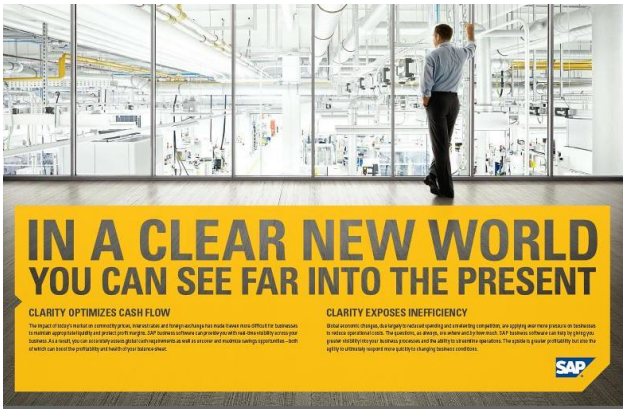
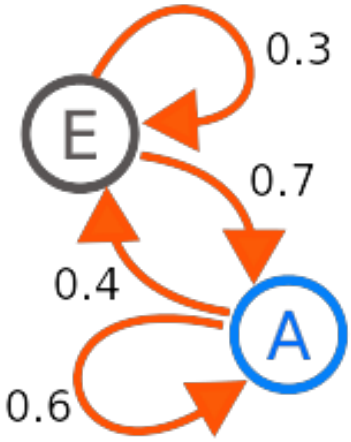
Cloudy Architectures

Orit Halpern





Markov Chain and SAP Ad, Downloaded from: http://dealarchitect.typepad.com/.a/6a00d8345190da69e201156f90741d970c-pi

February 15, 2015

The global enterprise solutions provider SAP rebranded itself in 2010 with a rather curious byline: "In a Clear New World You Can See Far into the Present". At first, this appears intuitive—greater analytics equates with efficiency, foreknowledge of future trends, the ability to anticipate consumer and production demands and to modify supply chains, all the those supposed benefits that sustain the general discourse of "smartness", big data, and high-technology managed logistics. On second consideration, however, the SAP ad is quite unintuitive, even offensive, to its client base. This ad campaign openly admits that human perception, and human intelligence, simply cannot comprehend the systems we manage. In turn, SAP invokes a notion of an eternally extendable real-time or present, one with a sort of in-built futurity, the actual contours and teleology of which is never specified. This suggestion of the future-present (a "deep" present

one can see "far" into), combined with this transparency that sees nothing (in the ad, in fact, one cannot see much in all the bright light of the window), justifies the penetration of computing into the lived environment as a solution to the problem of the human inability to "see" or know the systems we supposedly manage and the futures that we need to create. SAP's advertising embraces the infinite invisibility but operability of our logistical infrastructures.

It is not merely that humans are somewhat dumb in beholding their machines in this image; this human failure is not merely perceptual, but also cognitive. In turn, SAP offers a solution: enterprise software platforms that exist to increase flow while simultaneously providing optimization that results from better analytics and mountains of data, supposedly collected by these ever vigilant, and now very smart, networks. This joint mandate—to store and to analyze—simultaneously and autonomously becoming the justification for entire new infrastructures of data centers and high bandwidth communication systems.

What is most remarkable about this state is that it is met with hope, optimism, and even "love". Despite needing machines to provide intelligence, and no longer being able to make decisions, humans appear eager to embrace this situation. As the architect Jesse LeCavalier has artfully noted, and the corporation United Parcel Services makes explicit, "We Love Logistics". This "love", an icon not even denoted in language, encapsulates the fact that logistics are un-representable, and satisfy—if not automate—our desires by answering every demand of consumption with ever greater responsiveness and supply chain flexibility.[1]

We love our networks and, like all love, the desire it generates is almost always unrequited. No need however to dwell in romantic despair! Instead of psychoanalytic melancholy or neurosis, instead of seeking filiation with others, we can now simply turn to ourselves. Artists like United Parcel Service know this. Take for example one of the more famous installations on the theme of the Internet in the recent histories of contemporary art: *Listening Post.* First installed in 2001 at the Brooklyn Academy of Music, the installation comprised of two hundred thirty-one small screens scrolling text randomly grabbed from internet chat rooms illuminated a dark room. Dynamically generated sound, and the soft voice of a machine reading snippets, accompanied the piece. Seemingly ephemeral, the installation offered a sense of cloudiness, atmosphere, ether—a sense of being enveloped within the soft embrace of technology, a sensation of the murmurs and cadences of information. Offering users an affective introduction to the noisome chatting of the internet, the piece was created by the Bell Labs statistician Mark Hansen and multimedia artist Ben Rubin. At once a pleasureful rumination on the forms of intimacy and conversation we engage in online, and a dark examination of the relationship between surveillance and privacy in an age of machine-mediated communications, it was understood to be above all, in the words of the New York Times, "a chapel to the need for human connectedness".[2] Largely hailed—lauded, in fact—with almost magnanimous praise for offering an affective and sensory entryway into that least visible or sensible of infrastructures, the internet, *Listening Post* is both a piece of art and historical testimony to a shift in technical forms of experience.[3]

