

Visual Anecdote

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ABSTRACT

The discourse on information visualization often remains limited to the exploratory function – its potential for discovering patterns in the data. However, visual representations also have a rhetorical function: they demonstrate, persuade, and facilitate communication.

In observing how visualization is used in presentations and discussions, I often notice the use of what could be called “visual anecdotes.” Small narratives are tied to individual data points in the visualization, giving human context to the data and rooting the abstract representation in personal experience. This paper argues that these narratives are more than just illustrations of the dataset; they constitute a central epistemological element of the visualization. By considering these narrative elements as parts of the visualization, its design and knowledge organization appear in a different light.

This paper investigates how the “story” of data representation is delivered. By means of ethnographic interviews and observations, the author highlights the different aspects of the visual anecdote, a specific point where the exploratory and the rhetorical functions of visualization meet.

The Story of Visualization: Where Is It Located?

What do people mean when they speak colloquially of the “story” of a visual data representation? How is the story connected to the visualization and where is it located? This relationship depends on how visualization is used, for it can serve two purposes: thinking and showing. Visualization fulfills both an exploratory function, as a tool for finding new knowledge, and a rhetorical function, as a vehicle for communicating meaning.

The Exploratory Function

The discourse in the information visualization community traditionally focuses on the exploratory aspects. The main objective of information visualization, according to common definitions [1], is to “amplify cognition” by externalizing thought processes. As a tool for “crystallizing new knowledge,” visualization allows us to perceive and recognize patterns in data. In this context, the story refers to the patterns and structures hidden in the representation. Thus, the story is inside, implicitly embedded in the data. While the persuasive power of images is generally acknowledged, the “ethical codex” of information visualization demands skepticism, by avoiding everything that might distort the nature of the data [2].

The Rhetorical Function

In contrast to the exploratory approaches emphasized in the information sciences, theorists of diagrammatic representations tend to focus on the rhetorical function of visualization. Bruno Latour, for example, argues that the importance of visualization (or, as he calls it, inscription) “is, first of all, the unique advantage [it gives] in the rhetorical or polemical situation” [3]. By this he means the possibility to demonstrate a finding in a shared, highly formalized language. The primary advantages of these inscriptions are their mobility and immutability, not their perceptual advantages for discovering patterns, which Latour considers vastly exaggerated. In this



context, the story is the (social) narrative associated with representation. Here, the story is located outside, in the discursive context of the representation.

The Coupling of Narrative and Structure

The various visual languages of visualization are generally tightly coupled with the data represented. As long as we remain concerned with the description of structures in the data, this coupling between form and content is simple and direct. However, once visualization is understood as the representation of meaning [4], this mapping becomes more ambiguous, since “meaning” is a mental concept, not a feature of the data. In this ambiguous space, both exploratory and rhetorical functions are intertwined, while the visual vocabulary may remain persistent.

Narrative and Structure in Feynman Diagrams

A compelling example of the dynamic relationship between notation and meaning can be learned from David Kaiser’s analysis of the history of Feynman diagrams [5], which demonstrates how an essentially arbitrary visual language outlived the theory it initially described.

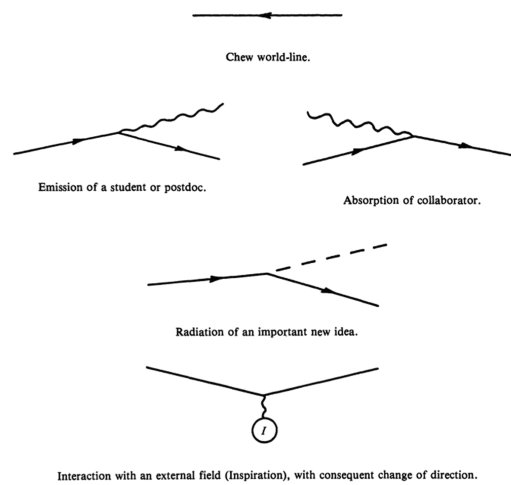


Figure 1. The visual language of the Feynman rules, adapted for a different context by William Frazer. © 2005 Public Domain.

