Inquiries in Infomics

Lisa Jevbratt (2004)

Chapter in Network Art: Practices and Positions edited by Tom Corby, Routledge 2005

The act of programming or coding is often, in effect, an act of writing, of typing characters, sometimes in an ordinary text editor. It is a combining of characters into "words" and these words into "sentences.” It is a similar process to that of writing any natural language, with nouns having adjectives describing them and verbs making them act or being acted upon. However, while it is tempting to consider the poetic and literary qualities of coding due to its similarity with writing, programming is not writing. To write code is to create reality. It could be likened with the production of artificial DNA, of oligonucleotides—a process where life is written. Or it could be seen as a more obviously physical act of generating and moving around material, an act that has dimensionality, that is non-linear. It is an activity that has more in common with sculpting or designing and sewing clothes—to start with a material and feel how it folds and falls, cutting out two dimensional surfaces from it and turning them into three dimensional shapes by sewing them together in specific way—than with writing.

THE INFOME

Because of the traditions in which computer languages and code were developed, they are commonly thought of as symbolic abstractions of thoughts and natural languages. Computers are described as the universal machines manipulating these symbols, praised for their ability to simulate any other medium. However, the scene has changed dramatically since the first code breaking machines and other early versions of computers. Every computer now exists in relation to a network, whether it is connected or not. Every software is potentially a networked software, a building block of the networks we live within and through.

The network of networks, the Internet, is an environment constructed by code—languages and protocols. It is written by us, yet it is reality. Code is the geology, at once a historical trace of our activities, and a determining circumstance, the ground we stand on, dictating the life of the environment. Coding is the act of building the environment, to 'move' the environment and a way of moving in the environment. Even if this environment is written by us, the whole (the network), made up of its parts, (the layers of languages and protocols, the packets, viruses, data, etc.) might have reached a level of complexity and richness high enough to make it interesting to consider it as an organism. It now seems fruitful to postulate that computers are no longer interesting because they can simulate reality, but because they transform the written word into reality, a reality whose ontology is to be found in and between ‘environment’ and ‘organism.’ Even if the complexity of the network of networks and their data have not yet reached a threshold where the network actually transforms from merely a set of connected nodes to an entity worth describing as a totally new category, form, or dimension, a rich and fascinating set of issues and areas of research open up by claiming so, and solidifying it by giving it a name. I propose the term ‘Infome’ to denote this all-encompassing network environment/organism that consists of all computers and code. The term is derived from the word “information” and the suffix ‘ome,’ used in biology and genetics to mean the totality of something as in chromosome and genome.

Infomics

Within the Infome, artist programmers are more land-artists than writers; software are more earthworks than narratives. The ‘soil’ we move, displace, and map is not the soil created by geological processes. It is made up of language, communication protocols, and written agreements. The mapping and displacement of this ‘soil’ has the potential of inheriting, revealing, and questioning the political and economic assumptions that went into its construction. Moreover, this environment/organism is a fundamentally new type of reality where our methods and theories regarding expression, signification, and meaning beg to be redefined. This text briefly points in some directions of inquiry that are of immediate importance and interest for me as an artist working with and in 'code.'

PROTOCOL GEOGRAPHY

FIGURE 7.1 L. Jevbratt, 2004.

FIGURE 7.2 L. Jevbratt, 2004.

Imagine yourself flying over a landscape, your eyes following the mountain ridges and the crevasses formed by water running down the slopes over millions of years. (Figure 7.1) There are roads crossing the landscape, some of them closely following the creeks and the valleys, some boldly breaking the patterns of the landscape, laid on top of it as if drawn on a map. (Figure 7.2) There are circular fields, the result of the mechanics of manmade irrigation systems, and oddly shaped fields wedged between lakes and mountain slopes. It is a fascinating display of the interplay between nature and culture, showing off the conditions of human life, our histories, and philosophies of living and relationship to nature. Open any atlas and one will see attempts to map this rich connection between geology and anthropology. These images, the view from above and the maps, allows us to see the layers of our environment, of how we have responded to the geology, the climate we live in, and how we have manipulated nature depending on our beliefs at different moments in time.

The Infome is made up of layers of protocols and languages, each functioning as the nature, the conditions for the next layer, and all of them together forming the conditions, the nature, which we relate to when spending time in (for example by navigating the Web), or using (by sending an email or transferring a file), the environment. We as people are expressed in this environment as a collective through how we use it, just as flying over a landscape reveals our cultures and their histories through the specific placement of roads, the shape of the fields, and conglomeration of buildings. In addition, we—humans —are also expressed in its very construction, geology, and climate. We wrote its mountains and its rain.

Protocol Politics

Different coding systems and languages modify and insert themselves in different layers of the Infome. Each layer interfaces to its underlying layer by omitting access to details of the previous layer, simplifying and narrowing the construction of objects and actions in the specific reality layer that the code operates within. A layer can interface with its underlying layer in a more or less acknowledging manner. Some of the commonly used

Internet languages/software, such as Lingo and Shockwave, strongly impose a metaphor from an already known discipline such as film editing, while others such as Perl allow the underlying layers to peek through by letting the interfacing filter be of a more abstract nature. Perl could be likened to the creek finding its way through the lowest points down a valley, creating a meandering waterway, not always efficient to use, while a Java applet could be seen as a constructed canal that sharply cuts through the landscape, offering a fast and reliable connection between two points but missing out on the cultural and geological history of the landscape it traverses. And perhaps Flash could be seen as the colonialist attempt to create borders in a place that is only known from a map, a place that has not been visited by the parties dividing the land, but is very well known by its inhabitants. Think of the straight borders of Africa, the result of the continent being divided by nations with political agendas separate from and insensitive to the issues and struggles pertinent to the tribes inhabiting it.

The Internet was created as an open environment, with is protocols and codes readily accessible for anyone interested. The transformation from a mere delivery system to a complex environment/organism that we possibly are seeing the start of, is a direct result of that architecture. We have not yet learned how to turn this entity in the making, into something profitable, so the obvious reaction from market forces is to counteract the transformation, to pretend that it is a delivery system, and to produce languages and software tools whose main use is the generation of content, and containers for that content. They counteract the openness of the network by creating proprietary protocols, languages, and tools that disregard the geology of the environment.

ABSTRACT REALITY

Within the paradigm that views the computer as a manipulator of arbitrary symbols, the dominating mode of the sign is the 'symbol': a situation in which the signifier arbitrarily relates to the signified, and where culture and convention dictate the meaning of the sign. Within that paradigm, software is seen as non-physical, and it is hard to justify the existence of an indexical sign that connects the signifier and the signified through an actual, causal imprint. However, since the Infome paradigm views the network environment/organism as 'reality' and 'life,' the symbolic representations —the binary states, the data—are actual entities, not references to entities. They are actually affected by events involving them. Within the Infome paradigm, the dominating mode of the sign is not the symbolic, or the iconographic, but the indexical.

This is a fascinating shift, resulting in new aesthetic expressions and implications. Images can now simultaneously be reality, since they are part of the Infome and an imprint of that reality, as if the image produced by a potato stamp were also a potato. This new emphasis on the indexical opens possibilities within the field of information visualization, which I currently work within. Instead of representing data symbolically by filtering it through known visual forms (such as using it to mimic aspects of physical reality) data can represent itself by being a slice of it or by "smearing off" on something. The visualization is an indexical trace of the reality, an imprint, a rubbing, a manipulation of the reality, and it is reality.

