CO-433

ENCOURAGING INTERDISCIPLINARY PARTICIPATION IN ATLAS PROJECTS USING AN OPEN SOURCE CYBERCARTOGRAPHIC TOOLKIT: THE ATLAS OF THE LAKE HURON TREATY RELATIONSHIP PROCESS

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ABSTRACT

Digital web atlases can incorporate perspectives derived from diverse participants or communities to create and present narratives using qualitative and quantitative information structured around a set of maps as organizational and analytical tools. Development of such an atlas requires a transdisciplinary team to contend with complexity in subject matter, technologies, and project dynamics. Technologies required are potentially as much an obstacle to some potential participants as they may be necessary to the fulfilment of a project's outreach and communication goals. This paper describes the Cybercartographic Atlas of the Lake Huron Treaty Relationship Process, the open source atlas toolkit used to implement it, and features of the toolkit that are intended to encourage transdisciplinary participation. The discussion explicitly addresses issues related to the iterative processes, at multiple scales, required to develop atlas projects within an academic research setting while using and creating open source software.

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BACKGROUND AND OBJECTIVES

Digital web atlases, designed to encourage discussion concerning complex topics, may incorporate perspectives derived from a diverse set of participants or communities and present them using qualitative and quantitative information structured around a set of maps as organizational and analytical tools. Because they are web applications, with the goal and the potential to disseminate a variety of atlas content to a distributed population of users and/or collaborators via online electronic information transmission, digital web atlases necessarily grapple with complexity. Cybercartographic atlases (Taylor 2005) provide a good example of this with their use of multisensory formats (video, text, image, and sound) and user contributed content, which both increase the potential communicative possibilities and the potential application complexity even further. In order to deal with complexity in the design, operation, and maintenance of a digital atlas, a transdisciplinary range of knowledge and skills is required.

This paper focuses on the Cybercartographic Atlas of the Lake Huron Treaty Relationship Process (CALHTRP). It explains ways in which iterative processes come into play in the design and development of the atlas, and examines collaborative processes and outcomes amongst atlas-making community members in resolving issues related to complexity as part of the ongoing development of the atlas over time and across a number of prototype releases. Common to the CALHTRP project and other GCRC research projects is the software base upon which these atlases have been created. This base is developed iteratively in conjunction with this and other atlas developments and is released as free and open source software (FOSS).

APPROACH AND METHODS

Diverse Participation in the Making of the Cybercartographic Atlas of the Lake Huron Treaty Relationship Process

Taylor (2003, 406) defined cybercartography as "the organization, presentation, analysis and communication of spatially referenced information on a wide variety of topics of interest and use to society in an interactive, dynamic, multimedia, multisensory and multidisciplinary format." Cybercartographic atlases tell stories through maps and, because of the interactive interfaces employed, these stories, or geonarratives, may reflect a variety of perspectives. In our experience, digital atlas projects proceed iteratively as fora for the development and exploration of ideas related to a set of topics rather than simply as answers or manifestations of collected knowledge on those topics. This is especially

true since these atlases are focused on finding ways to express multiple perspectives, each of which takes time to discover, explore, test, and integrate into an atlas. Iterative processes are manifested both within and between atlas projects in the sets of relationships that occur, in information transmission and exchange, in design and development decision-making, and implementation more generally.

The current atlas-making project to tell the story of treaty-based relationships in the Lake Huron and Lake Superior regions proceeded iteratively from work to create the "Treaties" section of the prototype 'Living' Cybercartographic Atlas of Indigenous Perspectives and Knowledge for the Great Lakes-St.Lawrence Region (GLSL, available at http://atlas.gcrc.carleton.ca/glsl; see Caquard et al. 2009). This prototype atlas in turn developed out of earlier research concerning cybercartography (Taylor 2003; Taylor and Pyne 2010) that had resulted in tangible outputs, including earlier atlases and the Nunaliit (GCRC 2006) software.

A core set of maps has been evolving in both the GLSL and CALHTRP projects. These maps represent the survey journeys of John Stoughton Dennis (PLS) through the Lake Huron region during 1851 and 1852. They have evolved out of an initial map that was constructed to reflect the surveyor's perspective presented in Marlatt (2004). This reference, which provides a critical summary of the reserve survey process by identifying errors and omissions, was recommended by Anishinaabe historian and Director of the Ojibwe Cultural Foundation, Alan Corbiere. The Robinson Huron Treaty was signed in 1850 and represented an agreement between the (British) Crown and 17 Anishinaabe communities occupying regions along the northern and eastern shores of Lake Huron, including Georgian Bay. The treaty was part of a larger process that extended to other regions historically and geographically. Along with the Robinson Superior Treaty, the Robinson Huron Treaty was the first treaty between the First Peoples and the Crown to deal in a 'land surrender' fashion with a large landmass and a diverse range of peoples who were nevertheless interrelated by a significant clan system. Although the Treaty document was signed on a particular day, three years ensued following the signing before the final reserve survey reports were submitted for government approval and the Treaty could be considered fully in force.