In 1948, Richard Feynman presented the notation technique as a mnemonic device for complex computations in the field of quantum physics. In this notation, each visual element represents a mathematical relationship associated with a specific particle interaction (Figure 1). Decades later, the specific brand of quantum field theory the diagrams are based on became contested and other theoretical frameworks were proposed. However, while the theory disappeared, the diagrams stayed: the champions of the new theory started to invent new meanings [6] for the diagrams, which otherwise would have become useless.

The reason for this surprising persistence might be the fact that Feynman diagrams offer a persuasive picture of the physical process: they reminded the physicists of the photographs from bubble chamber experiments and were compatible with previously established diagrammatic methods such as Minkowski diagrams. Thus, the diagrams have served as a vehicle for communication from the very beginning and have quickly found their way into textbooks. While the algorithm behind the visual language of the diagrams was at all times explicitly defined, the temptation to see them as a pictorial representation of reality remained – an effect that Kaiser compares to the notion of “realism” as an apparent ability to capture reality.

Therefore, Feynman diagrams show both functions of visual representation. On the one hand, their visual algorithm simplifies computation and exploration. On the other hand, their apparent realism provides them with rhetorical power for discourse. These two functions are not exactly congruent, since the pictorial aspect suggests more than the notation explains. Yet both functions are simultaneously present.

The Visual Anecdote

Feynman diagrams represent an exceptional example where the two functions live contentedly

next to each other. However, this is not always the case. More often than not, the rhetorical and exploratory functions meet only at a single point in the form of an anecdote. Anecdotes are accounts of single incidents, short, seductive and humorous, sometimes true, sometimes invented, with a point and a direction. Jane Gallop calls the anecdote a “theoretical moment” [7], a possible catalyst for a bigger theory. While the Oxford English Dictionary defines the anecdote as a “narrative of a detached incident, or of a single event, told as being in itself interesting and striking,” thus emphasizing its detached, singular nature, Gallop points out that the anecdote, as a narrative of the moment, calls for contextualization into a bigger story. Exactly the same relationships are at work between the exploratory and the rhetorical functions of visualization – the relationship between a general theory and a specific incident, an abstract algorithm and a tangible narrative.