1:1

I first started to explore these ideas with the projects *1:1* and *1:1(2)*[1]. The project *1:1,* created in 1999, consisted of a database that would eventually contain the addresses of every website in the world and interfaces through which to view and use the database. Crawlers (software robots, which could be thought of as automated web-browsers) were sent out on the Internet to determine whether there was a website at a specific IP address (the numerical address all computers connected to the Internet use to identify themselves). If a site existed, whether it was accessible to the public or not, the address was stored in the database. The crawlers didn't start on the first IP address going to the last. They searched instead for selected samples of all the IP addresses, slowly zooming in on the numerical range. Because of the interlaced nature of the search, the database could, in itself and at any given point, be considered a snapshot or portrait of the Web, revealing not a slice but an image of the Web with increasing resolution.

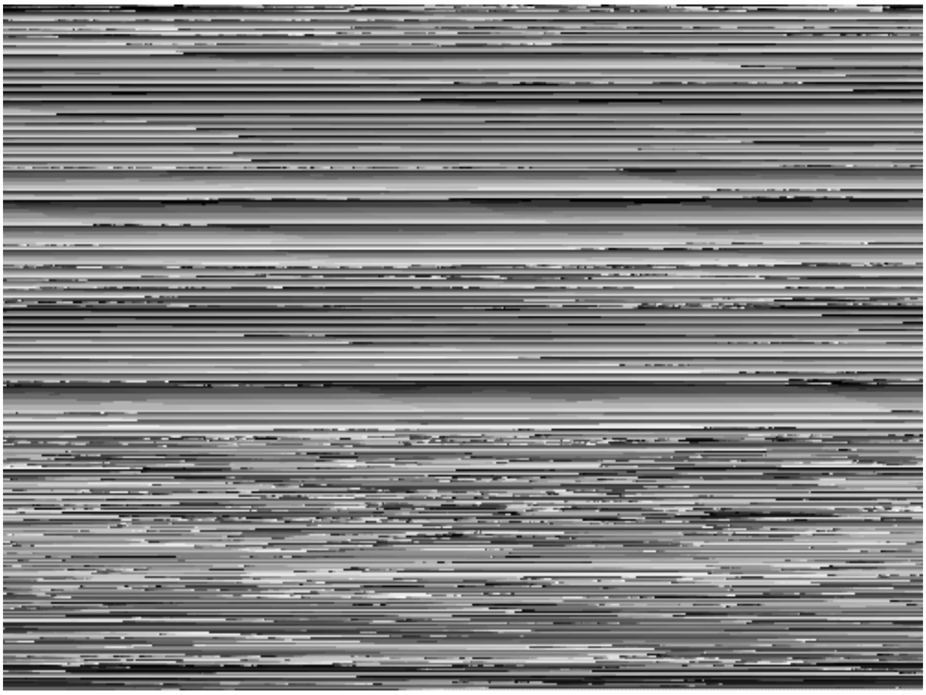


FIGURE 7.3 *1:1 Interface: Every(IP)*. L. Jevbratt, 1999.

1:1 Interface: Every(IP), Figure 7.3, here shown in grayscale, is a visualization of the database and an interface to the sites it visualizes. The image is composed of pixels each representing one website address stored in the IP database. The location of a pixel is determined by the IP address it represents. The lowest IP address in the database is represented in the top left corner and the highest in the lower right. The color of a pixel is a direct translation of the IP address it represents, the color value is created by using the second part of the IP address for the red value, the third for the green, and the fourth for the blue value. The variations in the complexity of the striation patterns are indicative of the numerical distribution of websites over the available spectrum. An uneven and varied topography is indicative of larger gaps in the numerical space i.e. the servers represented there are far apart, while smoother tonal transitions are indicative of networks hosting many servers, which because of the density have similar IP addresses.

The initial idea was to continuously search the IP space to eventually have covered the whole range of addresses. However, the Web was changing faster than the database was updated, and in 2001 it was clear that the database was outdated. *1:1(2)* was a continuation of the project, including a second database of addresses generated in 2001 and 2002, and interfaces that show and compare the data from both databases. When the project was first created in 1999, the system approximately searched two percent of the total amount of IP addresses, and it found 186,100 sites for inclusion in the database. The second search started in 2001 and was searching the exact same sample of the IP range in order to be able to make comparisons between the Web in 1999 and 2001.

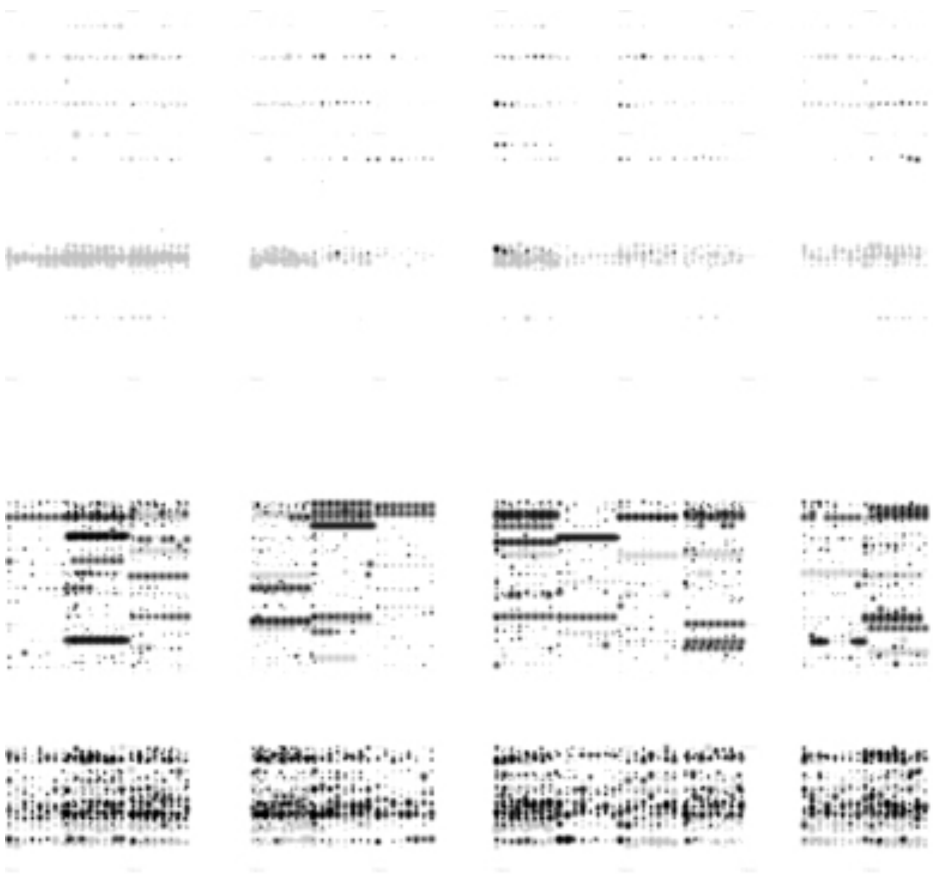


FIGURE 7.4 *1:1(2) Interface: Migration.* L. Jevbratt, 2002.

