Socializing Visualization

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Abstract

The immersive and compelling nature of many social visualizations arise not only from the nature and presentation of the data under consideration, but also from the social interactions, both implicit and explicit, surrounding the use of the visualization. Across numerous examples, “the social life of visualization” (to borrow a phrase from Wattenberg) has shown to be an important factor shaping the adoption, use, and efficacy of a visualization—an aspect often overlooked by the psychological / analytic orientation of contemporary information visualization. This position paper attempts a preliminary exploration of the consequences of this insight for the design of social visualizations by recasting visualization applications as not just external cognitive artifacts, but social artifacts. Key components of this re-thinking include the move from purely task-based considerations to that of ludic, or playful, activity and an exploration of fundamental design considerations for facilitating the social dimension of visualization use.

Keywords

Exploration, play, analysis, design, social visualization, information visualization

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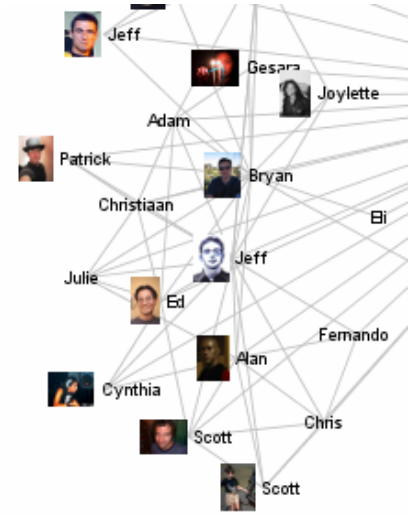


A segment of a friendship network visualized in the Vizster system.

Introduction

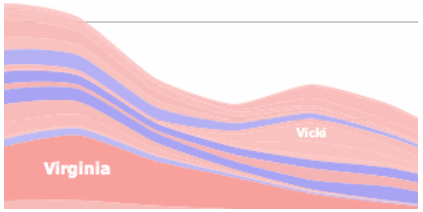
In the summer of 2003, millions of people flocked to the popular Friendster social networking service, invited by friends and acquaintances to articulate their mutual social bonds. As part of a study of this phenomenon, danah boyd and I built Vizster, a social networking visualization intended primarily for use by the end-users of the Friendster system [4]. In the process of evaluating Vizster, we deployed the software at an all-night event whose guests were largely constitutive of the early-adopters of the service. An interactive kiosk and a large projected display were installed, allowing for simultaneous viewing of the interface by a crowd of people. By placing the visualization in the "natural habitat" of the participants, we hoped to observe usage patterns and document larger social effects arising in the context of use.

The results proved interesting. Participants who approached the interface but were unable to find their own profiles, either through casual browsing or through a provided search interface, spent very little time interacting with the system. At most, they spent a few seconds experimenting with a few of the interactive features (*e.g.*, animated layout, automatic community identification) before walking away. The retention time of users who found their own profile was much longer and exhibited usage patterns much more focused on the data itself than on the surface features of the visualization. People explored their immediate and surrounding networks, tracking down friends and examining the distribution of various attributes of users' profiles.

Most interesting to us, however, was an additional shift in usage when groups of friends would interact with the system together. Not only would the retention time continue to increase, the explorations became deeper and more nuanced. This was clearly traceable to the conversations arising amongst the participants. The group would form hypotheses, check their own social knowledge against that reported by the system (*e.g.*, "What!? She's not single!"), and issue challenges to each other, such as finding the path to a particular shared friend from the current view. Experiences with the visualization also elicited social narratives, with participants telling stories of events involving both the people physically present and the people represented. We were struck by the observation that, participants using the system collectively appeared to perform deeper analyses and have more meaningful experiences than individuals using the system in isolation. Furthermore, the interactions between participants in a group were strongly characterized by playful, often improvisational, behavior.

We were all the more excited after learning Martin Wattenberg had reached similar insights observing the social use of his NameVoyager visualization [11, 12]. Extended conversations and playful engagement with both the visualization and other participants had sprung up on multiple blogs, exhibiting characteristics quite similar to those seen with Vizster.