The prototype "Treaties" section of the GLSL Atlas begins to tell this story through three introductory subsections, which provide the context for understanding the fourth, a geonarrative based primarily on archived surveyor reports, diaries, and field notes (MNR 1851, 1853). The maps in this fourth section present the first season of survey journeys undertaken by J.S. Dennis (PLS) in an interactive geonarrative form, and were designed to chart and track the surveyor's journey through 'Indian country' to mark the corners and draw the lines demarcating the boundaries of the reserves referred to in the treaty. Tasks involved in creating the survey journey maps have included: transcribing the Dennis report, interpreting written descriptions of the surveyor camp locations along the journey route, identifying probable locations to correspond with those described in the diaries, and finding and acquiring permission for the use of a diverse series of digital images from a correspondingly diverse set of atlas contributors. Beyond the research focus necessary to compile the information out of which the journey maps would be created, a group of collaborators provided assistance in designing and implementing a multimedia application using the maps, collected images, diary transcriptions, and narrated recordings of those transcriptions as inputs, guided by the knowledge of the survey journeys as the basis of the story to be told.

As the CALHTRP project proceeds, additional maps are being developed concerning the survey journeys, and the critical surveyor's perspective is being carried forward and integrated into a new atlas-making framework. While expanding the discussion of Robinson Huron Treaty processes in terms of comprehensiveness and community input, the CALHTRP project remains focused on achieving the goals established in the previous phase to contribute to an improved understanding of the treaty-based relationships that occurred in the context of the Robinson Huron Treaty investigation, negotiation, signing and survey processes. Part of this effort includes adding the second and third survey seasons (1852 and 1853) to the survey journey maps in order to complete the coverage of the reserve surveys.

Figure 1 shows an example map display from the CALHTRP section concerning the Lake Huron reserve surveys started in 1851 (available at http://atlas.gcrc.carleton.ca/lakehurontreaties). When the survey journeys section is accessed, the browser initializes the map display, fetching and displaying the survey camp locations overlaid on a satellite mosaic of the journey region. The theme layer representing the survey stops is interactive:

- A user may display details of each survey stop by either hovering the cursor over a camp location to display a summary pop-up (as shown in Figure 1) or by clicking on the location to display full details for the location in a panel to the right of the map. The pop-up provides a summary of the stop including a name and the dates during which the survey party was there. The right hand panel for each camp site

contains an image, a brief description, and transcriptions of Dennis's diary entries for the duration of the surveyors' stay.

- A user may control the display of chronologically ordered camp sites on the map using the slider in the lower left of the map or may select different survey seasons and journey segments for display using the parameter selectors above the slider. The interactive survey camp display allows a user to advance or reverse the progress of each survey journey segment to understand the route travelled by the surveyors.

