A Poetics of the Data-Image

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Abstract

In a world where information is ubiquitous, something has been lost in the firm delineation made between "raw" data and its eventual representation or visualization. This work proposes the concept of a *data-image* as translating function in this process, operating between past presence and future possibility. It originated with a single practical question for data artists: what materially are they capturing in their work, and what is at stake in the technical mode by which this is achieved? An analysis of the data-image reveals gaps left unaddressed by existing frameworks shaping the fields of data visualization and data art, opening up a radical space of possibility in the aesthetics and politics of image-making. But what is this latent data-image and what does it do?

Author Keywords

Data image; data visualization; data; new media; semiotics; installation art; aesthetics; archive; data exchange.

ACM Classification Keywords

Visualization theory, concepts, and paradigms; empirical studies in visualization; data types and structures.

Introduction

Ours is a world saturated and shaped by data, so it comes as no surprise that data is increasingly employed as artistic medium as well [3:75]. Anywhere that data is involved, there are two critical moments of human intervention: capturing it (or structuring its capture), and representing it (or structuring an algorithmic means by which this is done). Other scholars have examined a number of dimensions that inform the latter in reference to data visualization [3, 4, 7] but there is little interrogation of the potentials and poetics of this earlier decision.

In data art the question is particularly critical. Working from a wide variety of technical backgrounds, data artists are less beholden to the doctrines, values, or practices that may inform specific areas of academic research—assumptions which in those contexts wave away the examination of fundamental existential questions and decisions that underlie the collection and

use of data. As such, the objective of proposing a poetics of the data-image is to suggest a framework through which the technical and practical questions data artists encounter may be examined in all the ethical and ontological dimensions they possess.

Just as a thorough ontology of the image would span tens of fields across centuries of analysis, sufficient treatment of the data-image warrants deeper study in each of the fields it touches upon: embodiment, memory, media studies, bioethics, etc. The following work defines the data-image and seeks to cursorily sketch the major ruptures and apertures of understanding it poses to existing analyses of data visualization and data art, advocating further specific tracings of how data artists may conceptualize the full dimensionality of the space in which they operate.

Data and Images

It is notoriously difficult to apprehend a universally agreed upon definition for *data*, *information*, or *image,* so let us sketch our local landscape before adding anything new.

By *data* here I mean what Alexander Galloway refers to as "the mere stuff of the world, the raw material of measurement" [4:89]. In the information visualization literature this notion persists as *abstract data*, those raw quantified things waiting latent, as it were, to be mapped into visual being. Data points to the quantitative, albeit not necessarily to "facts" per se: here *data* makes no inherent claims whatsoever to organization or metadata which might render this raw sensory stuff useful. Numbers at least serve as the requisite abstraction that makes them virtually *usable* [12:128]. Across much literature in both information science and data visualization communities is an emphasis on the need for data to be collected, curated, and presented in order to effect meaning; this is a distinction I preserve in the use of the term *data* although is one challenged by the *data-image*.

To consider data raw or abstract need neither be an ontological argument, rather a technical and practical one. As Lev Manovich observes, "mapping one data set to another is one of the most common operations in computer culture / new media art" [7]. The fluidity with which this occurs is thanks not merely to the digital but also to the numerical, as humanity has quantified (ascribed numerical counterparts to) our dominant sensory media and then some: wavelength and frequency of light or sound, heat of peppers, volumes, dimensions, thereby enabling baseline mappings and translations among them.

Such definitions of data also seems to match a high-level technical distinction which defines in the information flows of the Internet *data* and *documents* in turn [11]. *Data* in this conceptualization are raw facts and bits, stored to afford uniform ease of access, in contrast to *documents* which are specific instantiations wherein data if presented is combined with the rules for its display, text, images, or other more idiosyncratic markup. Data are necessarily stored as documents in the sense of files, but the distinction here is one of affordances not materiality.