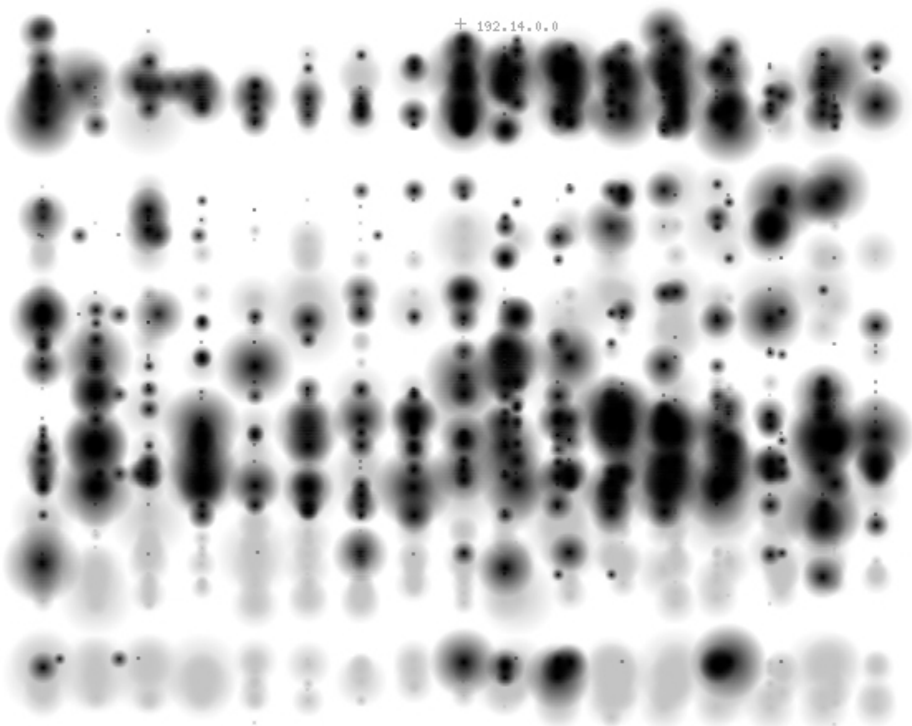
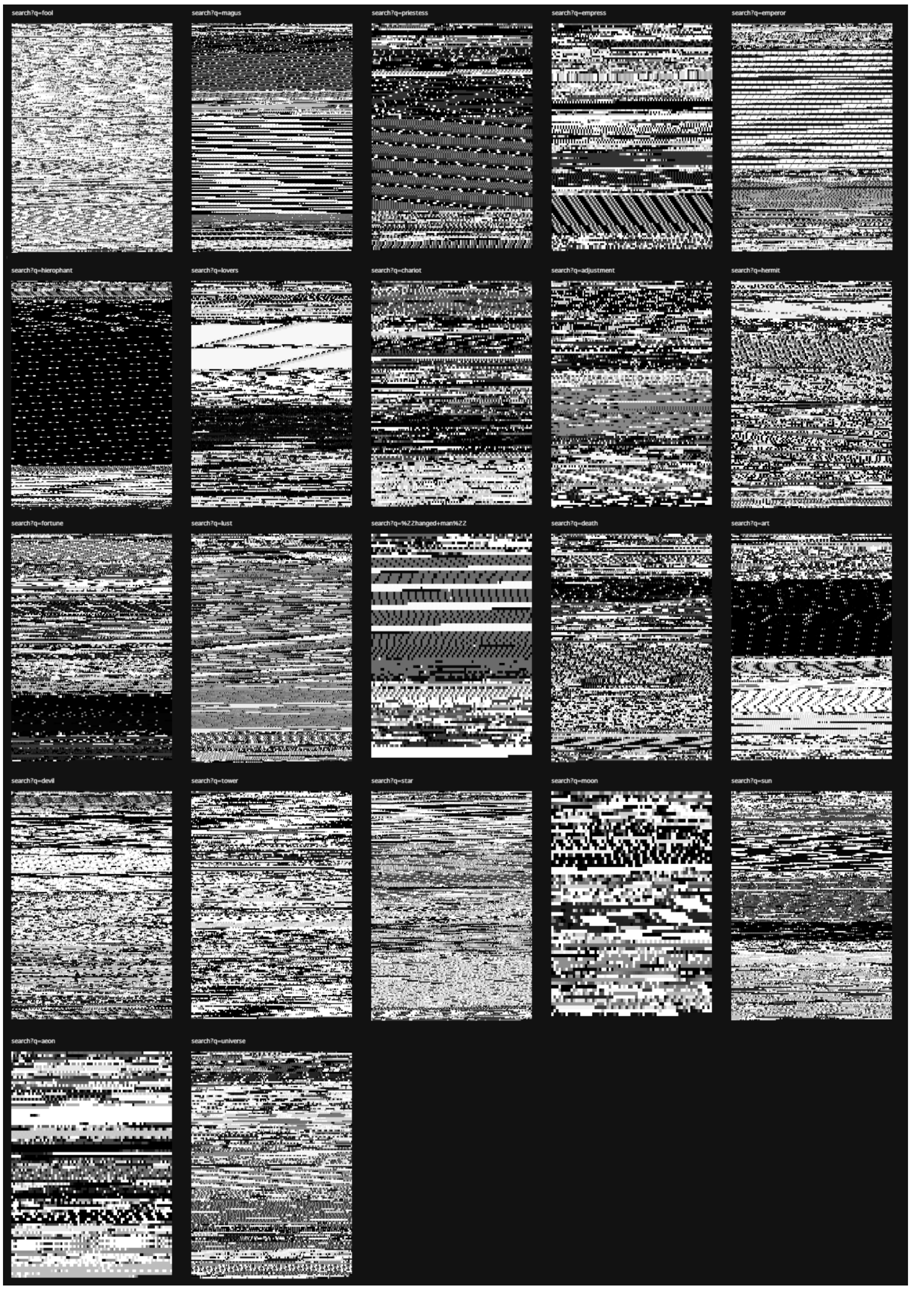


FIGURE 7.5 Detail of *1:1(2) Interface: Migration.* L. Jevbratt, 2002.

1:1(2) Interface: Migration (shown in grayscale in Figure 7.4 and Figure 7.5, a detail of 7.4, the actual image is in red and green) is a visualization of the two databases and an interface to the sites it visualizes. Each pixel location on the picture represents 255 IP addresses. The pixel in the top left corner represents the 255 addresses that start with 0.0.0 and the one in the lower right corner the ones that start with 255.255.255. The blobs represents IP addresses to servers that hosts a website. The red blobs, seen as the medium dark blobs in the grayscale reproduction, represent the websites the crawlers found in 1999 and the green, light gray in the reproduction, represent the websites found in 2001/2002. The size of a blob is determined by how many sites it represents. Since each pixel/blob location represents 255 addresses, each blob represents between 1 and 255 addresses. The amount of sites is mapped to the blob on a logarithmic scale. The darkest areas are an indication of clusters of sites that existed both in 1999 and in 2001/2002.



.

FIGURE 7.6 *22: search and thou shalt find_,* Arijana Kajfes, from *Mapping The Web Infome*, L. Jevbratt, 2001.

Mapping the Web Infome

After *1:1* and *1:1(2),* I continued to develop the ideas regarding visualization and the Infome with the exhibition *Mapping the Web Infome* in 2001.[2] I invited a group of artists to produce projects with the software *Infome Imager,* which I developed specifically for the show with input from the invited artists. The *Infome Imager* allows the user to create crawlers that gather data from the Web, and it provides methods for presenting and visualizing the collected data. The projects created with the software ranged from textual and systemic investigations to more visual expressions of the web-infome. Three of the artists, Arijana Kajfes, and Jennifer and Kevin McCoy, were visualizing the use of color in backgrounds, fonts, and tables from the webpages their crawlers visited. The McCoys were starting a crawler by having it search for ‘blue sky.’ The crawler collected only blue, white, and grey colors from the 30,000 pages it visited. In the resulting image, *Every Blue Sky,* each pixel is a representation of a color used in a webpage visited by the crawler. In her project *22: search and thou shalt find_,* Kajfes started twenty-two crawlers by making them search for each of the names of the Major Arcana cards in the Tarot deck. Each of the twenty-two crawlers generated an image with the colors collected from the 1000 sites it visited. The images were printed as cards and shown and sold as a Tarot deck in the exhibition. In Kajfes’ *22: search and thou shalt find_,* Figure 7.6, each pixel is a representation of a color used in a webpage visited by the crawler. The first webpage visited is represented by the pixels in the top left corner of each card and the last by the pixels in the lower right of each card.

