology becomes ontogeny. Things do not emerge from a static point; they are defined not by *what they are* but by *what they can do*. Whereas in a sedentary distribution "the attribute is understood as *predicate* and not as verb, that is, as concept and not as *event*" (Deleuze 1990: 97), a nomadic distribution sees pre-subjective forces marked by ontogenetic movements unbound by the static space of species and genus. If cognitive science's world of

7 Deleuze first introduces the distinction between nomadic and sedentary distributions in *Difference and Repetition* (1994).

computational structure errs towards a sedentary distribution, the Hume-Condillac Machine typifies a nomadic one.

The heuristic necessitated by this kind of nomadic distribution of associations is not to begin with a sedentary image of what the researcher wants to build and then to subsequently fill in the corresponding gaps according to a teleological blueprint. The question asked is not what kind of architecture can they can build, but rather what kind of architecture can the materials they have at-hand build: "Amorphous silicon and electrons have *their own way* of being in the world" (Teil & Latour 1995). The materials themselves speak, building the machine ground-up through finite connections between address locations. Like a logic of sense, it is, as they say, "blindly empiricist."[8] The qualitative connections instantiate the object rather than being merely subtended to a macro-structural taxonomy. Each connection, each element, *expresses* the machine as an intensive property without *representing* the machine as an extensive predicate of a sedentary point.

Through the Hume-Condillac Machine, Teil and Latour aim to demonstrate that forms and structures cannot encapsulate the totality of an associational network whose very logic these forms and structures are employed to compress. Their working methodology thus rests upon the presupposition that within every structure is an inhering and subsisting potentiality for the generation of surplus. Teil and Latour's machine concretizes this potentiality through the heterogeneous expression of informal associations between networks of words. And it does this through the materiality of the computer itself; the resulting aggregate word-associations are merely an application of the computer's base-level ability to draw connections between the physical locations of bytes of data on a disk.

The Hume-Condillac Machine is an example of a simple attempt to open up computation's axiomatics of structure; Teil and Latour's ad-hoc construction of an associational word-network is explicitly rudimentary in its approach. By contrast, contemporary computational linguistics research sees more complex and systematic attempts to model language. While the Hume-Condillac Machine attempts to escape all formalisms entirely, Michael Frank and Noah Goodman's Rational Speech Act theory harnesses sophisticated statistical and formal measures with the aim of capturing functional informality and operational fluidity.

Frank and Goodman's Rational Speech Act (RSA) theory situates recursion as the ineluctable basis of communicative inference. In their paper "Predicting Pragmatic Reasoning in Language Games" (2012), Frank and Goodman first propose the efficacy of importing Bayesian inference into the analysis of language games. In the RSA framework, a speaker and a listener engage in a coterminous process of recursive reasoning; an interpreter reasons about the speaker's reasoning about the interpreter and vice versa. In a later paper, Frank and Goodman (2016) outline a formal hierarchy for this recursive reasoning process: a

8 "The logic of sense is inspired in its entirety by empiricism. Only empiricism knows how to transcend the experiential dimensions of the visible without falling into Ideas, and how to track down, invoke, and perhaps produce a phantom at the limit of a lengthened or unfolded experience" (Deleuze 1990: 20).

pragmatic listener and interpreter P_L assumes a given state of the world *w* for the speaker P_S based on the speaker's production of an utterance *u* which is assumed by P_L to be the best attempt by P_S to characterize this state *w*. In order to avoid an infinite recursion, which would occur through P_L and P_S continuing to infer about one another's inference, Frank and Goodman place a naïve listener P_{LIT} in the matrix. P_{LIT} interprets all utterances literally. Thus, P_L can merely make the assumption that the intention of P_S is to maximize the probability that *u* will be understood to characterize *w* by P_{LIT}.