Images, equally mercurial, are nonetheless described in broadly very different terms. As others have noted, a true survey of the literature on the image need encompass technical, scientific, media studies, and while I will make reference throughout to various

conceptions of the image, such a comprehensive survey is far outside the scope of this project. In its place I would like to propose my own definition of image as a registration of intensities, captured over a set interval of time. By captured, I mean stored or embodied in some material form which permits the redeployment of the image in future contexts where the original referent is not present. What material form specifically (film, paper, vinyl, bits on a hard drive) is irrelevant to the object's fundamental image-ness, whatever other effects it may have. Photographic film registers light intensity. The digital photograph likewise, now stored as quantifications of color and brightness (the technically arbitrary division of which into individual pixels does not for our purposes change its character as a registration of visual information from the world onto medium). Audio recordings by these terms would be understood as a form of image as well, the registration of sound intensity qua amplitude and frequency.

What my image is not, clearly: limited to the visual. Indeed it is towards a very specific purpose that I suggest such a media-agnostic definition of image: one which strictly speaking better replicates what we might call *representation*. Foremost, that we *see* images in a certain way which I believe helpful to elucidating certain attributes of data which otherwise often feel too abstract to grasp in concrete terms. It entails a risk, surely, of ontological slippage, but I aim where this arises to present specific parallels we might parse for data and image each in turn.

Also, given the many modes and media through which data is understood to be translated (media-ted) into information, it serves to have a common generic noun by which to refer to such a specific instantiation; there is a compactness and specificity to *image* that the more abstract *representation* seems to me to lack. It is not a rhetorical move without precedent, either: WJT Mitchell charts a family tree of images which include perceptual, mental, and graphic among them [8:505], and Jacques Rancière writes compellingly of images whose medium is language [10]. I would suggest that the structure I propose holds likewise for other kinds of images captured without the aid of machine (painting or sculpture for example) even as it becomes considerably more difficult to define what combination of objective, idiosyncratic, and subjective intensities enter into these processes of registration.

In reality, it bears note that machine-based registration also suffers this same condition. As Wendy Chun reminds us, a computer "does not simply relay what is on the other side: it computes" [2:17]. Temperature, slight voltage fluctuations, factory variability, and other factors may impact an electrical machine's reading. Mediation was always inescapable, but fortunately no images were harmed in the making of this picture: there is nothing about images (visual or otherwise) which depends on them being a direct translation of some alleged reality.

What is a data-image?

If we can agree (or defer judgment) that this definition of image is appropriate, what does that do to data?

It turns out it is an argument which will hinge in part on the notion of specificity, so I should be specific. This is a question that arose (continually arises) for me in an interactive artwork of mine, *Breath Vessels.* For now the details of the work are unimportant but for its technical crux: participants are invited to exhale into a

small handheld machine with an onboard accelerometer and anemometer. The question which continues to trouble me is a very simple one technically and a troubling one otherwise: how should I as the artist store the information generated by this short interaction?

For by now we can conceive easily enough of a *data-image*, for data is defined by intensities as well. In the artwork here presented, the medium in question is wind (air flow), detected via intensities of voltage in a sensor, to which it is indexically linked. These analog rhythms are processed or stored as that raw intensity of numbers, which of course somewhere deep in the machine means bits and their tiny exchanges of voltage again. Intensities, as it were, all the way down, albeit not without their translations (an analogue-to-digital convertor translates the originally captured voltage to numbers, whose ultimate existence as electrical pulses is so heavily mediated by layers of process and protocol that it would merit its own study to discuss in any kind of nuance). Fortunately, whatever distinctions this mediation does make, under our definition it does not impact the image-ness of the data-image any more than the chemistry of the stop bath impacts that of the photographic image; as we agreed earlier, there is always mediation of a kind, and this is ours in data.

I should clarify: the data-image is an alternative means of conceptualizing a given set of data. It is not an alternative to the way data is stored or used in any technical way. It is what happens when we want to believe that data is raw and abstract and waiting for form but are forced to recognize the inherently spatial or temporal relationships that individual captured datapoints have to one another. In the example of this installation, who could argue that once captured, there is not a certain latent form already in the data-image: *this* rhythm, *this* pattern of breath? Surely there is an aesthetic question of how the data-image is translated into image, but in whatever media it is mapped, isn't the point of data that this underlying flux and these underlying internal relationships persist? Numbers may become light, sound, color, lines, recipe ingredients, or flight paths, transposed into any number of spatial or temporal forms but in some way, each re-presents that same primal rhythm, maintains the internal coherence of one datapoint's relationship to another. Said another way, the rules of conversion may be any, but within those rules *this* mapped data will always look like itself and moreover it will always look different from *that* one comprised of other points and a diverse rhythm. Could we draw a different box, capture or visualize a different set of data? Of course! Couldn't we also with the intensities registered by the camera or in their post-processing?