If *Listening Post* insists on a human form of sentiments and attachment outside of, or beyond, technology (a need to connect) then, implicitly, the piece testifies to another dominant cultural assumption: mainly that data is somehow not human, and must be rendered visible, aesthetic, and sensorially pleasing to be apprehended by people. In many ways, *Listening Post* insists on the fundamentally non-human structure of the network. In fact, it takes pleasure in the fact that networks entangle us, survey us, and construct our subjectivities—one of the more widely circulated videos of the piece is a wall of statements beginning with "I am…" (https://www.youtube.com/watch?v=dD36IajCz6A) . The seemingly dominant mode of "connection" is thus not about others, but rather about ourselves. These operations, however, all occur within the murky, now cloudy, embrace of networks whose only traces are statistically repetitive fragments that serve as the foundations from which we are to extract security, pleasure, and wealth. Unable to represent networks, we seemingly turn inward, to ourselves, and our own images in a kind of networked narcissism.

I open with these examples because it offers insight into an early 21st century obsession with data and

visualization that results not in knowledge, but in the seeming fulfillment of our desires, our need for perceived connections, through immersion into responsive, sensory, environments. Scaling from individual e-mails to massive automated supply chains, there appears to be a new ephemeral and invisible but still an emotional and sensory infrastructure of computing. *Listening Post*, after all, only repeats on another register what can be said to both challenge and replicate the far more dominant models of interactivity and data management in contemporary life. Let us, for example, take the antithesis of the art installation: an IBM operating center in a large urban area (Figure1-2). Littering the world with interfaces, these rather luminous data visualization rooms exist in cities across the globe. In this case, the system is being prototyped in Songdo, South Korea. But South Korea, for all its fabled technology, is hardly alone. London, Rio, New York City all have similar systems installed in different emergency and management agencies. What is most curious about this architecture is that it serves no clear purpose for human beings. It, too, is a performance. These large panels show snippets of information culled from various sensor systems, but the actual flow of information is too great for human cognitive processing capacity. Most of this data is autonomously analyzed by IBM algorithms that alert the operators only in case of an emergency, sometimes after already having begun to initiate emergency protocols. Managers in Songdo's control rooms—upon interviews conducted by the artist Tyler Coburn in Fall 2014—speak of incredibly rapid turnover by operators due to excesses of boredom and fatigue; to which they offered therapy, exercise, and shopping coupons. Forced to sit for hours before algorithmically analyzed data with no event structure, it appeared that individuals were literally, and figuratively, losing their minds.

Fig.1 and 2: Songdo Control Room, South Korea, September 1, 2013. Photo courtesy of the author.

Such architectures of immersion, connection, and algorithmic patterning pose questions about the impacts of big data and technological meditation on human life. If anything, both *Listening Post* and IBM's Operating Centers anticipate what has now emerged under the rubric of "the cloud", a sort of field of immersive information from which patterns can be deduced, optimized, and analyzed. If in the past, statistics bought foreknowledge and certainty, today pattern-seeking is not about deductive reasoning, but a productive process that brings us into being with it. And both in art and in life we continue to insist that increased interactivity and responsiveness will connect us, make our lives more humane, save our world.

Data

To think what it means to become human and realize our connections and desires through data, it might for a moment behoove us to take a spirited romp through a very brief history of data, clouds, and crowds. The term data emerged into use somewhere in the 17th century, the plural of the term *datum* denoting to be "given". Datum also refers to the basis from which inference may be drawn. Data is thus linked to both the fulfillment of desires and gifts, and to deductive reason and knowledge. [4] Emerging with the advent of Enlightenment science, data has long been connected with both abstracting information from the world, and with new forms of seeing and sensing. Arguably, the rise of empiricism (the analysis of data to deduce rules about Nature) has been simultaneously linked to collecting and archiving the world in the search for order. Reason and the archive have thus long been intimately related.