This attempt to limit RSA's recursive inferential process through the emplacement of P_{LIT} has the unfortunate effect of instilling on their model the supposition that all communicative acts tend towards the literal. Through their anchoring of communication in P_{LIT}, the functional utility of inference in RSA becomes a mere shift from the impurity of the non-literal towards the purity of the literal. This insertion betrays Frank and Goodman's desire to manage or cancel out the more cumbersome facets of communication as though they could force the rest of language into a computational model like a Tetris piece. This is because it is dubious at best to expect communication to always move towards a literal anchor. There are two major reasons for this. First, a growing body of psycholinguistic research indicates that routine acts of interpretation of non-literal statements are bound up with and even indistinguishable from interpretation of literal statements (Rataj, Przekoracka-Krawczyk, & van der Lubbe 2018). Second, it is difficult to for an interpreter to pinpoint the precise moment at which a speaker's utterance transgresses the literal. For example, P_S can speak with terminology that includes "entering a shop," "entering a dialogue," or "entering a situation" without in any clear-cut way entering the realm of the non-literal. The authors thus operate according to an ideal notion of language; as Paul Grice (1975) argues, non-literal linguistic devices such as hyperbole, metaphor, and irony—those used in utterances which are factually ambiguous or even denotatively untrue when considered literally—violate a definition of language as the most efficient and straightforward means of information transfer. While Frank and Goodman's ideal notion of language allows for conciseness and comprehensiveness when it comes to modelling simple acts of literal inference, their reliance on literality in RSA is problematic.

If we remove P_{LIT} from the equation entirely, we can just as easily imagine an alternative and radically new version of Frank and Goodman's RSA model that yields a vastly different output. Let us call this hypothetical model RSA*. RSA* does not count P_{LIT} among its variables. Instead, P_L makes the assumption that the intention of P_S is to maximize the probability that *u* will be understood to characterize *w* not by P_{LIT} but by P_L^n. The distinction between P_{LIT} and P_L^n and is that P_{LIT} interprets all utterances literally, whereas P_L^n does not necessarily do so. In keeping with the coterminous reasoning of Frank and Goodman's original model, it follows that P_S^n represents the assumption made by P_S about the likely assumption made by P_L that the intention of P_S is to maximize the probability that P_L will understand *w* given *u*, whether *u* is interpreted literally or not. P_L then therefore infers *w* in accordance with the data represented by both u and P_L^n, while P_S molds u in accordance with the data represented by P_S^n. But the process does not end here. P_L^{n+1} represents the assumption made by P_L about the assumption made by P_S^n about the assumption made by P_L that the intention of P_S is to maximize the probability that u will be understood to characterize w by P_L. The point here is that once we remove our literal anchor P_{LIT}, RSA* does not contain a definitive end-point for the inferential process. Both P_L and P_S may assume one another's assumptions ad infinitum. The recursive inference of RSA* continues indefinitely, with each consecutive iteration of the recursive cycle adding two new variables $P_L^{n+=1}$ and $P_S^{n+=1}$ to the equation. Because RSA* does not tend toward the literal—represented by RSA's variable P_{LIT}—the recursive reasoning in this model is theoretically infinite.

Removing the literal anchor thus has the consequence of rendering communication an infinite, incompressible inferential process. The theoretical and philosophical significance of RSA* is not only that it muddles any distinction between communicative, inferential, recursive, and computational processes; it also situates this synthesis as interarticulated with temporality. While this model is still indeed an attempt to fit cumbersome facets of communication into a computational model, it differs from the Frank and Goodman's RSA for the crucial reason that the inferential process it refers to is computationally irreducible to the model itself. As stated above, recursion in the RSA* hierarchy is theoretically infinite; the depth of the model's recursivity is limited only by computational processing power and time. One might counter by arguing that an infinite communicative process is impractical or absurd. P_L does, at some point, need to make a decision about what state w is being characterized by u; if P_L never made such decisions, communication as such would be a functionally impassable exercise. We know from experience in the world that P_L does indeed make such decisions; those are the crux of interlocution. But because there is no end to the recursive process that would yield a literal output as in RSA, the decision made by P_L in RSA* about state w is necessarily imbued with indeterminacy and accident. In RSA*, u becomes a variable contaminated with contingency; returning to the vocabulary of Hjelmslev's glossematics, u becomes contingent, stratified expression.

