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A PUBLIC PARTICIPATION APPROACH TO CHARTING INFORMATION SPACES

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ABSTRACT

This paper explores the use of GIS concepts to model information access barriers. This potential application is considered in light of recent meetings centered on the social impacts of GIS and its use in public participation settings and new community institutions. Models of the information access concept are presented, with other attempts to chart or map elements of information infrastructures, environments and spaces. The notion of a mixed delivery network / social network model is presented. The co-production of such a model in the setting of a state network is outlined. The paper concludes with a reflection on the meaning of "home" and the subjective sense of spaciousness in information environments.

INTRODUCTION

Several recent meetings sponsored by the National Center for Geographic Information and Analysis (NCGIA) were an opportunity for the GIS research community to join in a broadening conversation about the future of the digital technologies that have been under intensive construction for the past 50 years.

Broadly stated, the following questions were raised: Can the maturing spatial technologies, beginning with GIS, be brought to bear fruitfully on the problems of the geographies of knowledge that have surfaced through the appearance of globally networked personal computers? What freight do present technical approaches bring into this domain? How much real and useful information is being lost through the dominant focus on digital technologies? And, as the technical apparatus as we know it is only marginally satisfactory from some perspectives (and a downright threat from others), what can be done to right the situation in the future?

As a librarian concerned with public information resources, I brought to the meetings a notion that information access barriers could be represented through some form of GIS. Developing this notion as informed by the GIS and Society meeting and Public Participation GIS Workshop is the theme of this paper.

NCGIA INITIATIVE 19 and PUBLIC PARTICIPATION GIS

A conceptual thread that was heard frequently at the Initiative 19 *GIS and Society* specialists' meeting (March 1996) was discussion of the potential for a "GIS 2." Opening remarks by Michael Curry on spatial data institutions framed his question: What might GIS be? Critical perspectives on present GIS were shared by many at the meeting. The data-driven nature of present technology, its origins in the requirements of government administration, its adoption for surveillance and mass marketing purposes, its gender bias and roots in Cartesian thought were all vigorously discussed.

These views were balanced by a generally optimistic vision that some forms of GIS, versions of "GIS 2," could be developed and put to work toward goals of social and environmental justice. The discussion of GIS 2 accompanied discussion of "geographies of virtual worlds," pointing at the convergence of GIS with the potentials of widespread data communications networks.

A summary document of this discussion, "Criteria for the Design of a GIS 2," was presented at the concluding session of the I-19 meeting. These criteria envisaged systems would allow expanded end-user contributions of information, would integrate diverse media including sketch maps and audio, and would provide better handling of change over time. In sum, future systems should strive to preserve local knowledge while relaxing formal constraints such as those of the system of Cartesian coordinates.

Discussion of the GIS 2 theme was continued at the Public Participation GIS Workshop (July, 1996), with focus on improved integration of GIS technology into the domain of public involvement solution of public policy controversies. The Workshop was structured to promote discussion of topics related to technical as well as public process issues.

Environmental and natural resource issues and applications in urban and regional planning were the settings in which participatory GIS was largely discussed. Presentations were made on the following aspects: dispute resolution, urban data resources, neighborhood organizing, spatial conflict, the integration of multimedia and GIS, object-oriented computing, and future technologies such as "smart" compasses, binoculars and maps.

The PPGIS Workshop discussions tended toward two poles of emphasis: the development of new spatial technologies without direct reference to a specific applications domain, versus concern for what will be required of future technology in support of the human interactions that are central to enabling settling public policy disputes. The five original "Criteria" for a GIS 2 were expanded to thirteen. Needs for specific capabilities were noted, such as tools to enable discovery of precedents globally for local problem situations.

Publications that stand as examples of the themes of this Workshop include Aberle (1993), Bunge and Bordessa (1975), Couclelis and Monmonier (1995), Dunn and Lichtenstein (1994), Schmitt and Brassel (1996), and Shiffer (1995). (See Note *)

CREATING NEW COMMUNITY INSTITUTIONS

Two distinct points of emphasis, on technologies and on public processes, intersect in discussion of the physical location of a GIS 2. Would this be found in specific places, or would these tools largely be put to work in distributed network space? This points toward the mutual importance of people, technologies and geography in consideration of the design of information systems and in representing them.