For all the rawness of data I do not hold any illusions about the data-image capturing "raw" reality any more than the photo camera: machines like hands vary in precision, artists or programmers set refresh and baud rates as photographers set exposure. Moreover numbers for all their reproducibility are also inherently arbitrary: machines capture them in a given bit length which has everything to do with the hardware and nothing whatsoever with the data itself. What is registered as 1023 by one microcontroller is 4095 on another. What *is* consistent is a series of numbers' internal coherence: graphed absent of numerical labels, the rhythm of the breath captured by this first hypothetical machine would appear identical to that captured by the second (neglecting the idiosyncrasies

noted earlier). As a collective community of researchers we go through great pains by the addition of metadata to ensure consistency and comparison of units of measure across datasets. This does not change the fundamental character of the data themselves.

Is it the digital with its emphasis on fluid mapping and media-shifting that has made it possible to even conceive of such an arbitrary arbiter as this? Perhaps. And yet to again borrow from the photograph, within the range of human vision it is not this wavelength or intensity of light precisely which I recognize: under or over –exposed we can yet identify a familiar face. The data-image is subject to a similar kind of internal coherence.

Instead, the more striking difference between data-image and other more familiar images is this: in capturing data (a data-image), we are left with an image-in-waiting that lacks "the specificity of representation" that its translation into a single embodied form might provide. Crucially, however, it is still an image insofar as it registers some pattern of intensities from the world into medium. Moreover the data-image is better understood as an image more latent than virtual: although the possibility space in which data writ large operates may be relentlessly extended, what is captured as actual data-image is what once existed as actual intensities. At minimum it is the virtual rethought, as Stamatia Portanova suggests: "no longer as a complex infinity of relations but instead as a final simple idea whose complexity consists of its infinite possibilities of actualization" [9:95]. The data-image comprises, to borrow what Lev Manovich writes of data visualization, a shift "from the concrete to the abstract, and then again to the concrete" in moving from events in the world to numbers and patterns to finally one or more instantiated specific forms [7]. The critical move of the *data-image* is to recognize that the encoded patterns are abstract only in the language in which they are represented (numbers); each actual pattern already comprises a specific flow.

This also suggests a critical difference between *data* as typically conceived and data-image. Data is constantly taking on new dimensions in response to more (always more) data. Instead, the fluxes of a given *data-image* may be mapped but not modified, entered into a constellation of new contexts and new relations yes but bound within these to repeat a certain rhythm of the past within the bounds of whatever rules it is re-produced, visualized, in-formed.

What else makes a data-image? Or, when is it appropriate to read data as data-image? Well, whenever it is productive in revealing things otherwise obfuscated, as it is always a lens through which existing data may be read. But the fact of the matter is that for data artists in particular, there is also a practical dimension to this question as they have the ability to select between preserving data-image as such and preserving instead only specific instantiated images of data. A response here necessitates a survey of the ethical dimensions to which their material is subject, whether as data or as image.

A final distinction: whatever the data-image is, here it is not anything presently pointed to in the sparse literature in which the term exists. Our data-image is not strictly related to the databases of surveillance society (although it may involve the same ethics) nor is

it the data-image of Ascott's "sea of interdata" but rather a means of rethinking data and its use, particularly in the context of art.

Does our conception hold for other varied and less local types of data? Recall that our definition of image is specific to intensities captured over a given timeframe (it would be a separate project still to examine whether this understanding of image, founded in temporality, may be expanded to encompass any kind of relationship between one or more conditions), but to this extent I believe it may. If the capture described here (of the exhalation flow of a participant) is specific, it is only in its simplicity and relative directness. For a country's GDP over time forms a rhythm of its own in numbers, one which in a way is perhaps perceived in the lived experience of its citizens, economists, or foreign policy officials. What this "looks" like over time and on the level of human experience is of an entirely different ontology than what the pattern of lines, circles, or sound "looks" like when the rhythm of data is deployed as visualization, perceived over a much more rapid timespan than the original. Yet it can be argued there is a way in which some pattern of intensity persists across both incarnations. Of course, this treatment raises many further questions regarding who or what is the subject of that initial lived rhythm and how one treats the multitude of variances and exceptions to its experience at each level of scale. Still, the latent image-like quality of the data-image only expands the greater the number of distinct datapoints registered: that is, the more connections in which it is already entangled before it is ever even re-performed.