RSA refers to time as Chronos; RSA* refers to time as Aion. In *The Logic of Sense*, the distinction between these two times is central to the locus of the event.[9] Chronos is a successive time, a measurable progression from past to future. It emphasizes the material organization of actions and passions as they are distributed in space as bodies and things. It is a time of the present and a time of the actual. While Chronos opposes past, present, and future as three distinct temporalities, past and future merely exist relative to a fixed point in the actual present. Time as Chronos lives inside these fixed and limited presents, and it annuls difference through "good sense." For Deleuze, good sense is opposed to sense as such. Beginning in a state of pure difference, good sense views the universe as undergoing a temporal movement

[9] The Chronos/Aion distinction is discussed throughout *The Logic of Sense*, but its most extensive elaboration occurs in the chapter "Twenty-Third Series of the Aion" (Deleuze 1990: 162–168).

toward the total effacement difference.[10] In Chronos, time is the cancellation of difference and a repetition of the Same and Similar. Aion is the time of the virtual. It is an abstract time, and it is an *intensive* time in that it is not concerned with the *extensive* progression from past to future through successive movements of sedentary presents.[11] In Aion, time becomes an infinite abstract line stretching in two directions at once. The present is an infinitesimal point, infinitely sub-divisible and forever eluding itself as both a past it was and a future it will be. In these unfixed instants, each event communicates with every other event in an unlimited nomadic distribution of pre-individual singularities spanning both directions of the abstract line. Propositions endure in infinite series, where the sense of one proposition is articulated by another whose sense is then articulated by a third. RSA moors communication in Chronos with its literal anchor. RSA* steers communication toward infinite Aion through incompressible recursion and sense-production.

Both the Hume-Condillac Machine and RSA* present occasions for reconsidering the role of the language in computation and in the digital. In the case of Teil and Latour, sociological analyses reliant on the taxonomy are ontologically degraded, relegated to a subordinate role relative to qualitative, intuitive, and conditional networks of relations between keywords. In the case of RSA*, the introduction of infinity into a computational model presents an almost non-computational image of computation, where an intractable computational procedure forever eludes its own structure as infinite data conditions its algorithmic output. Rather than reflecting hermetically sealed and ironclad axioms, both of these systems position both their internal composition and outputs on glossematic planes of expression. Outputs here are conditional, irreducible to a logic of structure, always alluding to their own ability to refer to data outside themselves.

Digital Individuation and the Incompressible Expression Plane

Yuk Hui's reading of and departure from Gilbert Simondon's theory of technical individualization is an exemplary account of the becoming of the digital. Simondon's philosophy allows Hui to reframe digital objects as novel epistemic compositions comprised of heterogeneous relations between logical statements. In Simondon, individualization is distinct from individuation. The two terms are not opposed; they rather refer to two separate dimensions of a becoming. In general, though, Simondon refers to individuation for living organisms and individualization for technical objects.[12] Individuation names the relations between

[10] Deleuze first couples "good sense" with the second law of thermodynamics, wherein differences in intensity propel systems towards equilibrium, in *Difference and Repetition* (1994: 222–228).

[11] For an application of intensive versus extensive/metric time in the physical sciences, see (De Landa 2002: 82–116).

[12] Simondon primarily dealt with the former in *L'individuation à la lumière des notions de forme et d'information* (2005); he primarily dealt with the latter in *On the Mode of Existence of Technical Objects* (2017).

an organism's anatomic distributions; these relations undergo dialectical movements that propel biological development. Individualization, by contrast, names the procurement of particular functionalities which distinguish the individual within a milieu that the individual nevertheless depends on. The question as to whether *technical* individuation, rather than individualization, can lead to *digital* individuation, is the line of inquiry pursued by Hui.