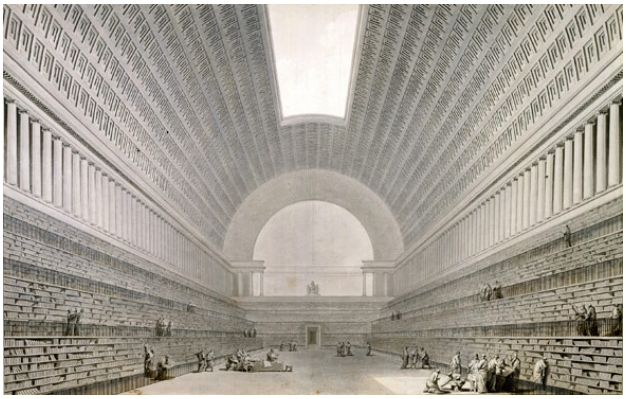


Fig. 3: Boullée, Deuxieme projet pour la Bibliothèque du Roi (1785) from http://en.wikipedia.org/wiki/%C3%89tienne-Louis_Boull%C3%A9e

From the beginning, however, mind and matter were never separate, irrespective of scientific protestation. Data has always come with a sensory, or aesthetic aspect. Architects, artists, and artisans crafted data making it sensible and experiential. Let us take a famous example of the library. Already in the 18th century, French architect Étienne-Louis Boullée envisioned a fantastical Royal Library, envisioning the sum of power and enlightened knowledge through the representational devices of seemingly endless spaces that are filled with knowledge, encapsulated and organized by the state (Figure 3). Coming a moment when democracy and nationalism were being linked to colonialism, these vast repositories of well organized and taxonomically ordered information were—consciously or unconsciously—part of producing the ideal of liberal governance and bureaucratic benevolence: a government grounded in data. Part of the new vision of "man" is now comprised and founded in the management of information. The archive, the library, the museum, the capitol—these are the many instantiations and embodiments that linked the visualization and representation of information with modern forms of reason, power, and government.

Clouds

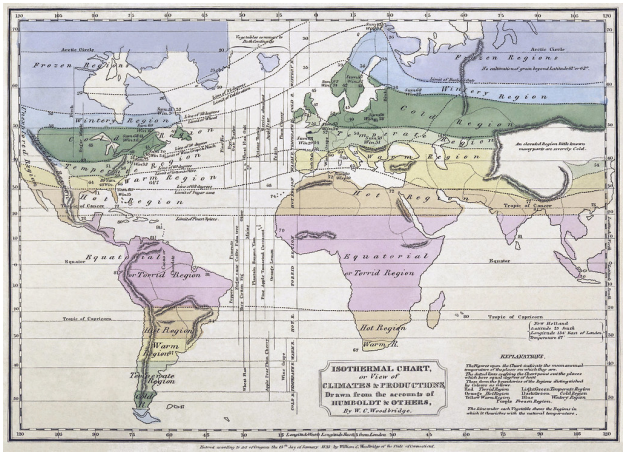


Fig 4: Isothermal chart of the world created 1823 by William Channing Woodbridge using the work of Alexander von Humboldt. From http://en.wikipedia.org/wiki/Timeline_of_meteorology

But if the archive has so often been discussed in histories of science and art, then perhaps it is the cloud that now deserves more attention. Clouds, after all, have long been of concern to strategists, artists, scientists. The first futures markets emerged over agriculture in Chicago in the 19th century, but already in the 16th century insurance companies and trading companies guessed on the success of expeditions and were betting, essentially, on the weather (Figure 4). The military too has always been at the mercy of nature. When Modern art appeared in the first steps to abstraction and modern psychology, it is the clouds of the

Romantics and later Impressionists, that came to demonstrate the tortured fates, and wavering subjectivity, of the modern senses.

In 1896 the first *Cloud Atlas* appeared. It was a miracle of political coordination and an astonishing scientific achievement. It presented an international standard in three languages—English, French and German—for the assessment of clouds. Now clouds had order, patterns, types. *Cirrocumulus, Cirrus, Cumulonimbus.* Each was a type, each could be studied, each could be correlated with events—rain, snow, hurricanes. Even if no one yet knew how they were made, the truth could be gleaned not by understanding but by organizing. It paved the way for the nascent science of meteorology—the scientific prediction of weather. Furthermore, the *Cloud Atlas* was, in the words of its reviewers, notable for its "beauty." These beautiful clouds, the portends of fortune, fair or terrible, for mercenaries, colonialists, generals, and homesteaders alike, inaugurated the careful study of the very misty. Scientific truth became a matter of aesthetic judgments; tying the world of mist to that of knowledge, these atlases inaugurated calculated speculation on the heavens.

Crowds

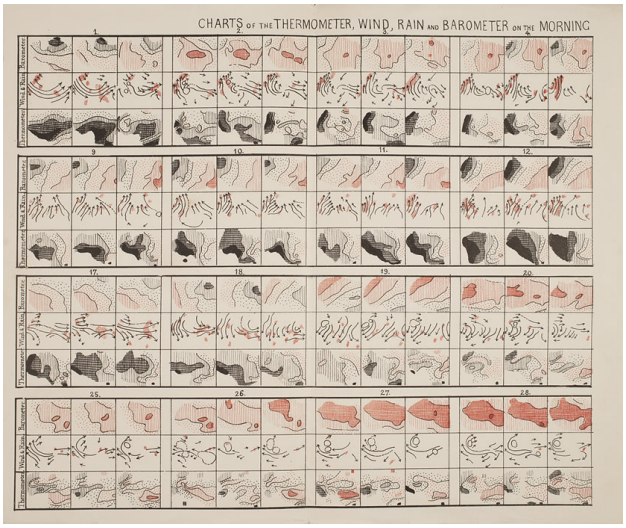


Fig 5: Francis Galton pioneered both mapping weather and people. Chart from Metereologica, or Methods of Mapping the Weather (1863) from http ://www.ucl.ac.uk/library/Newsletter/img/galton-weather-chart.jpg

