Increasing Youth and Community Agency in GIS

Sarah Van Wart
UC Berkeley School of Information
Berkeley, CA 94720
vanwars@ischool.berkeley.edu

Tapan S. Parikh
UC Berkeley School of Information
Berkeley, CA 94720
parikh@ischool.berkeley.edu

ABSTRACT

While new technologies have expanded users' ability to submit and view geographic data, most users are still excluded from GIS design and decision-making. *Local Ground* addresses this gap by combining the accessibility of volunteered geographic information (VGI) tools, with the process-oriented, inclusive emphasis of Participatory and Qualitative GIS. Users start by capturing tacit observations of their environment through drawings, pictures, and audio interviews. Once submitted, this qualitative data can be inductively coded, allowing users to discover emergent categories. Users can design their own data collection instruments, collect data, visualize results, and combine visualizations with qualitative data and narrative elements to communicate with diverse stakeholders. We believe that involving users at each stage of the bottom-up, iterative inquiry process can increase their sense of ownership and control, while creating new learning opportunities. We are testing these hypotheses by working with youth community data initiatives in Oakland and Richmond, California.

Author Keywords

Participatory GIS, qualitative GIS, participatory planning, paper interfaces, Internet mapping, urban planning, youth

ACM Classification Keywords

H.5.2. [Information Interfaces]: User Interfaces – input devices and strategies; prototyping; user-centered design

General Terms

Human Factors; Design

INTRODUCTION

Geographic Information Systems (GIS) are often used to inform place-based decision-making, helping users to characterize spatial patterns and trends, generate predictions and make principled, data-driven decisions. However, GIS has also been critiqued as "the language of planning power" [3] because it requires extensive technical knowledge and devices, and privileges quantitative and categorical ways of knowing over more qualitative and experiential ones. This empowers the already powerful to frame the terms of discourse, and limits the extent to which community members can exercise control over their own data. Though GIS is a "powerful mediator of spatial knowledge" [3], it can also disempower or exclude numerous voices – including those of racial and ethnic minorities, the poor, women and youth [5][8][2] – from articulating their ideas and concerns on their own terms.

RECENT INNOVATIONS

Recent technological advances, including GPS-enabled smart phones, open geospatial standards, free and publicly available geo-location, visualization, and data APIs, and the new geo-tagging capabilities of social media, have created an enabling infrastructure for developers to build innovative new geospatial tools. These tools have empowered the casual technology user to collect and consume volunteered geographic information (VGI) within a variety of domains, from disaster management and citizen science to the built environment [4].

On a related trajectory, Participatory and Qualitative GIS researchers and practitioners have been working to incorporate a greater diversity of perspectives, representations and processes that can be supported in GIS. These developments include integrating qualitative data, coding tools and practices into GIS [6][7], and involving communities in designing, operating, and managing their own GIS, drawing from the inclusive and process-oriented traditions of participatory mapping and planning [9].

However, many qualitative GIS tools still exist in the expert domain of desktop GIS software, limiting their utility and reach [1]. Furthermore, though the number of open source, geospatial tools continues to grow, control over how data is collected, analyzed, and represented within these systems remains in the hands of domain experts or elites.

LOCAL GROUND

Local Ground is a web-based mapping platform that combines the accessibility of contemporary VGI tools with the process-oriented, inclusive emphasis of Participatory and Qualitative GIS. *Local Ground* leverages publicly available data and visualization APIs, open source tools and paper-based data collection interfaces to support a bottom-up, user-centered, iterative, data-driven inquiry process.

Scaffolding Inquiry-Based Discovery

Local Ground enables place-based inquiry [1], by engaging users in the following iterative processes:

1. Observing the Physical Environment: users walk around and observe the area of interest; draw and take notes

using paper forms and maps; photograph scenes and record audio interviews; and upload and geo-reference the resulting qualitative data.

2. Determining Relevant Indicators and Categories: users collaboratively code and analyze qualitative data to determine categories, themes, indicators and hypotheses of further interest.
3. Designing Data Collection Instruments and Strategies: users design tables, forms and surveying strategies to investigate emerging research questions and themes.
4. Collecting and Combining Data: users gather various forms of data, including data from other sources.
5. Interpreting the Results: users visualize the results spatially and graphically, looking for evidence corroborating or contesting the original hypotheses.
6. Communicating the Outcomes: users combine visualizations with qualitative data and narrative elements to communicate research outcomes to diverse stakeholders, including parents, teachers, government officials, etc.

Design Principles

Local Ground extends the reach of GIS by adhering to the following design principles:

Prioritizing Accessibility

Users can capture drawings, audio clips, photographs, or even forms-based information using a variety of low-cost devices and tools, including paper and inexpensive camera phones, and submit this information via email or through our web-based interface. Our system automatically extracts and geo-references hand-drawn map annotations [10].