An ethics of re-instantiation

For I admit already there is something un-image like here, or there could be. Our latent data-image is not developed once in chemical baths; it is not re-represented so much as re-instantiated into the world one or many times, in-formed as the information science literature is so fond of reminding us, in its turn from abstract, raw thing to representation. Here again, the computer computes, whether it (she?) be machine or man. To re-present data, the flow of voltage intensities must run again through the device, or the artist traces the flux of numbers into physical being: in short, one of any number of possible embodied forms is adopted and the data-image's rhythm is repeated into the world.

There is a diffèrance which makes a difference here. Is there? Surely already the age of mechanical reproduction, to not even speak of the digital, has complicated things. The photographic image has been re-instantiated in newspapers and magazines for well over a century; the sonic image on radio and in government records for about as long; and the digital image every time we load a browser window, file, or graphical operating system. Undoubtedly until the digital, the term *image* suggested a persistence not merely of the registered intensities but also almost always the sensory medium in which they were re-presented. The digital broke this but invisibly: the medium was converted over and over but ultimately always translated back into the expected sensory form (presuming it didn't break entirely along the way). Even for the small community of glitch artists databending media types, there was always the "right" (original, intentional) medium; the joke lies in playing (re-presenting) it wrong.

By contrast, the data-image is a photograph without edges, or perhaps a photograph without origin: a spatiotemporal rhythm torn from all contextual details of the event in which it was instantiated.[1]

There are two significant modalities operating here beneath the surface. One suggests that we have taken for granted a certain material constraint which limits an image's possible forms of embodiment, a condition now threatened by the amorphousness of the data-image. The second suggests that the very notion of material medium exposes less a constraint in sensoria and more a recognition of another important function served by the image's frames and edges: to self-announce itself *as* image. Both provoke interesting questions and as such both will be treated in turn. In a certain sense these are arguments which also both operate in time: the first, an argument forwards in time: a schizophrenia or paranoia of to what ends data might be employed when all material constraints are removed; the second, an argument backwards in time, a hallucinatory mode which conflates past and present.

[1] That we might preserve such attributes through suitable metadata is a response both irrelevant and irresponsible: this has always been possible for images, and yet we recognize (and experience) other kinds of images as such even when they are entirely lacking of these annotations. Likewise technically speaking, metadata is an afterthought: nothing about the various capture of various experiential intensities whether through sensor, sense, or algorithm necessitates it. That metadata is increasingly important as an ethical dimension of data capture and visualization is a separate argument entirely and one already well-crafted by Julie Freeman [3] among others.

Specificity and the data-image

Surely representation as image in whatever form *changes* how data is encountered. To what extent is the artist implicated in the setting of these future virtual bounds? This is an argument forwards in time, not perhaps about ontology so much as a certain ethicality or space of possibility.

An example, to begin: Stamatia Portanova describes the interactive website *Synchronous Objects for One Flat Thing, reproduced*, developed by the Forsythe Company in association with Ohio State University's Department of Dance and Advanced Computing Center for the Arts and Design. The website provides various means of exploring data captured during the performance of William Forsythe's choreography *One Flat Thing, reproduced*. In particular, various digital objects "were meant to act as vectorial operators, transferring the relationality of the dance to different fields, from dance notation to music or architecture, statistics, or geography" [9:86]. Any single sensor reading can be translated not only to lines and bar charts but to sound, to light patterns, GPS coordinates, milling instructions—effectively any system to which the user has access. Certainly, as Alexander Galloway beautifully observes, "any visualization is foremost a visualization of the conversion rules themselves" and of the details of how these "artificial set of translation rules" convert number into form [4:88]. Still the fact remains that this translation process is rarely proclaimed (if it is, it is in the equivalent of metadata: the artist or architect's statement); its end results are all we experience.