Visualization

The *1:1* and the *Infome Imager* visualizations are realistic in that they have a direct correspondence to the reality they are mapping. Each visual element has a one-to-one correlation to what it represents. The positioning, color, and shape of the visual elements have one graspable function. Yet the images are not realistic representations; they are real, objects for interpretation, not interpretations. They should be experienced, not viewed as dialogue about experience. This is interesting in several ways. On a more fundamental level, it allows the image to teach us something about the data by letting the complexity and information in the data itself emerge. It allows us to use our vision to think. Secondary, it makes the visualizations function as art in more interesting ways, connecting them to artistic traditions from pre-modern art, such as cave paintings, to abstract expressionism, action painting, minimalism, and to post-structuralist deconstructions of power structures embedded in data. The visual look that follows from this thinking is minimal. It is strict and “limited” in order not to impose its structure on its possible interpretations and meanings. The visualizations avoid looking like something we have seen before, or they playfully allude to some recognizable form but yet slip away from it.

The abstract reality in which these images emerge is not a Platonist space of ideal forms, and the images are not the shadows of such forms. The term ‘visualization’ is problematic, and would be beneficial to avoid, because it indicates that the data has a pure existence, waiting to be translated into any shape or sound (or whatever medium the latest techniques of experiensalization would produce). The opposite view that argues that the data is not there if we don’t experience it—could be fruitful as long as it is not seen as a solipsist statement, but rather as a position more affiliated with ideas from quantum mechanics. The Heisenberg uncertainty principle implies that we can only be certain about something’s existence if we see it. Everything else is known only with some degree of probability. In the first of these arguments—the data-purist view, images are merely one possible expression of the data behind it. The images get their meaning in a vertical manner; the truth is in the data, outside the image, behind or below it. In the second view, the contextualist stand, images cannot escape their context, the methods producing them and the discourse they are produced within. They get their meaning in a horizontal manner. The meaning is created from how the image refers to its image-ness and the tradition in which it was created.

The most interesting examples of visuals displaying data, negotiate between these opposite positions.

The type of imagery produced in genetics and biochemistry, sometimes called 'peripheral evidences,' are imprints of DNA and proteins (Figure 7.7, Figure 7.8 and Figure 7.9).

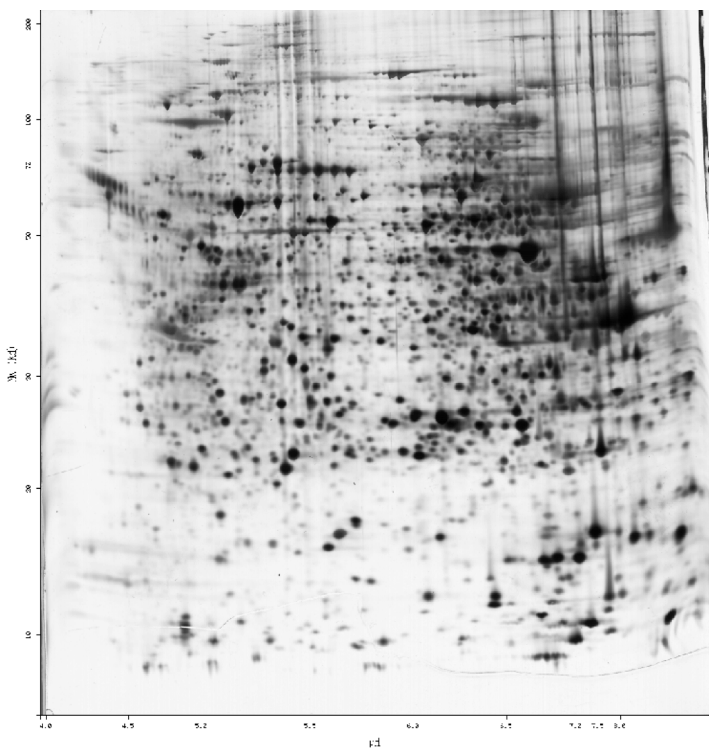


FIGURE 7.7 Two-dimensional polyacrylamide gelelectrophoresis, colorectal adenocarcinoma cell line.

Swiss Institute of Bioinformatics (SIB). Gasteiger E., Gattiker A., Hoogland C., Ivanyi I., Appel R.D., Bairoch A. ExPASy: the proteomics server for in-depth protein knowledge and analysis. Nucleic Acids Res. 31:3784-3788(2003).

URL: <http://us.expasy.org/cgi-bin/map2/noid_big?DLD1_HUMAN>

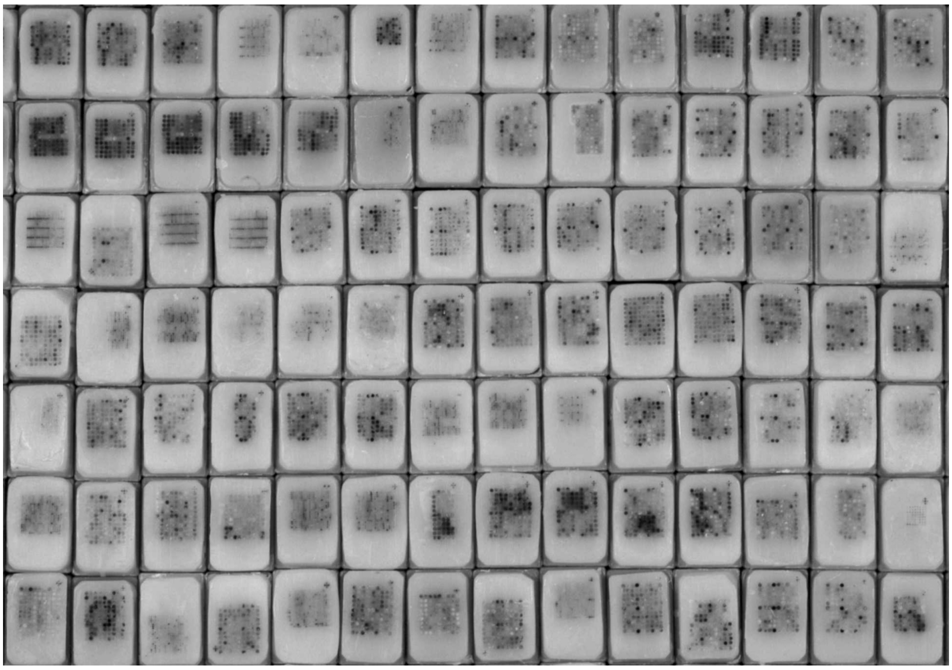


FIGURE 7.8 Tissue microarray. M. De Marzo, TMA Laboratory The Johns Hopkins University. URL: <http://tmalab.jhmi.edu/>