The notion of a "social learning center" or "community learning center" arose in response to assumptions that a place will always be needed, a real physical place within communities, where the activities supported by public participation technologies will go on. This new community institution would be built on the base already in place in the form of public institutions such as schools and libraries. Such a place would also require staffs trained in new professional roles, combining in some measure the teacher, librarian, technology coordinator and mediator. Without devoting resources toward developing such centers, the potential of a "public participation GIS" would not likely be realized.

Such centers have frequently been included within advanced technology scenarios. A contemporary futuristic vision is "tele-immersion" as propounded by the Internet 2 Applications Group, in which "high speed communications systems support collaboration applications in multiple geographically distributed immersive environments" (Internet 2, 1997). An earlier proposal, less technology-dependent, can be recalled in Brun's "houses of heuristics" (Brun, 1974).

* For background to NCGIA I-19 *GIS and Society* see: Pickles (1995), Harris and Weiner (1996) and Sheppard and Poiker (1995). Papers and reports from meetings mentioned here are available at the following sites: Public Participation GIS Workshop, at <http://ncgia.spatial.maine.edu/ppgis/ppgishom.html>; GIS and Society, NCGIA Initiative 19, at <http://www.geo.wvu.edu/www/i19/page.html>; Collaborative Spatial Decision Making, NCGIA Initiative 17, at http://www.ncgia.ucsb.edu/research/i17/I-17_home.html; Formal Models of Common Sense Geographic Worlds, NCGIA Initiative 21, at <http://ncgia.geog.buffalo.edu/ncgia/i21.html>; Spatial Technologies, Geographic Information, and the City, at <http://www.ncgia.ucsb.edu/conf/BALTIMORE/menu.html>; Theories and Metaphors of Cyberspace, at <http://pespmc1.vub.ac.be/cybspasy.html>

Considering prototypes for such a facility leads directly to the complex relations of people, machines, places and information environments in which they will be placed.

INFORMATION SEEKING AS SOCIETY-BUILDING

In some respects the themes of PPGIS parallel the themes of NCGIA Initiative 17: Collaborative Spatial Decision Making (see Note *), with the following distinction: I-17 conceives of a form of collaborative group work, while PPGIS considers the more general case of open public involvement. The problem of charting information spaces seems well suited to take advantage of this inclusive public involvement approach.

A framework may be set by considering information seeking as the ad hoc creation of a society. The simplest case might be that of asking directions in public space. A new and temporary society of two is created. That there is a geographic component in this situation is clear.

Extension of this simple case points toward the widespread use of wayfinding and navigation metaphors for information seeking in general (for example see Canter et al. 1985). A more complex case is seen in the creation of a paper for a conference such as this. The ad hoc society is represented in the paper's references, which stand both as a subset of information sources and as a set of pointers for readers and listeners. The craft of bibliography, within the area of the librarian's expertise, shares something with the craft of cartography in that references are the landmarks of the bibliographic search. In today's expanding but unstable information environment, the arts of reference (see McArthur 1986) are an area in need of development. For spatial data these are the metadata questions.

Wayfinding's simple "society of two" points toward a potentially paradoxical condition: the questioner enters into, and actually creates, the domain of her or his own observations. This implies a different process than is assumed in the fact-finding of traditional science, in which the observer is excluded from the domain of her observations. Accounting for this necessary condition is a task set out by "second-order cybernetics" (Brier, 1992).

Congenial public spaces could be rated according to the relative ease with which a stranger may be approached with a wayfinding question. By extension, information systems could be evaluated in terms of their affording of the abilities to speak, beginning with the range of questions legitimately allowed (see Chatman, 1996). Capable systems allow the articulation of diverse voices.

CHARTING ACCESS BARRIERS TO INFORMATION RESOURCES

As with navigation metaphors, the concept of "access" is often introduced into discussions of public information systems. Access implies open and closed spaces in which information somehow resides, and a sort of directionality from here to there. The access concept is tied to the notion that information is an object that can be retrieved.