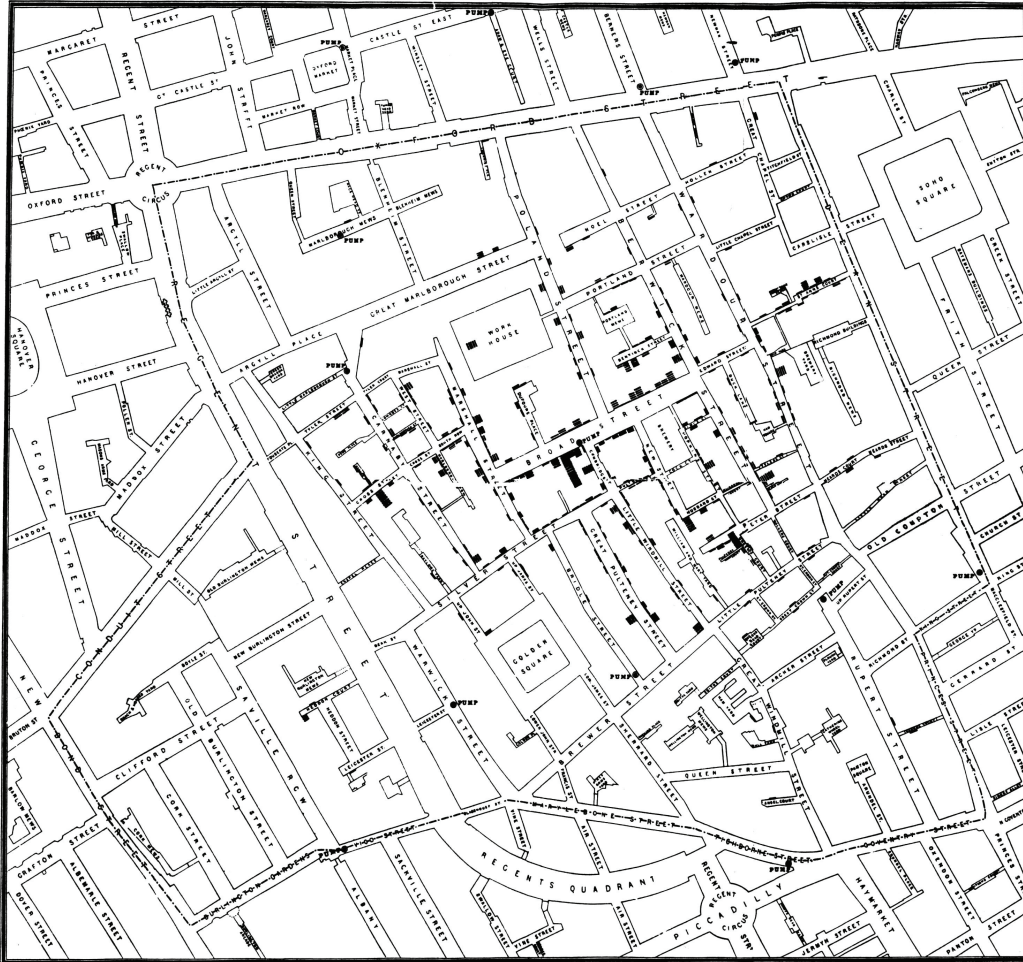


Figure 2. Snow's spot map of the Golden Square cholera outbreak, 1854. The Broad Street pump is located at the center of the map.
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Snow's Map as a Visual Anecdote

I will explain the notion of the visual anecdote through the well-known example of John Snow's map of the London cholera epidemic of 1854, one of the strongest narratives of visualization. While different versions of the map exist, all of them show two kinds of data: the locations where cholera-related fatalities occurred and the locations of public water pumps in the city. In one area of the map, black marks aggregate around the famous Broad Street pump, thus suggesting a causal connection between that pump and the casualties of the disease (Figure 2). There

has been some debate about whether the map actually led to the discovery of the connection between water and cholera [8]; historical examination revealed this role of the map to be a myth [9]. However, the actual role of the map is of no concern in this context; instead I will focus on how this map works as a narrative device. From a rhetorical perspective, all visual parameters are perfectly adjusted to support the narrative connected to the map. Unlike other maps of the cholera outbreak of 1854 [10], Snow's map is perfectly centered on the Broad Street pump. Further, the map only contains information about the fatalities and pumps, thus suggesting a connection between these two elements. Another issue is the choice of graphic symbols: the fatalities are marked as short black lines, resembling small bar graphs aligned to the street network. Only in the area around the Broad Street pump is the number of deaths high enough to create a solid black area that is able to draw the viewer's attention.

The point I want to stress is that the spatial organization of the map depends on whether the rhetorical or the exploratory function is examined. From the exploratory perspective, the information space is homogenous. The map maintains some generality; it might as well be used to learn about the street names in 19th century London. From the rhetorical perspective, however, the narration establishes a spatial hierarchy that divides the map into more and less important areas. The argument focuses on one single point, the cluster of fatalities around the Broad Street pump.

The Myth of Generality

To characterize Snow's map as a propagandistic device, however, would be the wrong conclusion. The map is not a rhetorical device in the same sense as a billboard, for its visual language is consistent and precise. Its rhetorical power depends precisely on this consistency for contextualizing the anecdote into a bigger frame in the sense of Gallop's anecdotal relation to theory [11]. This contextualization, however, should not be confused with generalization.

Observing presentations involving data visualizations, I often notice a rhetorical maneuver: after puzzling the audience with a complex visualization, the presenter selects, seemingly arbitrarily, a single data point and connects it to a story, an anecdote that unlocks the principle of the whole representation. I suspect that this single data point is seldom as arbitrary as it might seem, in fact the whole visualization might be designed to highlight this single point – a rhetorical device allowing the audience to reproduce the discovery of meaning in the data.

Obama | One People, SENSEable City Lab

In the last section of this paper I will focus on the communication process around the presentation and development of data visualizations with interview excerpts from a small ethnographic project on the subject matter. The interviews were conducted in the SENSEable City Lab at MIT [12], whose objective is to analyze and improve cities based on real-time information sources. While the lab is prolific in its visualization production, research on visualization methods is not the ultimate objective. Instead, visualizations play a central role in project collaborations with other departments, with external sponsors, and in communication with the general public. Projects typically involve a number of external academic partners, organizations, or companies forming a consortium. Many projects involve public exhibitions, which are not only a means of dissemination, but also a catalyst for research: by involving companies and organizations in a prestigious exhibition project, it became possible to gain access to datasets that would be otherwise out of reach for research purposes. This complex network of relationships makes the Lab a perfect case study for the investigation of the rhetorical aspects of visualization, which becomes a mediator [13] and a currency for the negotiation of research between the involved actors.