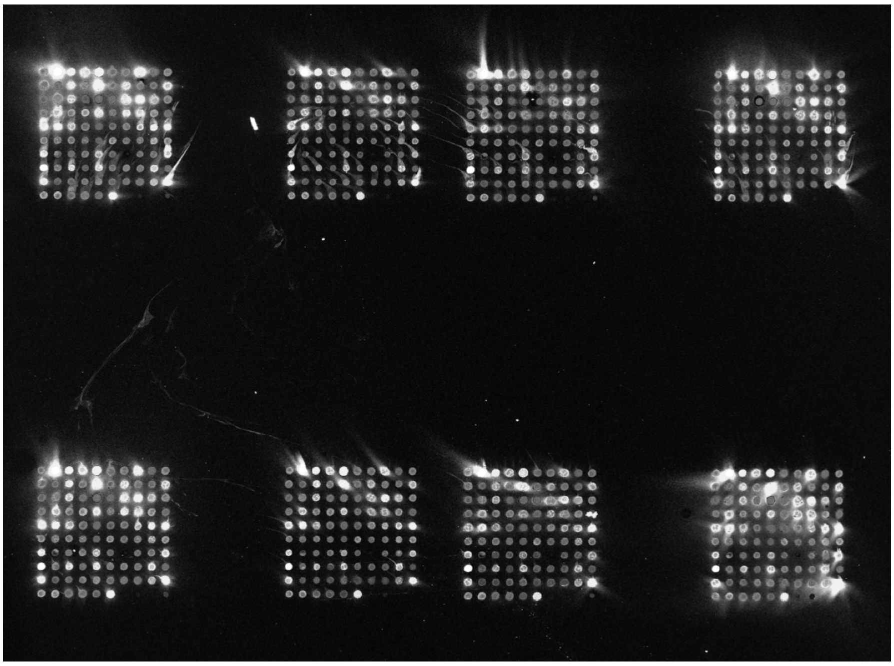


FIGURE 7.9 cDNA microarray. Daphnia Genomics Consortium. URL:

<http://daphnia.cgb.indiana.edu/tools/microarrays/?page=1gen>

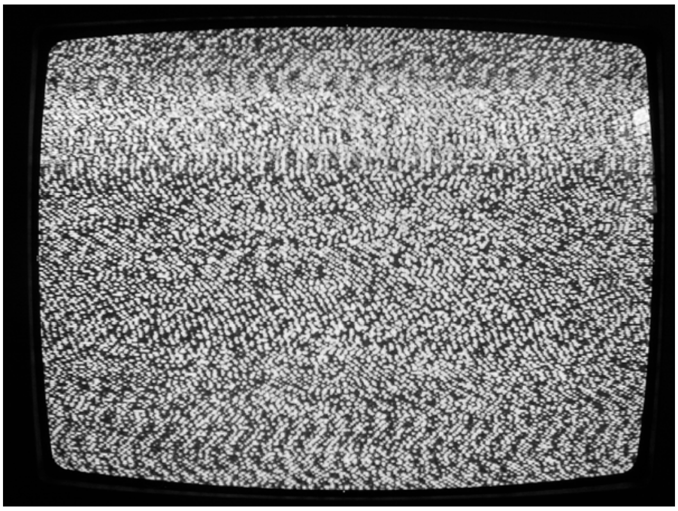


FIGURE 7.10 L. Jevbratt, 2004.

These images are evidence of something outside themselves, something (truth?) that could be visualized in multiple ways. Yet, because they do not escape the methods used to create the imagery, what they articulate could not be said in any other way. Another beautiful example of this simple but complex type of representation is found on TV. The static we see on the TV screen when zapping through non-existing channels allows us to see the Big Bang, the birth of the universe (Figure 7.10). In the static, 1 per cent cosmic background radiation is hidden. The visual noise we see is not how we would choose to represent the Big Bang; it is not a visualization of it. It is in fact a direct experience of it.[3]

Perhaps the most appropriate term for visuals that aim to negotiate between data-purism and contextualism, such as the examples above and the visualizations created in my projects, would be a ‘net’ or a ‘web’— an object that traps something. It is an interesting circularity that these terms are now most commonly used to describe modes of connectivity rather than entrapments.

THE UNINTENDED

In order to focus on the organic and geological nature of the Infome, my projects disregard the fact that we created it. I choose to examine it from the outside as if I just landed on planet earth trying to figure out whether it is alive, and whether the beings I encounter within it are intelligent or not. I regard the data of the Infome as noise and then head out on a signal hunt. What one finds, is how we are expressed as humans in and through the Infome, not what one single human is trying to express.

I focus on the unintended or make the assumption that the data is produced without intention, examples from various fields show that this strategy might reveal the identity of any given entity in a more accurate way.[4] The result from a search for any given term on a Web search-engine will yield very similar results if we look at the most relevant sites returned. However, if we look at the least relevant sites listed, the different search strategies of each search engine will be revealed. Similarly, biologists have found that the most well connected molecules in an organism are the same between various species. The ones that set us apart are the least connected molecules. In art history, the Morelli method claims that in order to identify the authorship of a painting, one should focus on the parts made with least intention such as the earlobes or fingers of a subject, not its eyes or mouth, which are painted with intention, and which typically reveal more about the school the painting was made within, than about the specific artist.