No sooner had the order of the heavens given way to the actuarial accounting of insurance companies, than the order of man was also turned to data for inference, and made visible—which is to say, knowable—to science. Already, earlier in the 19th century, astronomers looking at the skies found the most earthbound distributions. The Belgian astronomer Adolph Quetelet is famous for extrapolating the errors of instruments, when measuring heavenly bodies, to the pathologies of human bodies. By 1853, he had realized that instruments deviate around a common point, or "norm". He proceeded to apply this thinking to societies—measuring the body sizes of soldiers, for example, to create the "homme type",the ideal or "normal" individual. Discovering these patterns and regularities, he dreamed of a new science, like natural history, but of society. Measuring the births, deaths, marriages, and other actions of individuals would, in Quetelet's view, offer a way to predict future social behavior and plan accordingly. "It would appear...that moral phenomena, when observed on a great scale, are found to resemble physical phenomena; and we thus arrive, in inquiries of this kind, at the fundamental principle, *that the greater the number of individuals observed, the more do individual peculiarities, whether physical or moral, become effaced, and leave in a prominent point of view the general facts, by virtue of which society exists and is preserved.*"[5] (Figure 6)

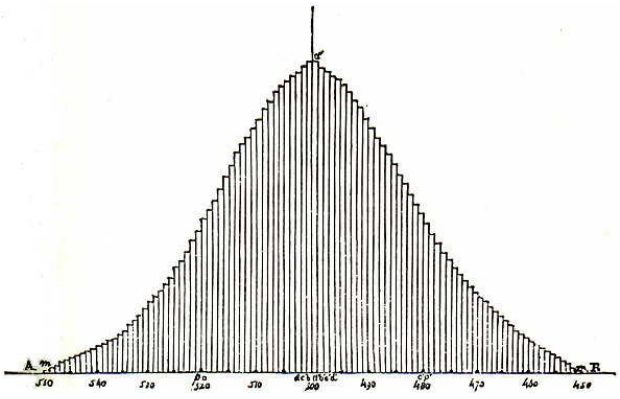


Fig. 6: Adolphe Quetelet Binomial distribution 999 trials: 1846 print http://www.math.yorku.ca/SCS/Gallery/images/dan/quetelet-binomial.jpg

The view of the heavens had been brought to earth. Humanity had become the object of our own study. Francis Galton the infamous polymath and cousin to Darwin was quick to realize the statistical

and visual power of clouds. In 1863, as part of his ongoing investigation in unearthing patterns in nature, he created a map demonstrating time-coded meteorological data from distant readings; thus creating one of the first visions of an earth interconnected by its weather patterns.[6] (Figure 5 above)

In the interest of both the British Empire and class hierarchy, Galton was quick to bring the order of nature to the vision of science. Taking from studies of clouds and natural phenomena, Galton sought a visual and statistical order for the human. If statistics and probabilistic thinking would provide the numbers to regulate populations and anticipate evolutionary change, then photography would produce a standard for imaging individual bodies. Having depicted the patterns of weather in the 1870s,, Galton—influenced by ideas of normality, evolution, and probability—sought to create a statistical photography. Such a photography would compile many images in one place, making visible types of "man"—racial, gendered and criminal. He wanted it to be possible to find racial and biological features of these groups in the faces of individuals. (Figure 7)