Supporting Qualitative and Quantitative Data

Because qualitative accounts are often the primary mechanism for everyday people to contribute their own expert local knowledge to place-based initiatives [3], *Local Ground* does not privilege one form of data, but supports both quantitative and qualitative data representations. Both can be geo-referenced and overlaid together on the same base map.

Involving Users at Every Stage

Involving users at each stage of data collection, analysis and presentation process provides them ownership and control, while creating new learning opportunities. Qualitative methods, such as inductive coding, are supported through our tagging interface, allowing users to discover emergent categories, rather than requiring them to determine the precise aspects of their data collection methodology a priori. Based on themes that emerge, users can design their own data collection forms, and iteratively refine their data collection methodology. Users can also combine multiple data representations for presentation.

CASE STUDIES

We have iteratively designed Local Ground with active input from youth and other stakeholders, working closely with three youth-centered, community data initiatives in Oakland and Richmond, California.

Planning a Local Park

Youth from a high school social studies class used *Local Ground* as a planning tool to imagine the future of a local park and a public housing development. Students collected data about existing assets, hazards and risks; created models; and used this information to advocate for a future neighborhood design plan. Finally, they used *Local Ground* to present their findings at a public meeting at City Hall [10].

Analyzing Air Quality Data

Working with science experts, youth participating in a summer science research program used *Local Ground* to analyze air quality in the San Francisco Bay Area. Students devised a data collection methodology; collected air quality data using various sensors; and took field notes and photographs. Students used *Local Ground* to help them visualize spatial patterns in air quality in conjunction with their notes and photos. Students presented their data and findings to the Port of Oakland and to the local transit commission.

Ground Truthing Civic Data

Working with a local school district and several community organizations, youth from different neighborhoods in Oakland used *Local Ground* to assess the accuracy of an existing "grocery store" dataset. The platform allowed young people to submit photos, audio clips, comments, and ratings of the stores they visited, and communicate to the school district that only about a third of the stores in the "grocery store" data set provided even moderately healthy food options.

Future Directions

Though youth are frequently excluded from participating in such planning initiatives, they are the most frequent users of public spaces and are capable of contributing valuable community knowledge, when given the opportunity [2]. In the future, we hope to determine whether *Local Ground* increases young people's agency and autonomy in communicating place-based ideas as they engage in community research. In particular, we are interested in:

1. The role that handwritten notes, photographs, and audio clips play in helping participants to identify emergent categories and themes.
2. How participants use these emergent categories to design and inform community data collection, analysis and visualization strategies.
3. How the various representational formats *that Local Ground* supports – stories, thematic maps, charts, etc. – are combined to reflect upon and communicate ideas, and in what contexts.
4. The extent to which novice end-users can design and manage a community GIS using *Local Ground*.

REFERENCES

1. Buckingham, W.R. GeoInquiry: A Novel Method for Qualitative Spatial Research. .
2. Dennis, S.F. Prospects for qualitative GIS at the intersection of youth development and participatory urban planning. *Environment and Planning A 38*, 11 (2006), 2039.
3. Elwood, S. Critical issues in participatory GIS: deconstructions, reconstructions, and new research directions. *Transactions in GIS 10*, 5 (2006), 693.
4. Goodchild, M.F. Citizens as sensors: the world of volunteered geography. *GeoJournal 69*, 4 (2007), 211– 221.
5. Haklay, M. How good is volunteered geographical information? A comparative study of OpenStreetMap and Ordnance Survey datasets. *Environment and planning B: Planning and design 37*, 4 (2010), 682–703.
6. Jung, J.K. and Elwood, S. Extending the Qualitative Capabilities of GIS: Computer-Aided Qualitative GIS. *Transactions in GIS 14*, 1 (2010), 63–87.
7. Knigge, L. and Cope, M. Grounded visualization: integrating the analysis of qualitative and quantitative data through grounded theory and visualization. *Environment and Planning A 38*, 11 (2006), 2021 – 2037.
8. Kwan, M.-P. Is GIS for Women? Reflections on the critical discourse in the 1990s. *Gender, Place & Culture 9*, 3 (2002), 271–279.
9. Rambaldi, G., Kyem, P.A.K., McCall, M., and Weiner, D. Participatory spatial information management and communication in developing countries. *EJISDC: The Electronic Journal on Information Systems in Developing Countries*, 25 (2006), 1.
10. Van Wart, S., Tsai, K.J., and Parikh, T. Local Ground: a paper-based toolkit for documenting local geo-spatial knowledge. *Proceedings of the First ACM Symposium on Computing for Development*, (2010), 11.