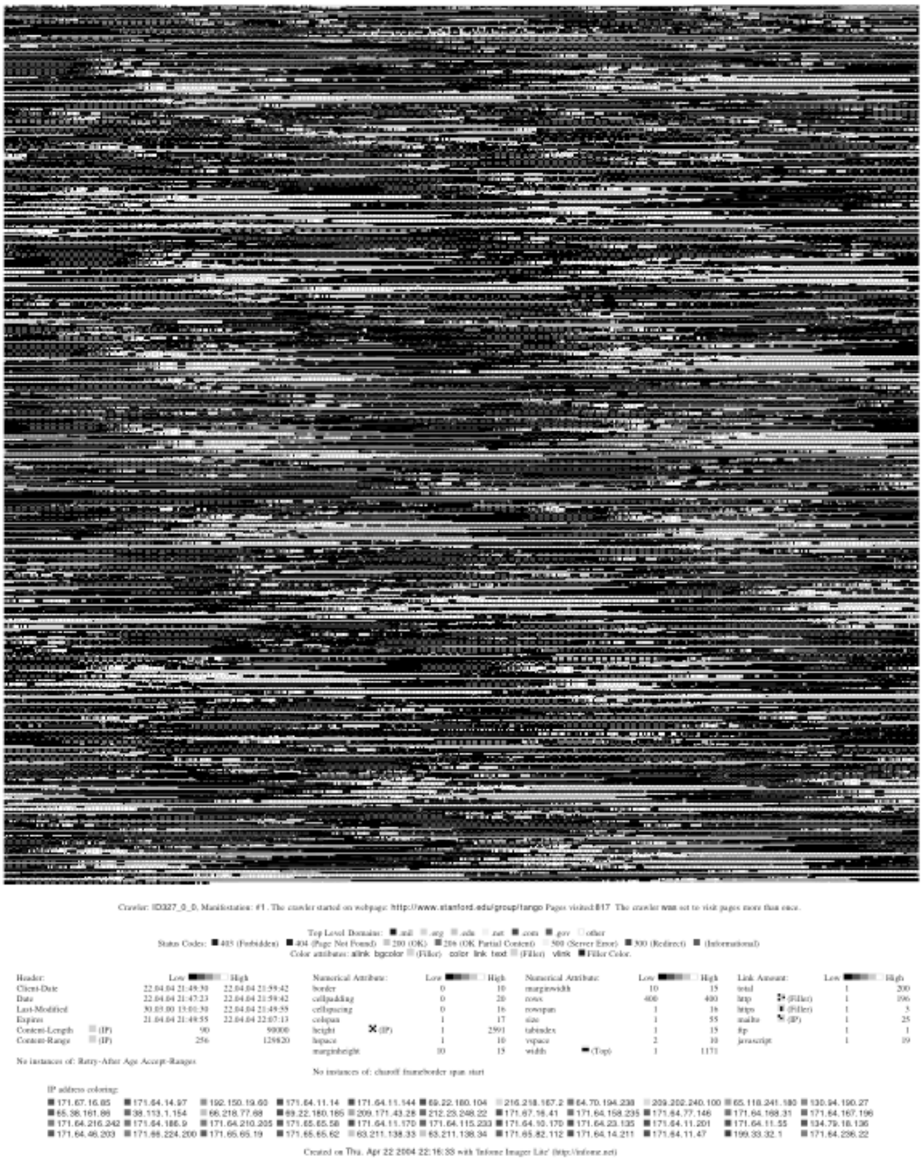


FIGURE 7.11 Visualization from *Infome Imager Lite*, L. Jevbratt 2004

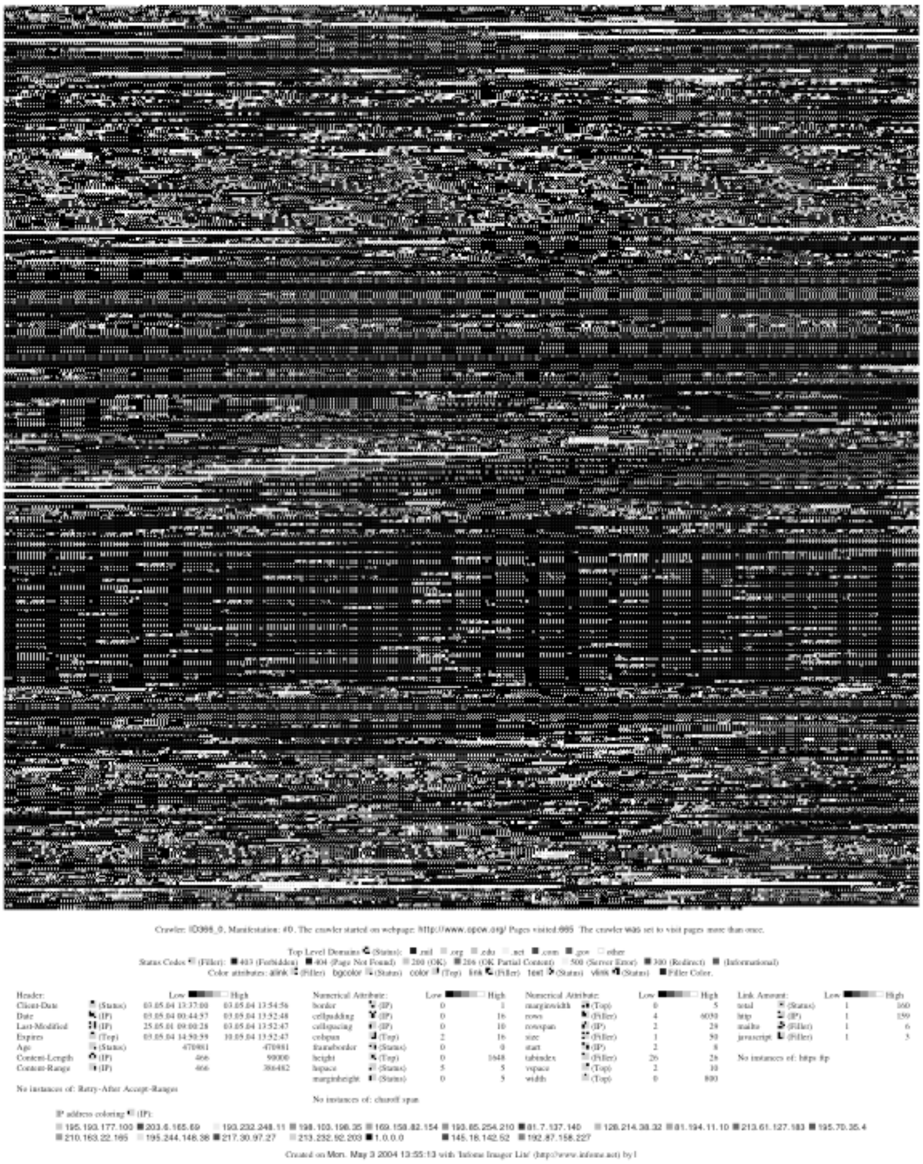


FIGURE 7.12 Visualization from *Infome Imager Lite*, L. Jevbratt 2004

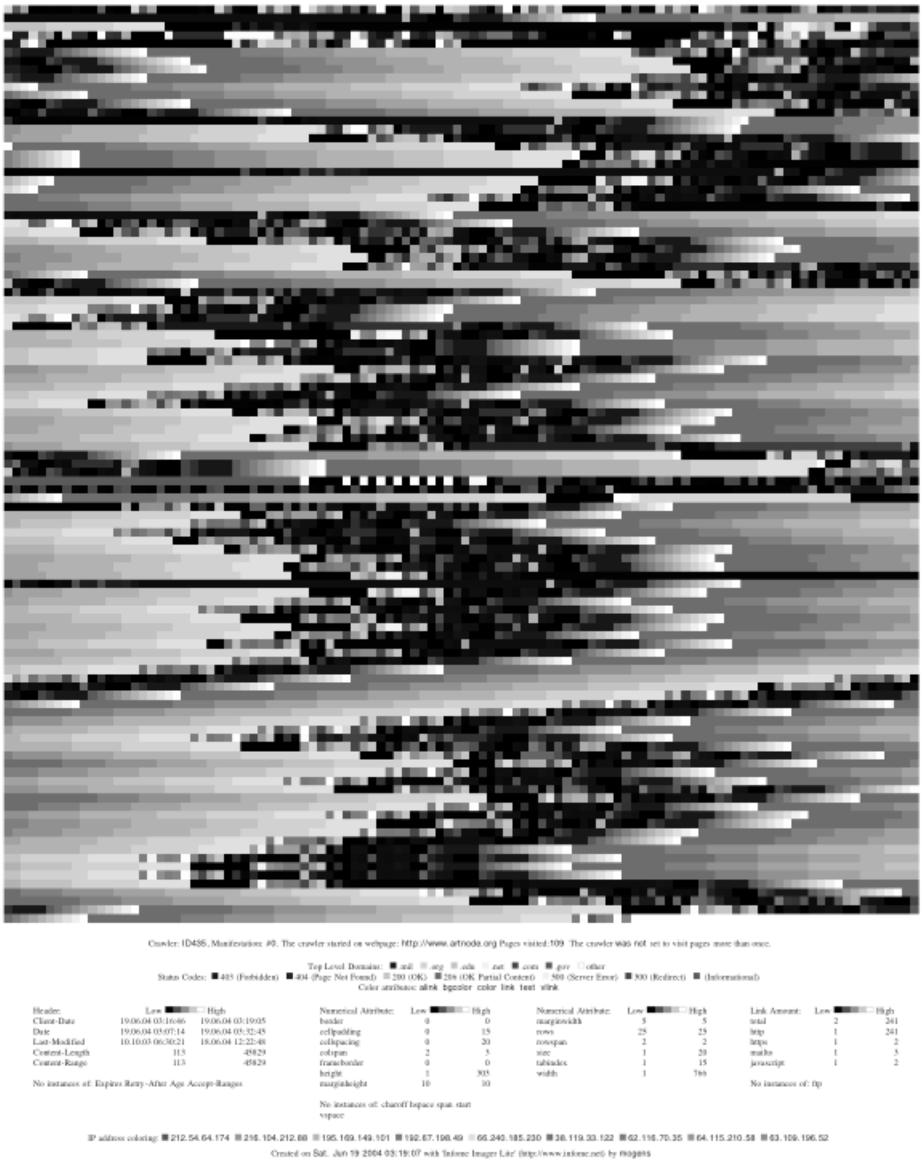


FIGURE 7.13 Visualization from *Infome Imager Lite*, L. Jevbratt 2004

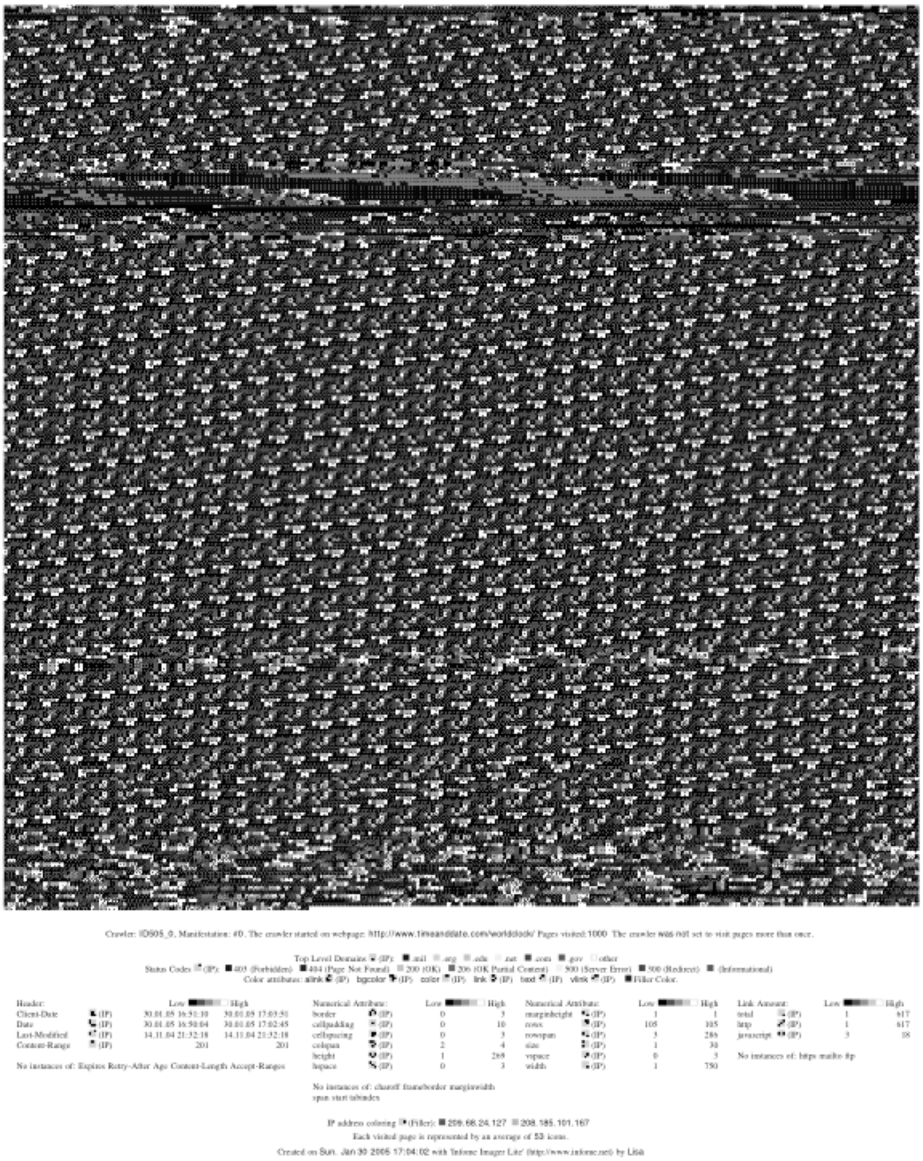


FIGURE 7.14 Visualization from *Infome Imager Lite*, L. Jevbratt 2004

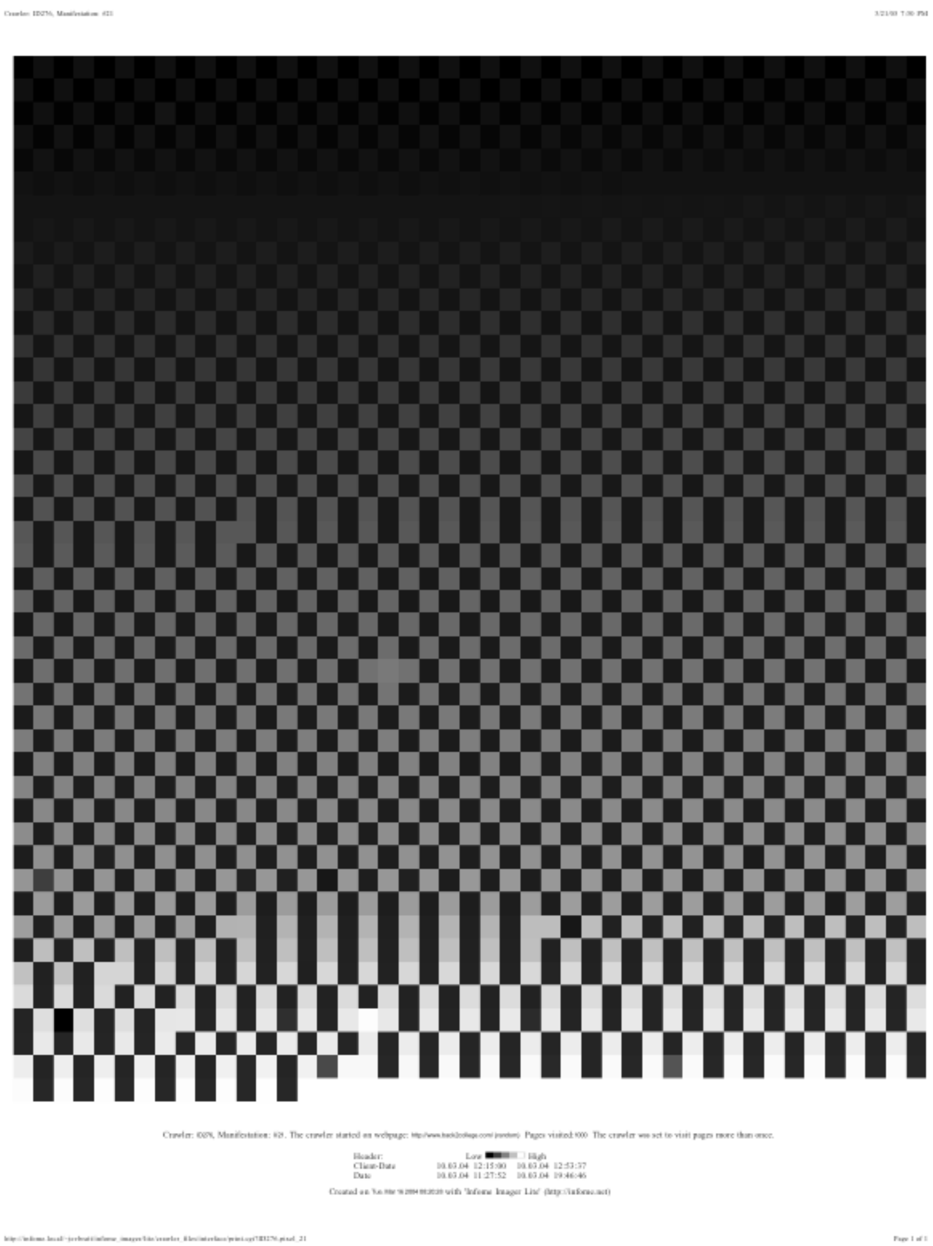


FIGURE 7.15 Visualization from *Infome Imager Lite*, L. Jevbratt 2004

Infome Imager Lite

When I continued to develop the *Infome Imager* software used in *Mapping the Web Infome*, I focused on its ability to collect hidden data which is not intended to be read as content. In *Infome Imager Lite,*[5] the user creates crawlers who collect data such as the length of a page, when it was created, what network it resides on, the colors used in it, and other design elements. The output of the crawler (Figure 7.11 to 7.15) consists of an image, which can also function as an interface to the crawled websites, and a legend describing the collected data.

The audience interacts with the software on the Web and in installations/workshops (Figure 7.16 to 7.20.) The project is aims to be a collaborative environment that glances down into the subconscious of the Web in hopes to reveal its inherent structure and create new understandings of its technical and social functionalities.