Actually… is this re-presentation at all or something else? Portanova's point is that certain flows of the

dance are performed anew through these digital artifacts but not repeated per se: rather, they may connect to other systems and data in the present, thus continually becoming a generative point of departure [9]. By contrast Galloway's object of study is network visualization, and he argues that the fact that "every map of the internet" and "every visualization of the social graph" looks the same belies a lurking problem of poetics: these maps reproduce not a unique data reality so much as a uniform aesthetics, and thus for him represent nothing [4:90].

What both arguments point to is a question about specificity and meaning. A certain existential specificity, after all, does figure into most conceptions of the image. For Barthes and for much of the history of the photograph, the significance of the medium was its relation to a unique moment of existence [5:46]. Although their objects of study are different, what is for Portanova open-ended promise might be interpreted through Galloway's logic as meaningless in its total break in any real correlation to the originating event. This question might also be viewed in light of the argument by Lev Manovich that the choice by an artist or designer of how data is mapped "often is not motivated, and as a result the work feels arbitrary" [7].

Collectively, a valid question becomes: can we conceive a language (visual or otherwise) specific and appropriate to the originating context of a set of data? Take out the final five words and it would seem in some ways this has always been the task of any artist in any time. My concern, to reference Alexander Galloway and Jacques Rancière's meditations on the unrepresentable, "is one of ethical obligation, never simply that of representation and representability" [4:93]. It is self-evident that we *can* map data into any number of forms. But in what worldview and in what ethics are we complicit in our decision, not merely to map it in one form or another but more fundamentally to either leave it raw and ready to be mapped or transform it into specific being? It is a decision as practical as it is theoretical. The first is data-image: a pattern in time ripped from its context for future deferred redeployment: embodied to be sure in bits but in any case ready to be (mis)used. It would only be through the addition of further context (metadata) that the or other artists and designers forward in time have even the option to seek specificity in their later representations, which is to say that the data-image in and of itself has lost it entirely.

In the second option, data is translated in the moment into image, video, sculpture: if it is stored, it is stored as such and not as a series of numbers alongside. Flipping Hayles (and speaking on a purely practical level of machine affordances), no amount of massaging this image will bring the data back [6]. It is specific—now image not data-image—and yet the rules for translation selected for this mapping comprise a personal and arbitrary decision. Within a globalized world, is this act itself presumptuous, cutting the life of that data short ahead of its time? Is image or data-image today's representation *par excellance*?

For an artist this is a decision made or deferred with a single stroke of code, but for a poetics it is critical.

Time and the data-image

The other possibility at work is that the embodiment of images until recently served as frames by which we

understood their existence *as* image. This comprises the ontological argument backwards in time.

After all, the image as we have defined it to date is always a *present* embodiment of a *past reality* of intensities. Within this understanding it seems reasonable to agree as WJT Mitchell proposes that experiencing an image involves the reflexive identification of that image *as such*: that is, as a record of a past moment and not mistaken for something actually existent in present reality: "When the birds peck at the grapes in the legendary paintings of Xeuxis, they are not seeing images: they are seeing […] real grapes— the things themselves, and not images of the things" [8:510].

Similarly Gunning writes, "There is no question of mistaking a photograph for the world; its stillness, borders, sense of texture, etc. forbid that" [5:46]. Or Barthes: "What I see is not a memory, an imagination, a reconstitution […] but reality in a past state: at once the past and the real" [1:82]. The photographic image is important for its relation to a unique moment in the existence of the entities pictured, but it is always already preserved, by necessity cut off from interacting with the present moment: always, as Barthes observed, "full, crammed: […] nothing can be added" [1:89].

By contrast the data-image must be continually literally re-performed in space and time whenever it is instantiated into specific form. Without a boundary frame, its continual redeployment into new environments and alternative forms does not necessarily announce it as from-the-past.

The phenomenon is not entirely new (most of us have had the experience at some point of mistaking some diegetic sound for a reality of our lived environment, and mix culture depends on such recontextualization) but its pervasiveness as a means of perceiving and representing the world may be. In the redeployment of the data-image, there is no delineation between what is past and what is present.

Whitehead is likewise interesting here, speaking of language as "the reproduction in the present of sensa which have intimate association with the realities of the past. Thus the experience of the past is rendered distinct in the present" [12:46]. Distinct qua palpable, perceivable, yes, but also distinct: separate, outlined, different. His larger project is to point to the generative possibilities of the past for present and future creation; is it critical to this process to recognize which elements are happening in what time?