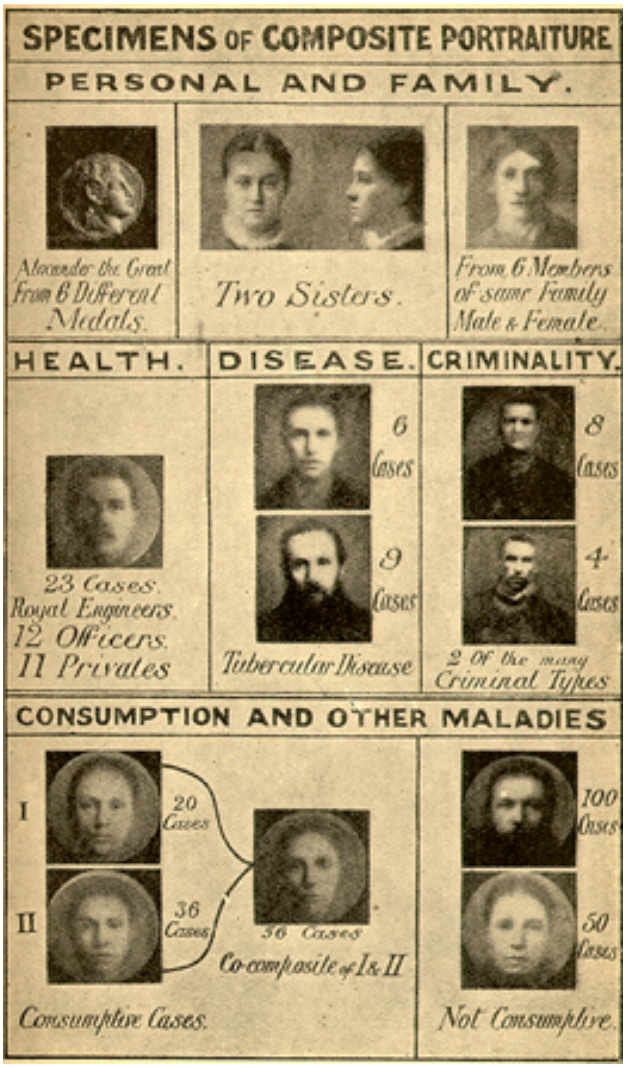


Fig. 7: Galton Composites and Eugenic Charts (1870's) from: http://www.bbk.ac.uk

What linked all these practices was a desire to make the invisible visible through new technologies that merged quantitative and statistical thinking with images to envision a new model of humanity and of nature. Cloudy images of people could be like clouds, organized as types to organize a planetary order. A new model of data emerged. The world of the 19th century was a reservoir of datum, a book that had but to be translated into statistics and, increasingly, into visualizations. Scientists, artists, and others turned ever more energy to turn the ephemeral and the fleeting—the seemingly accidental and contingent—into a patterned universe. What had once been sublime and romantic—a horizon that could only be evoked but never actually realized in the work of such artists and philosophers as Edmund Burke, Casper Friedrichs, and Immanuel Kant—slowly turned into

pure atmosphere and Impressionist sentiment,[7] or into graphical elements and mechanically reproduced images in the works of such luminaries as Étienne-Jules Marey. The path to Modernist abstraction had begun, the "taming of chance"[8] through pattern, redundancy and probability was well on its way.

The inverse of these visible archives of endless data were shadow archives; far less open to the public eye were records kept about criminals, national security, or demography. What links both archives in the 19th century was an obsession with the collection, curation and organization of data. This structural visibility of the archive and data—but the censorship of its contents—can be said to underpin the very ideal of democratic government and commercial transactions, even today:Transparency and Secrecy. These are most often the two poles of politics and capital. We continue to believe that if we could see more and know more, we would also be more free.

Heaven

These atlases that unified the world in a systematic study of the cloudy and the human, might have something to say to our present. Today, clouds are all the rage. The concepts of big data, data mining and analytics are bandied as the harbinger of the next economy. Masses of information are supposed to be the resources by which the future can be conquered—by which space, time, and subjectivity can be made visible, knowable, manageable. The language is telling us: data is "beautiful," we like to "visualize." We do this in order to "optimize" and "analyze" in the interest of improving life itself. One wonders, what is it that is being seen in such cloudiness? And what is being obfuscated by or behind these clouds? Perhaps nothing. This is speculation without alignment to the specular. The desire to command space, the capacity to see territory, has disappeared into the raw act of gathering and organizing data.

This transformation has been long in coming. The first image of Earth, enveloped in clouds, came in 1960 from the TIROS spacecraft, a weather satellite. (FIGURE 8-9) Taken by an unmanned machine, this image stands as distinct in offering the first picture of the earth from space. This image from the heavens inaugurated a new territory and a new form of perception, heralding the moment, perhaps, when as a group, humans came to see ourselves as a species by way of a non-human sight. What had once been the province of gods or angels, and later of scientists, is now the gentle care of "machines of loving grace".[9]

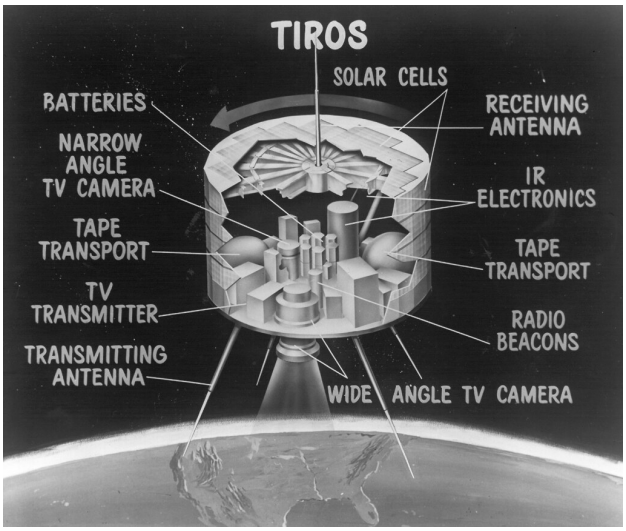


Fig 8: TIROS satellite, "the first weather satellite, was designed to test the feasibility of obtaining and using TV cloud cover pictures from satellites." nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1960-002B