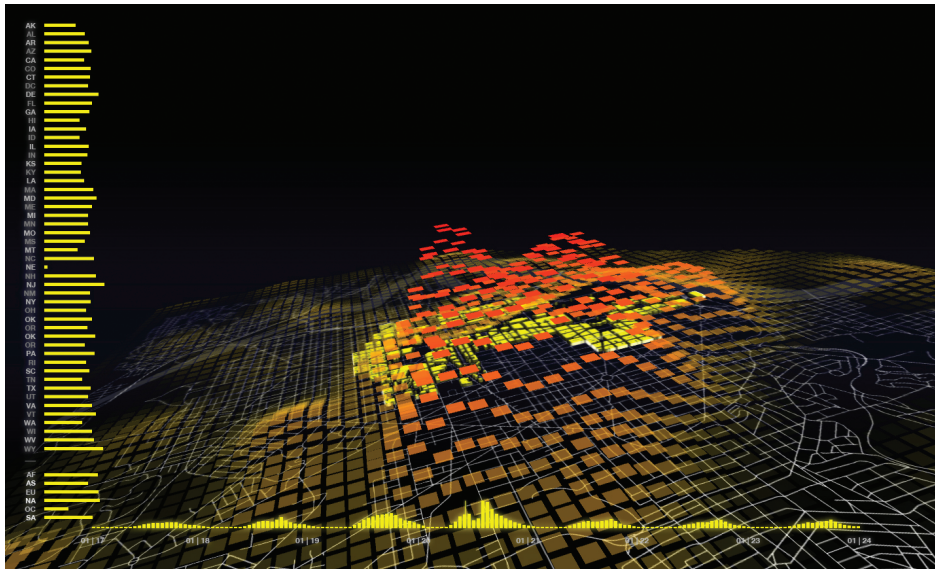


Figure 3. Obama | One People: visualization of call destinations during the 2009 presidential inauguration.
© 2009 SENSEable City Lab.

I first met the designer Mauro Martino, a research fellow at the SENSEable City Lab, to talk with him about his visualization of the cell phone activity in Washington, D.C., during President Obama’s inauguration speech [14]. Based on mobile call data from a telecom provider, the project tried to answer the following questions: Who was in Washington, D.C., for President Obama’s inauguration day? When did they arrive, where did they go, and how long did they stay? The dataset divided the city into a regular grid containing aggregated mobile call volumes, the call destinations, and the region code of the caller (Figure 3). Mauro sifted through the animated 3D landscape of cellphone activity and showed me the differences in the activity profiles between a usual week and this special event. When I asked him what he considered to be the story of visualization, he replied that it is certainly not about the complexity and richness of the data. For a car manufacturer participating in one of the Lab’s projects, he recently completed a real-time visualization combining a multitude of data streams in a strikingly complex representation. He said, “but for me it is just a screen saver, since there is no story. Compare this to the Obama visualization. It contains just the call intensities, but you can talk about it. The car data was more complex and rich, but the Obama data contained a story.” However, he also noted, “An important point is to match the interests of our partners with the story. There are many ways to change the visualization in order to show different stories.”

The goal behind the visualization of the presidential inauguration was to develop a representation that was as powerful a display of the impact of communication technology on cities as SENSEable’s New York Talk Exchange (Figure 4). This project mapped the global call activity of New York on a neighborhood level, reflecting the cultural and geographic diversity of its population. The Talk Exchange exhibit was also a success for the Lab’s partner AT&T, who provided the telecom data, and consequently the Lab proposed the Obama project to AT&T as well.

And indeed, the data from inauguration day show quite an interesting pattern. As journalists move into the capital, the activity slowly builds up, then a dent appears in the activity profile: a moment of silence, as the city holds its breath during the inauguration speech, followed by a peaking wave of activity before everything goes back to normal after six days.