The access notion also supports economic views of information that emphasize costs and consider information as a form of commodity. I began from this customary framework in asking whether we might learn something about patterns and problems in information access from the application of spatial models similar to those found in GIS. Could something like a friction surface map be generated that might represent the places where information lies, the points of origin from which questions are asked, and the relative cost gradients of various pathways between these? Such a model could potentially be used by librarians, for example, in making choices among available information resources, and by public policy planners in devising suitable public access arrangements.

An outline of how similar tools could be put to use in the context of physical accessibility problems in urban environments has been put forward by M. Gould for the *Spatial Technologies, Geographic Information and the City* conference (see Note *).

This approach applied to information access issues will break down because of general limitations on the information-as-object model. Braman (1995) provides detailed discussion of the tangible versus the intangible qualities of information in the context of applying economic models to information resources. (For further discussion of information as object see Reddy, 1993).

Relating three concepts may be helpful at this point: information infrastructures, environments, and spaces. Consider infrastructure to be the places where the tangible aspects of information are established. The information environment is where the intangible aspects, equally important but less measurable, are to be found. And information space joins the two, conceived either as an envelope or as an intersection, perhaps Schatz' "interspace" (1995).

In these terms, information infrastructure would include telecommunications networks, the contents of public libraries, the policies and costs related to their operations, and similar phenomena. Information environment would pertain to the social structures surrounding the infrastructure (as seen in the ad hoc societies noted above), and would need to account for the emergence of questions themselves and the criteria by which answers are accepted and judged. The concept of information space would be inclusive of both of these aspects.

Paulston, R.G., and M. Liebman. (1993). "An Invitation to Postmodern Social Cartography." Paper presented at the *Annual Meeting of the Comparative International Education Society* (37th, Kingston, Jamaica, March 1993). ERIC Document ED 358 576

Pickles, J., ed. (1995). *Ground Truth: The Social Implications of Geographic Information Systems*. New York, Guilford Press.

Reddy, M.J. (1993). "The Conduit Metaphor: A Case of Frame Conflict In Our Language About Language." In, A. Ortony, ed., *Metaphor and Thought*, 2nd ed., pp. 164-201. Cambridge, Cambridge University Press.

Schatz, B.R. (1995) "Information Analysis in the Net: The Interspace of the Twenty-First Century." Keynote Plenary Lecture, *American Society for Information Science Annual Meeting*, Chicago, October 11, 1995. <http://csl.ncsa.uiuc.edu/IS.html>

Schmitt, E., and K. Brassel. (1996) "From GIS for Control to GIS for Creative Exploration." In, Harris and Weiner, pp. D61-D63.

Sheppard, E., and T. Poiker, eds. (1995). "GIS and Society." Special content issue. *Cartography and Geographic Information Systems* 22(1) (January, 1995).

Shiffer, M.J. (1995) "Interactive Multimedia Planning Support: Moving from Stand-Alone Systems to the World Wide Web." *Environment and Planning B: Planning and Design* 22:649-664.

Union of International Associations. (1991) *Encyclopedia of World Problems and Human Potentials*. 3rd ed. Vol. 1: World Problems. Vol. 2: Human Potentials. Munich, K.G. Saur.

Wadland, J.H., and M. Hobbs. (1993). "The Printed Word." In, *Historical Atlas of Canada*, ed. by R. Louis Gentilcore, Vol. 2: The Land Transformed, 1800-1891, Pl. 51. Toronto, University of Toronto Press.

Williams, R. V. (1995). "Mapping and Measuring the Information Infrastructure for Planning Purposes: Preliminary Study of South Carolina." In, *Proceedings, ASIS '95*, pp. 144-151.

How would access barriers be treated in a comprehensive model that seeks to account for the entire information space, including the intangible elements? If information seeking is conceived as initiating a conversation within the information environment, then access would be linked to the relative inclusiveness or exclusiveness of the conversational choices available to participants. Tools such as Paulston and Liebman's "social cartography" (1993) would find a place in such a representation and analysis of the information environment. Kochen (1989) includes many studies involving social network maps.