These observations point to a possible extension of existing usage models for information visualization. The typical model tends to focus on a single individual engaged in task-based analytic activity, with most theoretical grounding arising from, or inspired by, perceptual psychology. This paper explores the potential for expanding this framework to include the social factors surrounding the context of use,



NameVoyager, a stacked area chart visualization of name popularity over time, designed by Martin Wattenberg.

considering visualizations as not just external cognitive artifacts, but social artifacts. While the value of visualization for communicating findings (as opposed to unearthing insight) is recognized by the field, a thorough examination of the "social life of visualizations" [12] remains to be done. Furthermore, given that observations of such social interactions to date are predominantly characterized by play, it suggests expanding the usage models of information visualization to include playful, unstructured behavior—data analysis of an even more exploratory type.

The possible advantages of such a study are plentiful. One is the phenomenon of "social data analysis" [11], in which collective intelligence is leveraged to unearth insight. Another is in applying a richer understanding of play and affective state to the individual use of visualizations, exploring design considerations that facilitate more engaging, and hence hopefully deeper and more relevant, experiences. The potential for improved designs for both communicative and collaborative visualizations is also inviting.

The remainder of this paper takes some preliminary steps in exploring the social use of visualizations, drawing on existing frameworks and observations of social visualizations. A review of one popular conceptual framework for play is provided and a series of design considerations for facilitating engagement, social interaction, and play is presented.

A Framework for Play

One potential framework is that posited by Roger Caillois in his book *Man, Play, and Games* [2]. Caillois characterizes play as unfettered, voluntary action conducted in a "space apart", such that loss or failure carries only limited consequences. He also defines a spectrum between what he calls *ludus*, corresponding to structured play governed by rules, and *paidia*, or freeform play. Between these can arise emergent play, in which rules or structure take shape through social interaction. Furthermore, Caillois identifies dimensions on which playful activity can be considered, an extended version of which is now briefly considered.

Agon is the dimension of competition, pitting participants against each other, against themselves, or against an external force. Sports teams vie for victory, chess players search to checkmate their opponent, and video game players seek to defeat each other or their computer-simulated adversaries.

Alea is the dimension of chance. Often play involves the intervention of randomness, such as the roll of the dice or the shuffled deck of cards. Chance provides a mechanism for new and unpredictable play experiences, can help level a playing field, and can place players in an agonistic struggle against probability.

Ilinx is the dimension of vertigo. Many forms of play involve a loss of control, or of disorienting or unexpected situations. This is an important part of testing and learning limits, both physical and social. Examples include children spinning around in circles, the game Twister, or the thrill of extreme sports such as skydiving.

Mimicry is the dimension of simulation. Play is a powerful means of learning and preparation, often without the consequences of "real world" actions. Many

sports and strategy games have origins in the preparation for combat or war, while toys such as Barbie or Easy-Bake ovens groom players for particular social roles. Other games, such as charades, involve mimicry and performance of actions, items, and processes.

Finally, *Harmonia* is an additional dimension suggested by Greg Niemeyer of UC Berkeley [7]. This extension to Caillois' framework acknowledges the role of play in strengthening social bonds and imparting social unity. Whether as team members, competitors, or simply co-participants, an important dimension of play is its ability to join people together. By placing people in a shared context, often with rule systems of its own, play can also provide means of subverting existing social conventions or hierarchies, enabling otherwise unlikely social interactions.

Many of these characteristics are clearly seen in the usage of Vizster and the underlying Friendster service—a social life "set apart" and harmonious group interactions are but two examples. Interestingly, the service's eradication of popular false profiles or "fakesters" [1] only upped the playful ante, engaging participants in an agonistic stance within a context of limited liability.

While it is important to remember that play is socially emergent, and certainly not a deterministic result of technological design, the above framework is a resource for helping guide design decisions for facilitating play. In addition, one must consider the accomplishments that must be met in order for requisite social interactions to occur. The next section considers some of these issues and attempts to make ties back to Caillois' framework.

Design Considerations

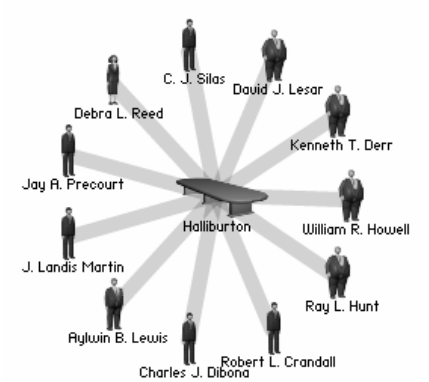
Motivated by observed visualization usage and discussions with colleagues, this section posits a series of four design considerations for facilitating the use of visualizations as social artifacts. The list is not meant to be comprehensive nor fully-formed, but rather to serve as a starting point for discussion and experimentation. These considerations are *accomplishments* to be facilitated by the design. Within the discussion of each consideration, we discuss some potential *mechanisms* of their implementation. Others are certainly possible, subject to the data being visualized and the particular context of usage.