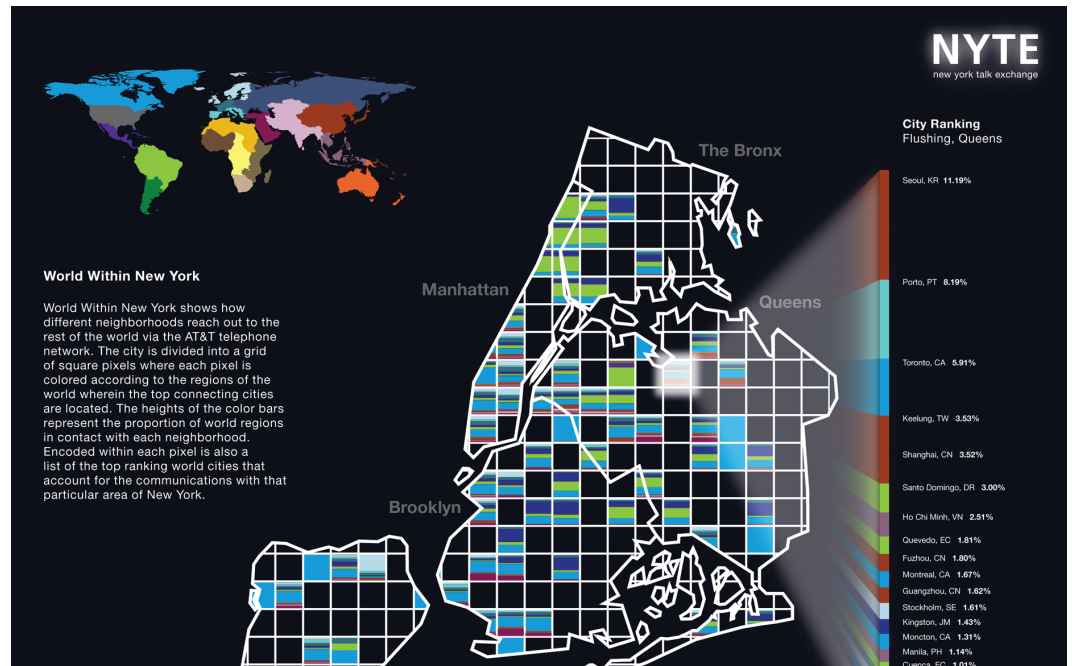


Figure 4. New York Talk Exchange: visualization of global call destinations by neighborhood in New York City.

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According to Mauro, there was another pattern: “We saw that some states seemed to have more interest in the inauguration event than others. However, we had to change it, since the data was considered impolite.” How can data be impolite? I asked. It turned out that the distribution of mobile communication across the states positively correlated with the proportion of African Americans in these states.

According to Mauro, nobody in the Lab noticed this connection, but AT&T noticed it immediately and initially objected to the visualization. Today, the controversial findings are published on the Lab’s web site. Still, Mauro concedes that there was some degree of negotiation involved: “Usually there are several stories in the data – you have to select one. You can change the visualization by putting emphasis on a different story.”

Real Time Rome

I conducted another set of interviews with Francisca Rojas, a PhD candidate in urban studies and researcher in the SENSEable City Lab. In one interview, she talked about an earlier project involving live telecommunication data: Real Time Rome [15], a live visualization of urban activity presented at the Venice Biennale 2006 (Figure 5). The analytical part of the project involved to some degree a validation of assumptions about the everyday in a city like Rome: “You see how over the course of a day people wake up on the fringes of the center, they go into the center, and then back out at night. You could assume that this is how the city operates – it is not telling you anything new, but it exposes a pattern that you would not be able to get at otherwise at that broad scale.”

By lucky coincidence, the dataset covered an event that engaged the whole city – the 2006 soccer World Cup final, France against Italy. The tides of mobile phone activity reflected the events around the game. Francisca said, “Once we implemented the idea, we saw that the data really did show these huge spikes in cell phone usage. We all saw the visualizations and were trying to figure out what that was telling us about human behavior. We always had to remind ourselves

that it was people making phone calls. It was a proxy for human activity, not the actual activity. We understood the visualizations as emotional maps of the city – you see how it is quiet during the match, then the usage of phones spikes during the halftime, and then at the end. And then, when something happens like Zidane’s headbutt to the Italian player...” Of course, this anecdote concludes every presentation of the project.