A future-historical note

All this in data? Yes, although operating in different contexts. The argument for the specificity of the data-image takes form not only in the context of information visualization but also within the politics of the information society, surveillance, and digital identity.

The second argument regarding the time orientation of the data-image is presently encountered much less frequently as the overwhelming majority of data visualizations to date reproduce their frames very well: like other familiar images, there is no question here of mistaking one for the world. But it serves to note there is nothing about the redeployment of data outright which necessitates this. The immersive arts and virtual reality applications pose potent means through which

this aspect surrounding the redeployment of the data-image may be explored or exploited to a much greater extent in the future.

Even now, the increasing availability (if not also ubiquity) of sensors of all kinds invites increased participation in the creation of data-images and the images that arise from them. Although the focus of this paper is on the arts, the ethics which underlie these questions is not divested of the highly political collection of consumer data: captured into a database for future flow throughout other networks of data, of capital. At the very least, this context comprises an element of the worldview of which one or another decision surrounding the data-image's artist potential (particularly in the case of biometric or timestamped data) need be conscientious.

Conclusion

This work has outlined the concept of a data-image and some of the questions which inform its existence. This data-image is not the momentary crystallization of a series of data as referred to occasionally in surveillance studies nor is it a specific visualization or representation but rather a simultaneous tracing and disembodiment of the essentially event-bound specificity of the image as heretofore conceived. The data-image captures less a moment in time than the rhythmic passage of a moment: a spatiotemporal rhythm capable of divestment from all contextual details of the event in which it was instantiated, able to be continually redeployed in new environments and embodied in alternative forms. Not only does it not *announce* itself as past: it is not ever *actually* past, as the redeployment of the data-image both technically and conceptually depends upon its re-instantiation in each present moment.

This quality of the data-image serves as well as a reminder that like human memory, computer "memory does not equal storage" at least not in any practical sense [2: 167]. In its translations between data and image, the data-image is perpetually re-performed on successive levels: the flux of electricity, the transfer from computer memory locations to and from registers, the ultimate perceptual representation to which it is put in service. There too, rhythms of light sound or form replay in present time the patterns of the past, colliding with present context.

What does this mean for the artist's decisions around data capture? After all, if these are aesthetic concerns they are also the very promise of working with data: an image (pattern of intensity) encoded in time yet with neither identifiable referent nor clear teleology.

It is in some ways a question of the significance more broadly of the artist working with data in a world saturated and driven by it. How should data artists navigate the competing ethos that define their operations? What is the cultural scope of their interventions?

On the one hand, to paint in very abstract strokes, the very significance of any event seems precisely to be its engagement with the world; thus conceived, the artist's ability via the data image to apprehend this trace and redeploy it into endless new contexts extends this very potency. Wouldn't the potentially near-total disembodiment of an event from its originating context mobilize (or recognize) all images as heralding the

continual flow of transformation and becoming? Any moment becomes a living generative possibility into the future. There are no more museum vitrines [12:123], only and ever interaction with the world.

Or is it resistance to these continual flows of information the intervention that is warranted in a given (our given?) context? Can specificity absolve this lingering sensation, as present in the world as Galloway describes it for visualizations, of our participation in a flattened aesthetic space? What kind of image-making need *not* predicate itself upon the responsible translation of event into its appropriate and specific language? Certainly the decision to archive a specific image rather than its data resolves other questions that arise around the use and redeployment of the data-image: what would it mean for the process to be interrupted or corrupted? [3:76] How far into the future does the possibility-laden latency of the data-image extend? How might one codify *in the data itself* the ways in which these answers may be dependent on the type of "image" initially captured or any other attribute of its originating context?

In outlining an initial poetics of the data-image in response to a specific practical question, we yet arrive at the need for new tactics in order to answer the deeper concerns which this project raises. These ethical questions demand analysis on the same level of specificity with which we began, perhaps through a survey of how the data-image operates across specific artworks and on specific machines in all their ontological, temporal, and practical dimensions. That is, what does this poetics look like mapped in practice? In whose or what image are we making and being made?

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