The initial topographic image of access barriers, featuring costly paths between open and closed information spaces, could be supplemented by a topological approach representing pure boundaries without bounded areas or spaces.

RELATED APPROACHES TO INFORMATION SPACE MODELING

This section presents several approaches to representing the tangible infrastructure and intangible environment of information. The most comprehensive attempt at the former is the set of "information delivery network" maps of the Pacific Northwest presented by Murr et al. (1985). A similar recent example was produced by Williams (1995), mapping distributions of libraries with Internet access and other public information institutions in South Carolina. An example portraying diffusion of libraries and newspapers in 19th century Canada is given by Wadland and Hobbs (1993). Also in this tradition are the charts of Internet diffusion presented in the Matrix Mapping Quarterly (Matrix in the World, 1995).

The project of charting the social environment of information is presented in great detail in the *Encyclopedia of World Problems and Human Potentials* (Union of International Associations, 1991). Thousands of "human problems" are cataloged and cross-referenced, including over 100 examples amounting to a typology of obstacles in information space. Detailed requirements for "mapping social complexity" are provided. Another typology of information barriers at much smaller scale (five classes) is presented by Brown (1991). From the community of GIS researchers, the approach of Lemberg (1996) shares many elements with suggestions presented here.

The notion of charting access also has been explicitly suggested by Mitchell (1995, p. 131) with reference to G. Nolli's 18th century maps of Rome showing public and private spaces: "Perhaps some electronic cartographer of the future will produce an appropriately nuanced Nolli map of the Net."

The existence of these related efforts at least points to a perceived need for modeling or creating conceptual frameworks in this area. A possible application area is described in the next section.

APPLICATIONS IN A STATE NETWORK SETTING

Assuming that a satisfactory model could be devised along the lines described here, who would construct, maintain and use charts of public information spaces? I foresee that information policy planners, educators, public librarians, transportation planners and others with similar professional responsibilities could co-produce and use such tools.

The state level is a unit of geographic importance for the development of public information resources. Even under deregulation state policy will continue to guide telecommunications developments as under previous regulatory frameworks. In Maine, a 1,000-site school and library data network is under construction. Maine has looked to the "North Carolina" network as a model, as well as to the "Kansas" and "Georgia" models for state information access policies.

The institutions connecting to the networks certainly view those connections spatially. This new information space represents hazards similar to those assumed in unfamiliar physical terrain. School administrators are uncertain about their abilities to provide safe information space in this new information environment.

The need to convey a useful image of the network and its potentials has become a priority of the Maine Internet Education Consortium, which has assumed responsibility for end-user training throughout the state. It was recently reported that only two of the state's 150 school superintendents regularly use e-mail. This nonparticipation is attributed in part to lack of coherent images of the network and its possibilities.

The Consortium's Board has assembled a workgroup to develop "maps and tools" aimed at informing school administrators about the network. It is foreseen that these would ultimately be created collectively by the connected sites, and would be used for identifying projects, sharing expertise, and locating information resources regionally. This could be done online, and could begin with the site and district base maps already completed by the state's Office of Geographic Information Services. With a pervasive network in place, the actual construction of a widely distributed system model will be possible.

AT HOME IN A SPACIOUS INFORMATION ENVIRONMENT

The project of cooperative construction of charts of information spaces built using the capabilities of future spatial technologies (or Mitchell's "Nolli maps of the Net") may never be fully realized. Nonetheless, models of those spaces will by analogy serve to cast light on the complexities of the public information environment.

Today, many have "home pages" on the Web. How often do these convey the feeling of home? The domed reading rooms of the British Library and Library of Congress, and other library settings in smaller scale, produce a sense of spaciousness surrounding the information quest. Though the world of the Web claims to afford wider worlds of access, online searching still seems subjectively to proceed within a severely confined space.

Among the challenges facing such efforts as GIS 2 and its counterpart Internet 2 will be the building of a spacious information environment in which many more of us can find a home and voice.

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