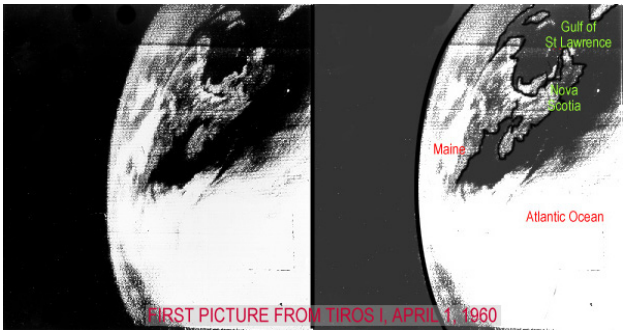


Fig. 9: First Image of Earth, TIROS 1, 1960 "When stations on Earth received data from TIROS, technicians recorded it on 35 millimeter film for making prints and large projections of the image. Forecasters dreams of watching weather from space had finally come true." http://celebrating200years.noaa.gov/events/tiros/image1.html

TIROS tracked the weather, but by the early 1970s, NAVSTAR, the United States Department of

Defense program was in progress. The goal was to use satellites equipped with transmitters, sensors, and radio waves to automate precise missile targeting and military navigation. In the early 1990s, this system consolidated into what is known today as the Global Positioning System (GPS), and was opened to industrial use for supply chain management. The management of globalization and the bombing of Iraq coming together, gifts of our "loving" machines.[10]

This love and connection, brought to us from the stars, has finally made space a question of relative time. In fact, these satellite systems do not measure space; they measure time. GPS is a network of 24 military satellites that in the words of Laura Kurgan comes "at the cost of fixed or absolute understandings of time and space."[11] Coordinated through the time of radio signals and atomic clocks, these systems generate a self-referential temporality that emerges from within the system, at an atomic level. This time, not of humans or even industry, establishes a baseline within the system, by which all movement is measured according to time lapse in signal transmission. The satellites coordinate according to each other and the tempos of the system, and we coordinate ourselves to it, establishing Network Time Protocols that simply coordinate our attention to our machines. A time coming out of our networks, that we now sync with and realize in our own lives through utilizing the algorithmic integration between satellites, RFID tags, QR codes, and a myriad of other machine-to-machine communication protocols that move people, products, and missiles seemingly seamlessly through our world.

Algorithms

There is, therefore, a strange amnesia that pervades the cloud. If the 19th century was the age of the archive, of the sciences and technologies, of memory and inscription—psychoanalysis, photography, gramophones—our present is an ephemera grounded in *memorylessness* and relative temporalities.

How is it that we have made the world so cloudy and ephemeral? Such mention of random weather patterns and relative territories make us consider one of the latest rages in computer modeling and algorithmic trading, some of the very algorithms that coordinate between GPS and users on-line, the algorithms that in theory facilitate machine "learning" and adaptation—Markov chains and neural nets. Markov chains have a remarkable characteristic, they can tell the future of a state, but never the past. They are *memoryless*. The special marker of these techniques in probability is that Markov chains or processes cannot tell one how a system arrived into its current state. They have even been labeled "psychotic" by some of the early pioneers of computing.[12]

What makes Markov chains particularly useful is their ability to assist us in creating futures for systems and applying probability into engineering, under conditions of incomplete information. They are the logics of the cloud, embracing the lack of visibility to produce interactivity.

For example, Markov chains are used to help enact such phenomena as random walks in order to make preemptive and rapid decisions in domains such as algorithmic trading and weather forecasting. They generate models of water flowing, dust swirling, clouds forming, vehicles moving, and stocks vacillating all on the assumption of independent random steps, unconnected to each other. Minute agents acting independently, without memory or history, might yet become mighty storms and vast fortunes. It appears that the more we are networked, the more we fantasize of a force of autonomous agency, the self-organizing system. We look to the heavens, but we operate on the molecular, even atomic, strata.