Connecting to Data: The Relevance of Rabbit Holes

The first consideration is to craft a personal connection between the data and participants. This connection may be one of immediate personal interest or relevance, or may take on a more abstract character. In either case, the goal is to stimulate interest and a willingness to explore by establishing the relevance of the data to the end-user. Using the Lewis Carol inspired metaphor of McGonigal [6], designers will want to craft a "rabbit hole" through which participants are drawn into and situated within the world of the visualization. With participants successfully able to "write themselves into the data," the hope is that they might then continue on to more fully explore their data environs.

With Vizster, a person's own social network was the obvious starting point. This provided a context with

Zipdecode, a visualization of the United States postal code system, designed by Ben Fry.



TheyRule, a visualization tool for exploring the directorial boards of large corporations, designed by Josh On.

which participants were immediately familiar and clearly had a vested interest: the articulated social environment of the user and their friends. With this orientation, users (and especially groups exploring the system collectively) would move on to explore other regions of the social network. Participants who could not find themselves using the provided search features (those whose profiles either weren't captured or were constructed after we stopped crawling) and did not recognize any of their friends' profiles, at most spent a few seconds playing with the interactive features of the visualization before walking off uninterested.

Another example of note is the NameVoyager system, in which people would regularly search first for their own name and those of their friends and family members [11]. Though in some ways abstract, the personal connection is clear: you have a name, and all the people you know have names. At a higher level, we all have a window of experience onto the variation in names, and can test our own conceptions against the data. Similarly, Ben Fry's zipdecode[1] visualization operates on multiple levels—people can first look for themselves in the data, typing in familiar zip codes, learning the mechanics of the system and gauging the scope of the data (and complaining when they don't find themselves, requiring new versions with expanded datasets!). Users can also more systematically explore the familiar but perhaps structurally opaque world of U.S. postal codes. In these instances, either or both levels can serve to forge an interest in the data.

Personal interest can also be generated at the socio-cultural level. Consider TheyRule[2], a visualization of the surprisingly overlapped memberships of the boards of various corporations. Both political and class tensions fuel interest in the visualization, as well as the potential realization of the effect a relatively small and close-knit group of people have over life in modern society. While simultaneously interjecting humor, the design choice to encode the degree of a board member's connectivity as the obesity of a person-like glyph contributes further to an agonistic reading of the visualization.

An ilinxic/agonistic alternative is to use the lure of mystery to capture the user's interest and establish personal relevance. For example, many video games provide players very little context in the beginning of the game, but as users explore their world, their overviews or maps expand and persist. Often, mechanisms within the game then arise to let players more easily return to previously visited regions. Though often a means of directing players through a game, this "progressive unveiling" also constitutes a reward system for exploration and engages competitive tendencies. In an inversion of traditional information visualization doctrine, micro-level data exploration could result in the reward of ever-larger vistas on the data set as a whole. Such approaches might also prove effective at establishing visualization narratives.

At the extreme end of this spectrum is to intentionally make the data opaque, requiring users to explore not only the structure of the visualization, but to unearth what exactly it is that is being represented. This

[1] http://acg.media.mit.edu/people/fry/zipdecode/

[2] http://www.theyrule.net/

approach to “curious interfaces” was advocated by McGonigal [5] and has been effectively used in the widely popular *Myst* video games. To quote McGonigal, “A clear interface is a window to the designer’s intentions, but an opaque interface is a mirror, reflecting different motives and modes of deployment with each user it engages.” Though an obvious tension exists between this approach and traditional information visualization models, for judicious designers in an appropriate context it remains an under-explored option.

Common Ground: Do You See What I See?

Moving from personal motivation to social interaction, a basic foundation is the establishment and maintenance of common ground—a shared understanding enabling participants to meaningfully communicate. With respect to social visualization, this leads to an extremely simple yet vital insight: to effectively discuss a state of a visualization, it inordinately helps if the conversational participants have all seen that same view.

In the case of Vizster the visualization was exhibited in a public space and participants were all physically co-located in that space. Participants saw the same display and could interact with each other directly. The need for mediating design arises when participants are not co-located, a common case for visualization software distributed on the Internet.

