THE FUTURE OF SCIENCE AND TECHNOLOGY

Forecast: Novel cartographies of cyberspace will add value to online navigation, search, and business intelligence

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Description:

The rapid development and diffusion of Internet and Communications Technologies since the early 1990s has yielded a burgeoning cyberspace within the wires of networks and emerging spaces of Web pages and virtual worlds. Maps are obvious media for charting new spaces like this. They are a first step in exploring any new territory (this is ostensibly what we are all doing when contributing to the tag cloud for the X2 project). Cyberspace is prone to information overload and grasping a firm understanding of its breadth, as well as the nuances of its details, is challenging. Maps are a convenient medium for mining the complexity of systems of this kind. Indeed, William Gibson, when envisioning cyberspace, couched the very phenomenon in cartographic terms: “Program a map to display frequency of data exchange, every thousand megabytes a single pixel on a very large screen. Manhattan and Atlanta burn solid white. Then they start to pulse, the rate of traffic threatening to overload your system. Your map is about to go nova. Cool it down. Up your scale.” (Gibson 1984, p. 57) [1]. Cyberspace is spatial; maps are the geographical medium de rigeur. Whether the geographies of cyberspace conform to known spatial structures or patterns or not, the entities, links, and exchanges that constitute cyberspace have a natural cartographic affinity.

The early foundation for these spaces were relatively manageable and mappable in the era of the telegraph and land-line phone [2], but new cyberspaces have emerged so spontaneously, grown so rapidly, and transmuted so dramatically since the early 1990s that even charting the nodes that form the World Wide Web is an intractable problem. Much attention has been devoted to mining these spaces [3], visualizing their cartographies [4], and theorizing about their emerging geographies, sociologies, cultures, and so on [5, 6, 7], but mapping cyberspace needs to move to the next level.

Cyberspace cartography will merge with scientific visualization and data-mining

Many of the existing maps of cyberspace are beautiful as scientific art or simple eye candy, but more often than not, tell us little as scientific media. CAIDA's Walrus tool is a notable exception, but it's over five years old now. In essence, they are visuals, rather than visualizations. Expect cyberspace mapping to mature as its cartography shifts into the realm of scientific visualization that can the handle places and features, but also the rich space of flows and interactions that characterize the geography of cyberspace. (See, for example, Many Eyes as a step in this direction. The site hosts a public forum for visualizing and interacting with data. [8]) Also, expect novel mappings to emerge from citizen cartographers looking to make sense of their own cyberspaces or virtual worlds. (See, for example, this social network map.)

Maps of cyberspace will add value to business intelligence and e-commerce

Maps are, fundamentally, models of the real-world, used to distill and abstract complex realities into a more compact and manageable form. They are also formal, metric, media in which shared standards, datums, and mathematics are used to develop ontologies of common or novel objects, patterns, and features. In this way, maps allow us to characterize the world around us and to agree upon common procedures for ascribing significance to spaces, distances, hierarchies, and so on. Cyberspaces are spaces too, and the science of cartography can be applied to the Online world (although there is some debate as to whether the conventional cartography can be ported as-is; see [5]). The potential benefits are diverse. Firms may map their evolving consumer base in cyberspace in much the same way that they do in meatspace today, charting market-share and positioning assets relative to key demographics, positioning their brands in key territories, and so on. Deriving formal ontologies for the geography of cyberspace allows for events and activities in Online world to be sorted, classified, and

processed. Moreover, this can be easily automated with webcrawlers, such that shifts in the evolving cybergeography can be identified and acted upon quickly. Indeed, much of the knowledge driving the Semantic Web is likely to be geospatial.

Mapping memes, spimes, and viral marketing

Understanding the cartography of cyberspace will likely be influential in recognizing the emergence of new memes--emerging trends in culture, sub-cultures, fashion, politics, and so on. Such trends are likely to surface Online first, and charting the space-time choreography of their formation, perpetuation, diffusion, amplification, and dampening across demographics and geographies will be incredibly useful in developing an understanding of novel sociologies, ethnographies, and phenomena. There is growing appreciation that such memes are increasingly bound to tangible spaces, people, and products through spimes--position-conscious objects (or "blobjects") and the related dataware that allows them to interact geographically with their physical and human environments. Spimes, essentially, form a bottom-up and impromptu architecture for innovative socio-technical systems, with geography as the glue that binds the social and the technical (often literally, where a spatial identifier is used to join a social and technical database). The potential for flux between the virtual and real creates a host of interesting future scenarios, particularly around marketing. Indeed, we are already seeing cyber/real viral marketing campaigns proceed with great success (in entertainment and politics in particular), although the potential treasure-trove of related information that could be gleaned through cartography-mediated studies or coordination of such campaigns has not been mined to any large extent.

References

[1] Gibson, W. 1984. Neuromancer. New York: Ace Books.

[2] Standage, T. 1998. The Victorian Internet. New York: Walker Publishing.

[3] See, for example, Bill Cheswick's famous peacock maps of Internet topology from Bell Labs, and more current initiatives by CAIDA to chart network emergence

[4] See, for example, Martin Dodge's (now retired) efforts to maintain an atlas of cyberspace

[5] Dodge, M., and R. M. Kitchin. 2000. Mapping Cyberspace. London: Routledge.

[6] Zook, M., M. Dodge, Y. Aoyama, and A. Townsend. 2004. "New digital geographies: Information, communication, and place." *Geography and Technology*, eds. S. Brunn, S. Cutter and J. W. Harrigton, 155-176. Washington, D.C.: AAG.

[7] Rheingold, H. 1993. The Virtual Community: Homesteading on the Electronic Frontier. Cambridge, MA: The MIT Press.

[8] Fernanda B. Viégas, Martin Wattenberg, Frank van Ham, Jesse Kriss, Matt McKeon (2007). "Many Eyes: A site for visualization at Internet scale", IEEE Transactions on Visualization and Computer Graphics, 13(6): 1121-1128.

[9] Sterling, Bruce (2004). "When blobjects rule the Earth". Keynote at SIGGRAPH (Special Interest Group in Graphics) 2004, Los Angeles, August 9, 2004.

Signals:

ManyEyes: A Site for Visualization at Internet Scale
New digital geographies: Information, communication, and place

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