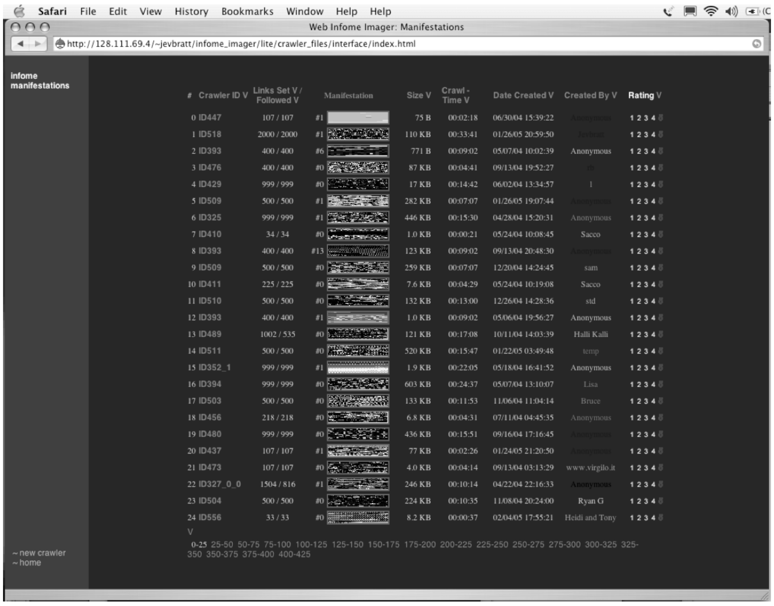


FIGURE 7.16 Screenshot of *Infome Imager Lite* website, L. Jevbratt 2005

FIGURE 7.17 *Infome Imager Lite Workshop,* installation in *Techno Sublime*, CU Art Museum, University of Colorado, Boulder, CO. L. Jevbratt, 2005.

FIGURE 7.18 *Infome Imager Lite Workshop,* installation in *Techno Sublime*, CU Art Museum, University of Colorado, Boulder, CO. L. Jevbratt, 2005

FIGURE 7.19 *Infome Imager Lite Workshop,* installation in *Techno Sublime*, CU Art Museum, University of Colorado, Boulder, CO. L. Jevbratt, 2005.

FIGURE 7.20 *Infome Imager Lite Workshop,* installation in *Techno Sublime*, CU Art Museum, University of Colorado, Boulder, CO. L. Jevbratt, 2005.

OPENINGS

The nature of the Infome, its complexity, unpredictability, and beauty, point us in directions that we usually do not consider when engaging with information technologies. It asks us, with a wink, to wonder if something beyond our comprehension is making itself noticed in the appearances of the Infome.

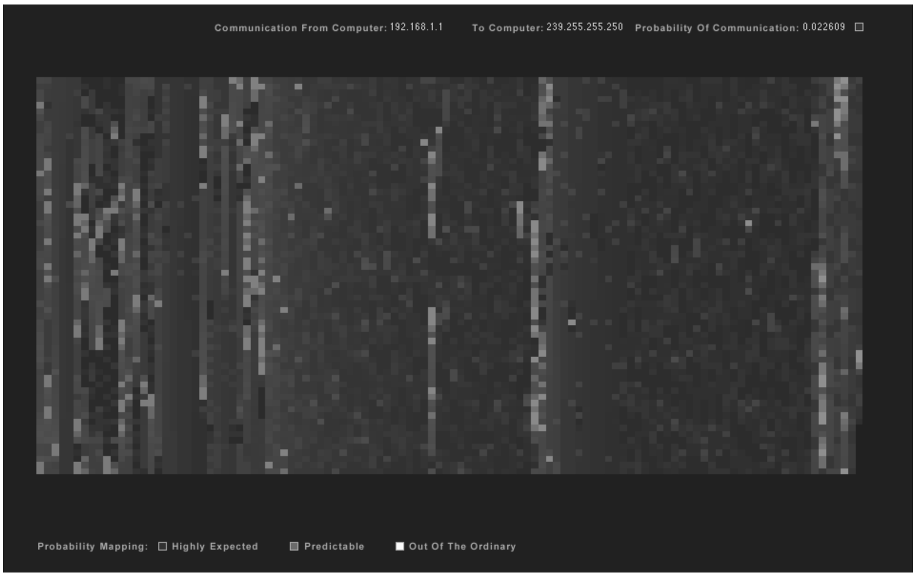


FIGURE 7.21 *Out Of The Ordinary,* screenshot from a mapping of the network traffic at computerfinearts.com. L. Jevbratt, 2002.

Out of the Ordinary

My project *Out of the Ordinary*[6] (Figure 7.21) explicitly plays with the idea of us finding something unexpected, something that shows signs of an awareness hidden within the Infome. *Out of the Ordinary* is a network imaging software that measures and maps the probability of communication between computers on the network that the software resides in and between computers on the network and the Internet. Data travels on the Internet between two computers in packets. The *Out of the Ordinary* client maps the likelihood of a packet being sent between the two communicating computers. Each packet that comes through the network is represented as a square. The tonal value of the square is determined by the probability of the packet being sent between the two computers. The lower the probability is, the lighter the square is. The result is a grayscale image that is continuously created as packets travel through the network. It does not look like anything, until, potentially, something emerges slowly, drawing attention to itself, revealing itself, letting us know it has meaning.

A Shift

The trajectory through history to the computer as a symbolic manipulation machine led us through several more or less explicit mystical traditions and practices. It takes us from the Pythagoreans (500 BC) with their number mysticism and Plato (428-348 BC) and his ideal forms. It touches the universal art of Raymond Lull (1235-1316), a model of understanding that anticipated symbolic logic, and the memory art of Giordano Bruno (1548-1600). These discourses served as a foundation for Gottfried Leibniz (1646-1716) when he conceived of the *lingua characteristica* (a language that could formally express all knowledge), *calculus ratiocinator* (an all-encompassing problem-solving machine/system) and his calculus.
Leibniz's work was highly influential on Charles Babbage (1791-1871) and his ideas leading to the Analytical Engine and George Boole (1815-64) and his theories of binary logic, both cornerstones in the development of modern day computers. The logic conveyed in all these traditions stems from a belief system where there are concepts and thoughts behind physical reality,

a system of symbols more real than the reality experience by our senses. This symbolic layer can be manipulated and understood by modifying its symbols. There is a thought entity outside nature, a power that is either in the form of a god, gnosis, a oneness, or in the likeness of a god, as humans.

However, if computers are now the access-points to the Infome, and coding and code are processes and entities used to experience and manipulate the reality of a multi-layered environment/organism, then the metaphysical is no longer an all-knowing entity outside, dictating the system, but an emergence, an occurrence within it: a scent, a whisper, a path in-between for a shaman to uncover. And what she, or he, finds is not an absolute but a maybe, made of hints, suggestions, and openings.

---

[1] *1:1*, *1:1(2),* URL: <http://jevbratt.com/1_to_1/>, 1999-2002

[2] *Mapping the Web Infome,* URL: <http://jevbratt.com/mapping_the_web_infome/>

[3] "The next time you complain that there is nothing on, remember that you can always watch the birth of the universe." B. Bryson *A Short History of Nearly Everything* (p. 12), Broadway books, NY, 2003.

[4] L. Jevbratt, 'A Prospect of the Sublime in Data Visualizations', *Ylem Journal* Volume 24 Number 8 (p. 21), July-August 2004.

[5] *Infome Imager Lite*, URL: <http://jevbratt.com/infome_imager/lite/>

[6] *Out of The Ordinary,* URL: <http://jevbratt.com/out_of_the_ordinary/>