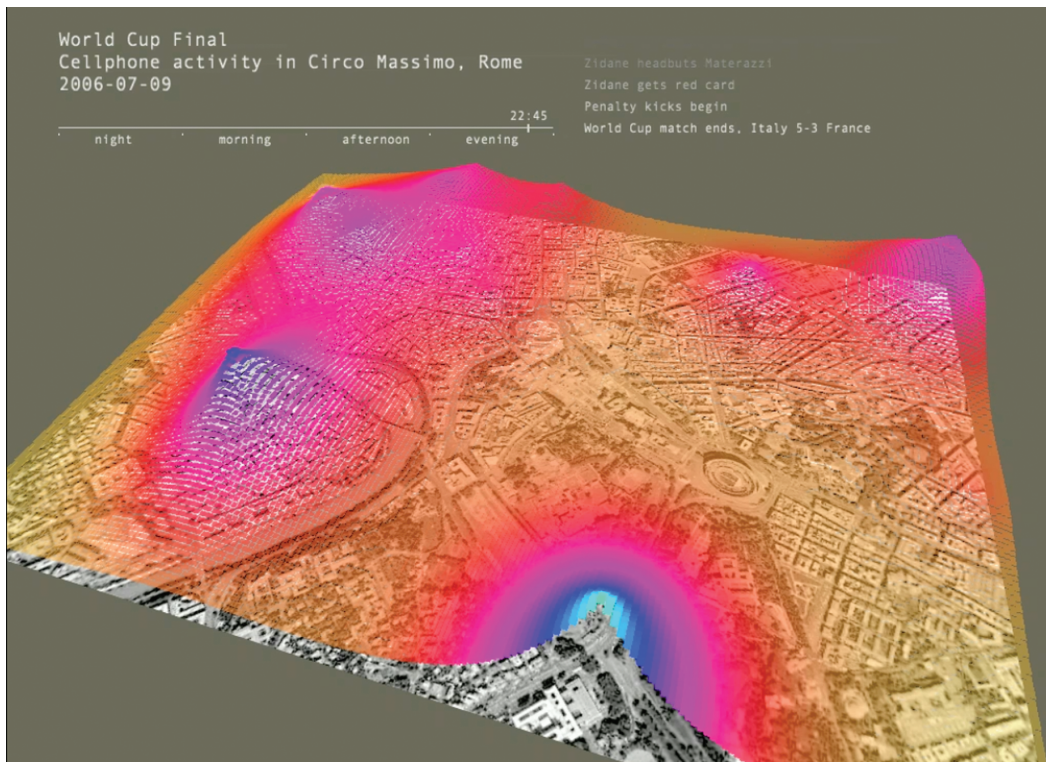


Figure 5. Real Time Rome: visualization of call activity in Rome during the World Cup final soccer game. © 2006 SENSEable City Lab.

Conclusion

As demonstrated in the examples, the rhetorical perspective reveals a range of strategies that also have consequences for the exploratory aspects. The design decisions behind Snow’s map can be understood as a rhetorical strategy to direct the exploratory process. In the example of the Obama inauguration visualization, these design decisions become explicit in the context of the communication process between all involved actors. The rhetorical instruments depend on the expectations of the different stakeholders – collaborating researchers from other disciplines, sponsors, the researchers inside the lab with their research interests, as well as the media and the general public. Visualization thus becomes a currency for negotiating research, a currency that has a specific value for every stakeholder.

The notion of the anecdote goes beyond rhetorical principles of visual communication [16], since it also covers the non-visual and performative aspects of the presentation. The nature of the anecdote, as theorized by Gallop, provides a link between a specific incident and a larger story, similar to the visualization concept of focus plus context [17].

My interview partner Mauro noted, “If you want to design general tools, you are interested in the whole range of possibilities, in the interaction and so on. But if you are interested in a particular dataset, the story is crucial.” While the exploratory perspective emphasizes generality, the rhetorical perspective emphasizes the anecdote.

Acknowledgement

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