These particles, so random, have come to reformulate the human and the subject. Invented over one hundred years ago, in 1913, by the Russian mathematician A.A. Markov, these chains also emerged from our dreams and sentiments, from the study of poetry. Analyzing Alexandr Pushkin's famous novel written in prose, *Eugene Onegin*, Markov spent hours immersed not in the cadences, the characters or the aesthetics, but in the redundancies and patterns in consonants and vowels. What had begun as literature, came out as statistics. And what Markov discovered, at this tumultuous time in Russian history when so little of the future could be known, was a new way to act upon futures that appeared cloudy. In an age of increasingly media and global connectivity, he built

a new application for probability, for networks and events that were linked; a new way to apply probability to problems that were not merely games of dice or coin tossing.[13]

This remarkable invention has permitted poetry to become "personalization". By the 1950s, pioneers in computing argued that our markets and machines would work better if we ceased to think of ourselves as omniscient, troubled or psychological beasts, and instead embraced our limited abilities to comprehend the world—focusing on our actions, not our thoughts. Herbert Simon, the father of modern finance and artificial intelligence introduced a concept of "bounded rationality". He described it in recourse to an insect, discussing a small ant. In invoking this insect he argued that we should treat all animals and machines like worker ants, capable of only seeing each obstacle as they come to it, endowed with limited potential actions, responding in time for the future. Stock market speculators, he said, are ants—not giants, and certainly not poets. They are part of a network, an organization. They build the market, it doesn't exist beforehand. We implicitly recognize in these models the vision of a human subject who is always mired in the clouds, never capable of surveying the territory from above; a partial, and in his words "schizophrenic" subject.[14]

Such approaches are also part of queuing theory. Queuing theory anticipates waiting times or queues. A branch of operations research, such theories allow us to optimize telecommunications systems, supply chains, hospitals, and any number of other locations where people and things might pile up.

PageRank, the page ranking algorithm of the Google search engine, comes immediately to mind as a classic case that merges memoryless Markov chains and queue management, ironically in the interest of data mining and information retrieval (operations that sound archival, if not historical). PageRank maps the network (imagine a chain with upwards of 40 billion states!), but must also automatically match advertising and drive user behavior in order to perfectly anticipate our next interaction. By treating each page link as a "state", the purpose of the algorithm is to guess , the possibility of users clicking a particular link. Since Google grounds its ad placements and search results in part by mapping how many links are attached to each site, and in part by estimating through (we assume) Markov processes the demands, speed, information availability and user profile, of and from the network, these algorithms both create a partial snapshot of the network, and produce a speculative assumption on the next state the network (and user) will take. These rankings, and their affiliated advertisements for further consumption or interest, are speculations based on moving users and data without bottleneck through Google's vast warehouses of information. Such systems proliferate—Facebook advertisement and Netflix suggestion algorithms, Amazon recommendations—it is endless. With extreme speed, these systems generate possible futures for the users based in their memorylessness that is, again, ironically grounded in vast and rapid access to a lot of data from the network. Storage and memorylessness are not antagonistic, they are simply not historical or archival. In such systems, the image and the act are the same. The interface does not represent the network, it enacts its future, and we willingly participate.

Lacking memory, but lording over endless fields of data, we, the users, are offered the comfort of believing we are looking at our own images. Narcissus in the mirror; all our desires fulfilled at the interface—an interface that shows nothing but what our next interaction should look like.

But in our networks—whether nomadic or controlling—statistical functions and images are so closely married as to be indifferentiable, and analysis has become a process without end. The more data we accumulate, the more urgently it must be utilized to project into a future that, while grounded in information from the past, has no history. Our individual narcissism has replaced the crowd, and the algorithm has replaced history. Clouds, like the weather, change and move; they are not about historical time, but about preemption, anticipation, self-organization.

Desire

What is seemingly most attractive about these concepts is that we never need to finish or represent the final state of the system, or necessarily know how we got there. Behind the

Markov chains is the dream of the self-organizing system. If once we aspired to create models to know the future, now we live in a world of uncertainty, obfuscated by clouds of data that offer the imaginary of constant analytics while never really showing us the future. Immediate analysis of vast amounts of data can immediately be fed back into operations, anticipating the next move and desire of every user. Nothing needs to get seen, nothing needs to be fully described, and time can be ever more compressed to emerge out of the system.

This returns us to the queues and lists, the running images and flows of our endless Twitter feeds and texts. As we enter our social environments, now all managed by algorithmic logics, providing the soft hum of networks 24/7, we click away, awaiting, in the words of the NYTimes, "connection"— to satisfy our desires, to finally be human.

Fig 10: Kiva Robot Warehouse. Screen shot from: https://www.youtube.com/watch?v=6KRjuuEVEZs

It's curious what we connect to when we click. Our demands, perhaps desires, can now be fulfilled without some unrequited longing or romantic interlude. Small, lively machines stand ready to hear us, our algorithms are prepared. They link the satellites in the heavens—the GPS and GIS coordinating and bringing our containers from far off lands into warehouses— the statistical instruments that anticipate, coordinate, and modulate these chains.