In Simondon, the term *relative technicity* refers to an object's status in the project of progressive determination from abstraction to concretion. Physical and environmental constraints impose specific restrictions that stifle particular functionalities and swell the development of others. The sufficient development of an individual's particular mechanisms through its physical circumstances as well as ancestral inheritance concretizes it, giving it an internal and external integrity that maintains its coherence as a discrete entity. No single thing exists alone as a technical object; an object needs a milieu which activates and buttresses its functionalities. This milieu need not consist solely of fabricated elements, but also of objects of the natural world, favorable environmental conditions, and physical location in space. That is why Simondon refers to it as the "associated milieu" (2017: 59–66). The milieu is both technical and natural. An object may even have multiple associated milieux: an audiometer requires stabilization by two separate associated milieux, one for the oscillator and one for the transducer. Milieux must synergize the object's "infra-individuals" (*ibid*., 66) or the object is stripped of its practical efficacy in the world and its corresponding status as a technical individual.

Hui aims to characterize a shift from Simondon's technical individual, which "specifically refers to a hardware system rather than to digital objects, which consist mainly of code" (2016: 56), or a set of logical statements. The shift from hardware object to digital object is a question of reconsidering the nature of the object's infra-individual elements and its associated milieu. For digital objects, sets of statements structure the object's infra-individuals; these appear in the form of executable code, programming languages, network protocols, web ontologies, and algorithmic instructions. Hui's first intervention into Simondon's technical philosophy is thus to allow for the entrance of language into his digital epistemology. Language demarcates the digital object's ontogenesis and maintains the digital object's internal integrity in the world.

Hui recounts the digital object's individualization through language. He discusses the development of the semantic web through the standardized adoption of markup languages. First, GML—Generalized Markup Language—inaugurated the convergence of text editing, database retrieval, and web-page composition, a trichotomy that marks the fertile ground upon which the seeds of contemporary digital-technological functionalities were planted. Through the transition from GML to the International Standard Organization's implementation of SGML—Standard Generalized Markup Language—the content and form of the semantic web decoupled. Then, as today, users needed only learn the web's *form*, such as metadata schemes and simplified user interface keywords, rather than the web's *content*, largely rendered in machine code. HTML—HyperText Markup Language—branched off from SGML, and, while operating through a principle of simplicity, still schematizes the structural, visual, and hypertextual metadata of the World Wide Web today. With each version update, HTML collected new semantic tags and, at version 4.0, integrated CSS—Cascading Style Sheets—for the separation of style formatting, and then XML—eXtensible Markup Language—in order to absorb the developing ubiquity of multimedia online formats. HTML version updates adopted the representational types of XML as XHTML, growing into HTML5 in 2011: the current recommendation of the World Wide Web Consortium.[13]

The concretization of web ontologies, Hui argues, gives way to a concretization of the digital. As HTML5 introduced more transportable modes for object metadata cataloguing, internet users began to more fluidly interface with metadata such as geotags, object IDs, media creation date, and persons or content associated with objects. Web Ontology Language (OWL) and Resource Definition Framework (RDF) geared data retrieval mechanisms towards refinement. It is important to note that the collective adoption of these standards across global computational networks is indeed an integral part of the individualization process itself. The universality of these ontologies sharpens the internal integrity of individual digital objects; the grand-scale adoption of standards allows for a consistency and stability that supports the extension to progressively new functionalities. A digital object, whether image, text, or multimedia, can then be characterized "in terms of markups, which make explicit their meanings, and can now be further formatted in terms of their appearances. We should also recognize that this is the process of objectification *as* concretization" (Hui 2016: 65).

Hui's chronology is an account of the linguistic-discursive individualization of the digital object. Language forms the infra-individual elements of the object, while the abstract formal schematizations which structure these compositions of language form entities within the object's associated milieu. It is thus primarily language which sustains the object's becoming, erecting its semi-autonomous internal coherence within an environment that reflexively works to buttress it. Of course, the associated milieu of a digital object accessed via the internet incorporates programmers, routers, server farms, fiber optic cables, and electromagnetic currents. But the definitive difference between Hui's digital individual and Simondon's technical individual is the primacy of language in the digital's individualization.