As described by Wattenberg [11], detailed conversations about explorations within the NameVoyager system arose on numerous blogs. One design aspect of NameVoyager that facilitated the establishment of common ground is the remarkably easy process of accessing any view: simply type in the name or prefix being discussed. A short and easily memorable string of letters provided a sufficient serialization of the state of the interface. Comments such as “Check out the names that start with ‘*I*’!” were all that were needed to reproduce views and thus gain shared experience.

One take-away for visualization design is to make the state-space of the visualization easily accessible.[3] For visualizations exceeding a threshold of complexity, and thus not amenable to approaches as basic as that used by NameVoyager, one possibility (also discussed in [11]) is the construction of the equivalent of URLs, or Uniform Resource Locators, that point into the world of the visualization. Such encodings of state could then be used to bookmark and share particular views, facilitating both revisitation and the establishment of common ground.

Furthermore, if the design or structure of such visualization-space URLs are available to end-users, it also provides new opportunities for playful behavior. Aleaic activity could be facilitated through random jumps into the state space, either as a provided feature or by manual editing of URLs. Similarly, jumping headlong into an unknown region of the visualization could foster experiences of ilinx. Finally, this notion opens possibilities for testing the boundaries of the system, and is discussed in a subsequent section.

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[3] Though possibly taking into account issues of access control, especially if a “progressive unveiling” approach is being applied.

Conversation and Community Formation

Of course, common ground is irrelevant if there are no means for communication. As such, social interactions in and around a visualization require spaces in which conversation can occur. Design possibilities accrue within both the design of the visualization itself and the digital or physical architecture in which the visualization is situated.

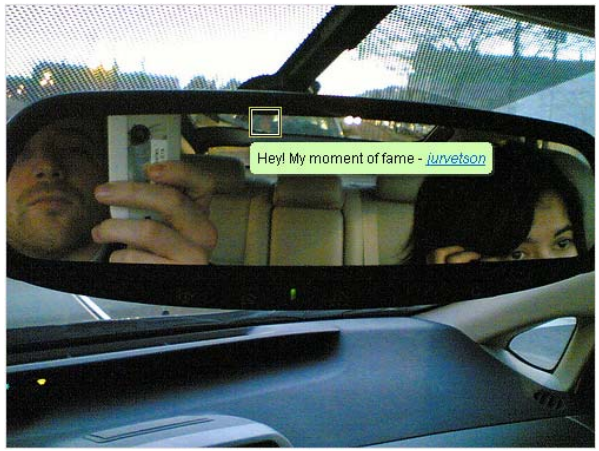
Artifacts of the Presence Era, a visualization chronicling museum experiences, by Viégas et al.

In the case of Vizster and other notable examples such as PostHistory and Social Network Fragments [9] and Artifacts of the Presence Era [10], the exhibition of visualization systems in a public forum in physical space gave rise to a natural social place in which common ground could be established and conversation could occur. The specific context of deployment, whether a party or a museum, also plays a role in shaping the interpretations and conversation that may arise.

In the case of NameVoyager, conversations formed on blogs not affiliated with the site on which the visualization was hosted. Since the visualization was publicly viewable and sharing views was simple, conversation could be initiated practically anywhere on the net. Still, it should be noted that such interest and extended conversation were neither planned nor expected by the author of the visualization, begging the question: how might a designer intentionally facilitate such community formation?

One possibility, illustrated in both examples above, is to situate the visualization in an environment with a rich potential for communication. For a visualization placed online, e-mail, blogs, chat, discussion forums, and wikis are just some of the available digital communication channels. Complementing a visualization deployment with one or more of these channels, accessible from the same website in which the visualization is located, is an obvious approach. Here enter a number of design challenges for embedding the visualization in a larger communicative medium.

In addition to this externalized approach, communicative mechanisms could be embedded within the visualization itself. Annotation is one example. Participants could “plant their flag” to lay claim to interesting research findings or highlight other interesting aspects of the data. Similar mechanisms have been successfully used in the popular photo-sharing service Flickr[4].



An example of a photo annotation on flickr.com. Hovering the mouse over a marked region of interest causes the annotation to appear.

[4] http://flickr.com/

Another form of annotation currently receiving much popular attention is tagging—affixing simple keyword labels for description and later retrieval. Given the wide adoption of this approach it provides a convenient model familiar to many users. Supporting retrieval of different views using such annotations provides additional possibilities, not only for classifying and finding interesting data views, but facilitating the formation of identifiable sub-cultures—particular tagging conventions, such as selected prefixes or agreed upon codes, are used to signify and communicate information to particular subgroups of participants.