It brings to mind that most characteristic of 19th century behaviours—the ballet. The perfect modernization and industrialization of the body, brought to art. The ultimate work of coordinating precision—so much movement, so perfectly scripted, seemingly effortless. The new choreographers of our present are excited, their systems are ready, but if we knew what the performance would look like in an earlier age, now it appears disorganized, chaotic, and surprising.

Boston based firm Kiva Robots literally has dancers. (Fig.10) Small and orange, basically retrofitted robotic vacuum cleaners, the Kiva system has revolutionized fulfillment management. Purchased by Amazon in 2007, the basic innovation is that there are almost no humans on the warehouse floor. Instead of stacking goods in a warehouse and then going out to get them, these small robots—guided by QR codes and tracks on the floor—bring the goods to you (the few human laborers who fill the orders). The entire warehouse is full of little machines carrying their respective shelves. Items are laid anywhere in the warehouse, and tagged. When called for, the closest robot goes out and "fetches" the entire shelf with the item and brings it to the vestibule, where a person picks it up. So wonderful at fulfilling every click and desire of the online shopping world are these little machines, that Kiva has made a charming video in time for Christmas. Playing Tchaikovsky's nutcracker suite, a small corps of little orange robots moves along well-tracked floors in concert—whirling and whirring, humming their little engines and blinking their small lights—all to amuse us, the consumers. As a climactic moment, the final act, the robots dive beneath their shelves, the video ends. We are left with one final cloudy thought...we envision that in the next moment, these little machines will roll out, bringing us our gifts, fulfilling our dreams that were logged in the cloud and served on Amazon (this scene can all be witnessed at: https://www.youtube.com/watch?v=Vdmtya8emMw). Little Clara's dreams have been fulfilled, without any Freudian dramas about sexuality and adolescence. All in real-time, which is network time, which is to say almost immediately.

The dream of self-organization has been fully automated, the invisible hand, then the managerial touch, has now become the autonomous algorithm. What matters is that, now, it truly is every desire—every point, click and transaction that is being directly "fulfilled" through the little hum and soft embrace of our loving machines.

This same logic brings us full circle to the amazing operating centers and sensor filled smart environments that we now inhabit. The corporation Cisco Systems, Inc. sells its smart programs under the logo: "Smart and Connected". Now, with every

space in our environment perfectly logged in, our living space turned into a cloud—infinitely responsive and anticipating, awaiting our clicks, our need to connect, our desires—we perhaps begin to recognize what it means to live in a cloud.

Fig 11: Songdo in the Clouds. July 4, 2012. Courtesy of Orit Halpern

Cloudiness takes on a new logic, no longer hiding some invisible truth. We no longer wish to represent world. The older weather maps, with their quaint taxonomies of clouds, have been left behind. The clouds of our present draw us into a desire to enter and never leave the network. We appear to enjoy being wrapped in the intoxicating and senseless embrace of our data (figure 11). We like being inside the fog. We have embraced the beauty and aesthetics of the *Atlas,* and our clouds coordinate the time and space of our world. But we have abandoned the search for a natural, true and objective order. This is not necessarily a bad thing. Bounding rationality, trading with algorithms, speculation is not about full information, but immersion into the data mist. Visualization has replaced vision as we accede to an unremitting longing to continue analyzing a world we no longer wish to see, but whose orderly cloudiness wraps us in delight. We have come to desire the experience of the network—our partial perspective, the endless demonstration of the human "desire" to connect.

This returns us to art. *Listening Post* is above all a demonstration of these magical algorithms and their logics. A system that also sifts and seeks pattern. This need to have human desire fulfilled at the interface is accompanied by a need to "experience" or "sense" the network; even as the installation itself gives witness to this impossibility. As Rubin and Hansen have argued, the piece can be understood as a type of "data visualization". Implicit in their argument is the idea that if data cannot really be fully represented, should we not be more creative in our experiences of information? The corollary of this hypothesis is that the work of art in the networked age might be to imagine such different modes of experience.[15] Why, one may ask, build interfaces that are all the same, if none are more truthful? If we dispel the dream of objective surveillance over space, perhaps we can imagine different modes of "visualization" and, ultimately, imagination. If *Listening Post* differs from contemporary smart cities, or Google PageRank, it is because it is so carefully choreographed and cadenced. The artists have unearthed the potentiality of ephemerality and invisibility,—if we cannot see objectively, then perhaps we can see differently. It has taken the mechanization of our communications systems and relations to their logical extreme, to reveal that the "need" to connect is not primitive, it is technological. It is born of our machines, and our clouds. No matter the Markov chain, we can never know the weather, or each other. The work of art, and perhaps what *Listening Post* might still remind us of, is that desire may always exceed automation; there is always something left for imagination. Perhaps something beyond the instantaneous fulfillment of our every demand at the interface. Invisible architectures that can never be represented, but may yet become transformative.

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