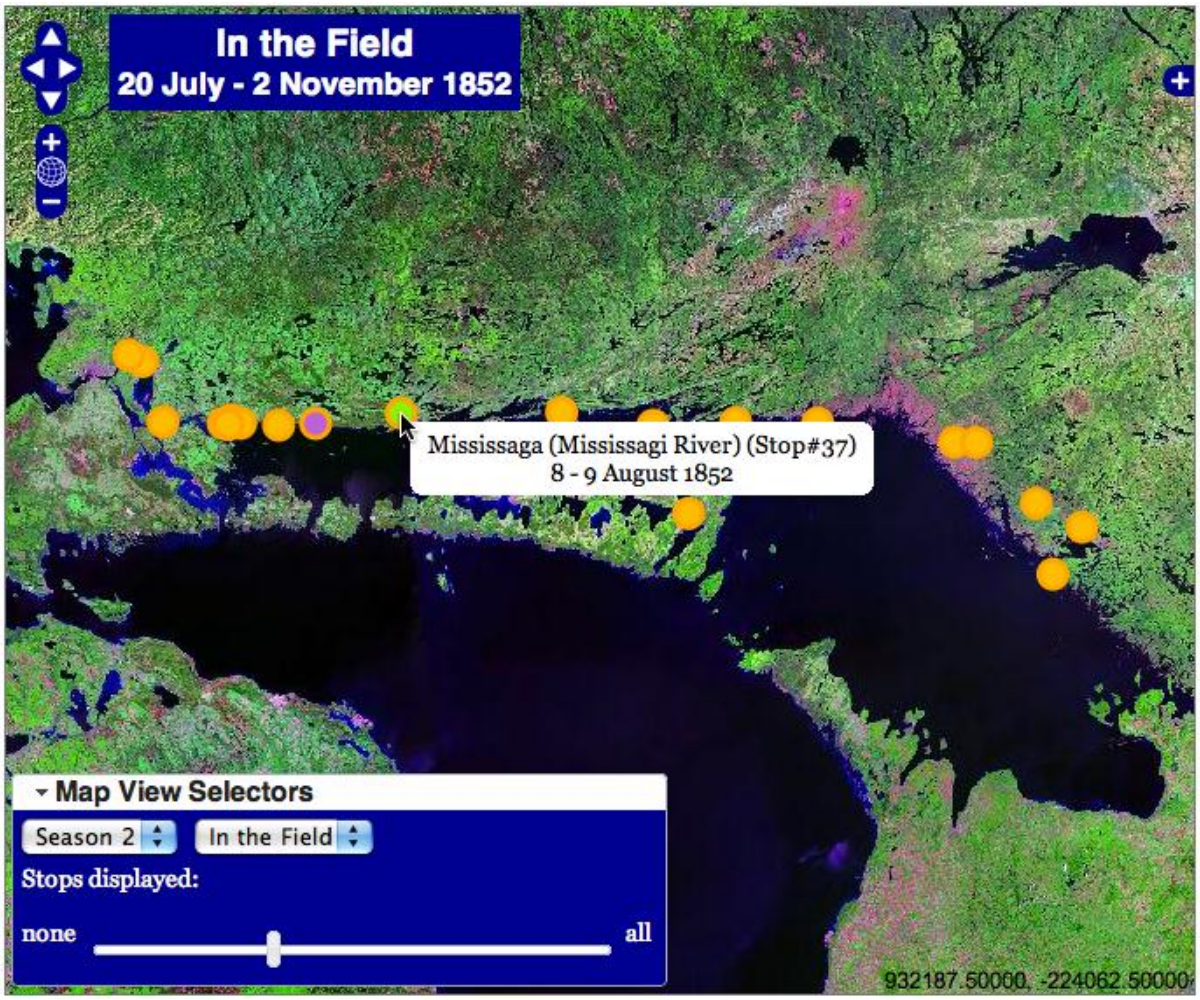

Figure 1: Interactive survey journeys map.

Expanding Season Coverage of the Dennis Survey Journeys in the Atlas

The atlas toolkit used to create the CALHTRP is being developed to address the requirements of a number of atlas projects simultaneously. Although general information display structures and user interaction models across these atlases are often similar, there are almost certainly differences between the thematic data associated with locations represented in each of the distinct atlases, if not between different maps within a single atlas. Customization of the displays such as the information panel associated with each mapped survey camp is supported by the atlas toolkit.

The atlas software kit makes default assumptions concerning the structure of the database records that are used to create and update a map theme layer and provides default behaviours for all elements of the browser display with respect to that theme layer. Within the atlas project, the tasks of configuring the database schema, programming the browser display, and preparing geographical information and map backgrounds have been separated from the entry of data that comprises the content of a map. We assume that people participating in the former activities will have knowledge of the programming languages and configuration interfaces required to set up the atlas base. At the same time, we are striving to reduce technological knowledge barriers and enable community and team members to contribute to the atlas-making process without being expected to have a complete understanding of the implementation of the atlas or its component technologies.

The atlas software kit enables an atlas user to create new locations and edit existing locations on the map, both drawing the location on the map and editing the thematic data associated with the location according

to the underlying database schema that has been defined as part of setting up the atlas. These operations are completed by invoking editing functions that allow a user to draw points, lines, or areas directly on the map and using web forms through which a user may fill in details and optionally upload media files providing additional information concerning the location. Although there is still complexity involved in entering and uploading information for an atlas entry in this manner, general familiarity of web forms from their use in various forms of social media and online business models allows us to benefit from training that potential users have already received elsewhere thus enabling them to create content for an atlas. Although the new data entry process allows those with content more independence in entering the data, the description of the survey journeys is intended to be a relatively static portion of the atlas, with more community participation expected in the creation of a set of critical commentaries concerning the processes by which the surveys were conducted. This set of commentaries is now being designed and thought of as a new map layer to be overlaid on the survey journey maps. It is for these that the web form editing functionalities will be most useful.

Mapping Critical Commentaries Concerning the Dennis Survey Journeys

Previous fieldwork conducted during the making of the GLSL Atlas involved showing a prototype of the Dennis survey journey maps to community members (including leaders) from some of the Nations included in the treaty. These atlas-making collaborators revealed several insights and provided critical comments relating to specific details of the survey process. For example, in February 2008 a member – and the chief at that time – of a Nation within the treaty territory expressed concern about the use of "mouth of the river" as a geographical reference demarcating the territorial boundary, noting probable cultural differences in the interpretation of this feature. The process of finding ways to include critical comments such as this remains an ongoing challenge.