But digital ontogenesis does not stop at its individualization; individualization must give way to individuation. Individualization establishes the digital object's distribution in space; individuation establishes the digital object's relationship with time. The latter names the contamination of space by time through a disruption of individualization's sedentary distributions of propositions in localizable presents. Its interarticulation with time is twofold. First, the logico-mathematical statements of computation only become pragmatically efficacious once the script is run; script execution occurs in the time of the computational data

[13] Specifically, HTML 5.2 is the current recommendation. See https://www.w3.org/TR/html52/.

processing. Second, the relations between code-statements distributed in space necessitate reshufflings and reorientations in ontogenetic movements that inevitably refer to a time other than the present. Code-statements distributed in space allow for sets of relations, and it is these relations that constitute the digital individuation.

Telecommunications networks are vast geographical associations of machine agents whose medium of exchange is the logical statement. In a client-server architecture, two machines interact with code over network protocols, communicating with one another through propositions in time. The architecture thus functions through the relations between statements that emanate at a distance: an image loaded on a browser is the product of a relation between the machine code of a client-based display, one or several network protocols, and the machine code stored on a host server. The architecture recalls the conversational model of RSA*; an object's infra-individuals coalesce through a communicative transference of logical statements in runtime. Like RSA*, every machine agent communicates with every other machine agent through the inference of utterances in a theoretically interminable dialogic process. The transference back and forth of propositions over network protocols constitutes an apprehension of the virtual infinite time that conditions propositional statements; the proposition's execution becomes a stratified expression. The expressions expressed by machine agents are conditioned by the multiplicitous potential of virtual relations which are irreducible to any one given structure in any one sedentary present. Communicative relations emerge through the execution of code in runtime and the rearticulations of particular statements necessitated by other statements in the milieu.

The immanence of excess data in algorithmic propositions has been further articulated by Luciana Parisi—specifically, in the importance placed by Parisi on Gregory Chaitin's mathematically incompressible Omega number. Chaitin's Omega is a discrete yet algorithmically random number between 0 and 1 that expresses the unknowable probability that a given computer program will halt.[14] While the number is real and definable, no amount of computational processing power can calculate the totality of any one of its infinitely many binary expressions. Parisi emphasizes that for critical theory, the significance of Omega is that "algorithmic objects cannot be contained by a metacomputational ontology" (2013: 7). If discrete algorithms are always conditioned by the immanence of immensurable infinities that exceed them, philosophy can no longer view computation simply as a succession of discrete steps mechanically deduced from a priori programs. Instead, Chaitin's digital halting problem establishes that the nature of computation is irreducible to the structure of simple algorithmic statements. Incompressibility enters the logic of algorithms.

It follows that a digital object is not reducible to the structure of an algorithmic proposition. For an object to be digital, rather, refers to its constitution by the heterogeneous virtual relations between logical statements whose immanent infinities exceed their stratified expression in concrete sense-events. Every code-statement is a proposition; it acts on a state

[14] Also known as Chaitin's constant, an exposition on the number can be found in Chaitin 2007.

of affairs following its execution in runtime. In turn, these executions necessitate reorganisations of the relations between other code-statements that comprise the object and its associated milieu. The code-statement's potential to always exceed its fixed and limited present is typified by the evolving nature of its relations with other the code-statements in its state of affairs.

The digital coheres on a plane of expression. Every logical statement rendered in code, every expression, is a contingent stratification of virtual inter-objective relations and algorithmic infinities. Code-statements maintain the expressive potential of Purport. It conditions them through the evolving relations of individuation. These ontogenetic movements necessitate that the expression of any one code-statement always contains an excess of that which is expressed by it. That excess is alluded to but never wholly encapsulated by the expression of the totality of the digital object's code-statements at any one fixed and sedentary present. Its virtual expressive statements are irreducible to a propositional structure. An object's digitality thus presupposes an irreducibility to the structural mechanisms of power-in-action or the syntactic manipulations of logico-mathematical symbols. Digitality through a logic of sense instead sees objects individuated through the convolutions of irreducible and incompressible sense-events, rendered in logical statements of code.

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