Another example of internal social sharing is through visualizing traces of users within the system, either aggregated over time or illustrating real time usage. Such forms of meta-visualization afford ad-hoc conversation—*e.g.*, chat with a user currently viewing the same view as you—or even help participants direct their explorations—*e.g.*, the notion of anti-social exploration [12] discussed in the next section.

Other examples abound, all presenting an engaging challenge: how do we introduce these social cues without unduly impacting participants' perception of the visualization itself? Such cues might be placed in the visualization directly, or in a separate display which updates automatically dependent on the current view. Regardless of the mechanism chosen, judicious design should be applied towards the greater accomplishment of facilitating conversation and community formation to enhance, rather than distract from, the underlying visualization.

Exploring Boundaries; Breaking the Rules

In the face of social engagement and playful behavior, one should also expect various forms of "disobedience" to arise. Exploring and pushing the boundaries of one's environment is a natural outgrowth of play. This can take any number of forms, from the fun and light-hearted to the dangerous. American teenagers, in a life phase characterized by social play, explore and push the bounds of social behavior; numerous athletes push the boundary between "strong play" and fouls; flamers cause trouble on newsgroups. Be it tax loopholes or video game cheat codes, all manner of participants attempt to "game the system," finding and exploiting nuances of surrounding rules, norms, or structures. Players break out of the game and play with the structure of play itself.

Such behavior is common in online environments; in the context of Internet search engines, some exploits have even given rise to neologisms. A *google-bomb* is the result of a large group of people linking to a specific website using specific link text, resulting in search engine results for that site using that text. A famous example is the Google query "more evil than satan himself" returning Microsoft's home page as the top result. A more benign example is a *google-whack*, finding a query string which returns a single unique result. In both cases, people are exploring (and in some cases exploiting) the process and structure underlying Google's search indexing and ranking.

Various forms of unexpected use and technology re-appropriation are an accepted phenomenon in social computing research, and can be either embraced or battled by service providers. Similarly, visualization

systems supporting social interaction should no doubt expect the unexpected.

Still, the human predilections for exploring and pushing the boundaries of a system can be used opportunistically, with design decisions (perhaps surreptitiously) made to provide outlets for such behavior. In a discussion of the social data analysis surrounding NameVoyager [12], Wattenberg suggested the possibility of "anti-social" exploration—directing people to unvisited spaces in the visualization. Incorporating such visitation cues into the visualization (discussed in the previous section) is one possible approach for engaging boundary-exploring behavior and facilitating the desired exploration.

Another means of probing the structure of the visualization space is the inclusion of visualization URLs discussed previously. Providing a manipulable "handle" into the space of visualizations grants participants an alternative mechanism for exploring, and even hacking into, different views. Including so-called "easter eggs" in the systems, for example, special views only reachable through URL manipulation, is one approach for adding playful rewards for such endeavors. No doubt other fruitful means by which users will either game the system or game the data await.

Future Directions

The potential for the type of social visualization discussed here is largely untapped, in both academic and practical terms. One next step is a more thorough grounding in existing theory. I have, without much elaboration, drawn on the work of Caillois for framing play; Wattenberg has made use of Richard Bartle's taxonomy of online role players (specifically in MUDs) to characterize participant roles. Among the wealth of additional relevant sources are Huizinga's *Homo Ludens* [3], Salen and Zimmerman's comprehensive textbook on game design [8], and relevant work in Performance Studies, which has been used as a resource for describing playful behavior in numerous gaming [6,7] and online social [1] contexts.

Focusing on a more general conception of play, this paper has had little to say about the more structured aspects of game design. Designing visualizations with specific game structures in mind is an interesting alternative carrying numerous trade-offs. Such approaches might favor a particular usage model or highlight specific aspects of the data. In the physical world there exists a spectrum of designed environments for facilitating play, from the grassy field, to the baseball diamond, to the addition of umpires or referees. Whether or not this can be of use in the context of visualization remains to be explored.

Finally, the above design considerations can be applied in the design and implementation of novel social visualization environments. Through quantitative and qualitative research methods, researchers can monitor the usage, both intended and emergent, of such mechanisms and over a series of examples gain insight into their effects. I look forward to this eminently enjoyable and playful endeavor, and hope to refine and extend the possibilities presented here.

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