There are two aspects to the production of a critical commentaries layer: continuing community communication and collaboration to collect the commentaries and technological considerations for the representation of the commentaries as part of the survey journey maps. Some critical commentaries have already emerged and could be developed into a map layer within the geonarrative but ongoing work with the atlas as a boundary object is expected to continue to generate ideas and discussions that could be included in this layer. Part of the outreach to the community to generate these discussions will be in continued personal contacts with community members but we are also planning to enable community contributions of commentary directly to the atlas using web forms similar to those already discussed with respect to creating the existing survey journey maps. Once added, critical commentaries would be available to all atlas users, forming the basis of additional discussion within the community.

Several issues must be addressed in order to enable the contribution of commentary by community participants, some of which are only partially addressed by the atlas software toolkit now: moderating the discussions is probably required; robust thematic search capabilities are required to complement the location-based organization provided by the geonarrative; and software changes are required to customize the representation of critical commentaries within the atlas and to properly handle their contribution.

First, some form of moderation is probably required to ensure participants that they are engaging in a civil discussion of issues. The issue of moderation has multiple dimensions that are beyond the scope of this paper. The atlas software kit includes an abstraction of community participation roles related to atlas creation, maintenance, and use (e.g., moderator, known contributor, guest contributor), and supports these by providing and enforcing authenticated login processes (user identifier and password). While configuring an atlas, a set of roles can be defined, each of which has associated capabilities to query, modify or delete information in the atlas database, thereby distinguishing potentials for distinct roles to alter the atlas narratives. For example, a 'moderator' role could be created and given extensive capabilities to create, update, or delete details such as locations and associated data for a map or set of maps. By contrast a 'guest' could be defined with only the capability to add comments to existing features. Users roles, such as 'moderator' and 'guest user' are supported by cartographic styling, allowing moderators, if desired, to see content recently added by guests.

Second, the primary form of organization of information within a geonarrative such as the survey journeys section of CALHTRP is locational, but a critical discussion such as that concerning the processes by which those surveys were conducted requires thematic as well as locational organizing strategies. Participating in such a discussion would be easier and more productive if the atlas provided capabilities to assist in finding existing contributions concerning a given topic. A static index or a set of static indexes would be undesirable, potentially fulfilling only a small number of possible search needs.

The atlas software toolkit already provides a rudimentary version of the search capability envisaged here by providing a text search function, already related to the locational organization of the map through

interactive controls that allow a user to re-centre the map on the location associated with found content. Being able to search on other data types than simply text is probably required.

Third, the inclusion of critical commentaries within the map requires that they be distinctly represented within the atlas and that the atlas software supporting user contributions provide a user with the ability to specify which of the possible types of contributions they are adding when submitting information to the atlas. The atlas software toolkit does already provide the capability for multiple layers of thematic information to be separately selected and displayed, although facilities to specify the representation of features associated with each layer must be made more flexible and could probably be made simpler to use.

RESULTS

The Cybercartographic Atlas of the Lake Huron Treaty Relationship Process is an ongoing research project developing an atlas to foster transdisciplinary learning within overlapping communities. The project objectives, still in progress, include:

- understanding evolving treaty relationships in the Lake Huron region and beyond through a context-sensitive understanding of the Robinson Huron Treaty-making process;
- fostering a critical awareness in atlas users and developers of the value of archival documents in understanding past events; and
- presenting these archival documents in new and non-dominatory ways that make specialized knowledge and information more accessible to a broad audience, including Anishinaabe students and community, the wider Canadian public, researchers from a variety of academic disciplines, and policymakers involved in treaty related issues.

As a research organization attempting to work with small communities and non-governmental organizations in developing atlas projects relevant to them, our desire to produce and use FOSS is based on cost and political reasons. Our ability to make this decision and successfully develop atlas projects has much to do with the viability, maturity, and quality of existing and emerging FOSS projects across a range of applications, including networking and geospatial computing applications. Although the development and use of FOSS as part of our project efforts is a means to the delivery of our atlases, the use of FOSS in an academic research context has a number of benefits which support our projects:

- Transdisciplinary learning is fostered through the development of technology-focused expertise (how to build an atlas) atlas subject matter expertise (what geonarratives this atlas should include) in the same group. This would happen to a certain extent with proprietary tools as well but working at both the software use level and at the software customization level to develop the technology base of our atlases enhances the process. Technology-focused team members learn about the raison d'être of the atlas while story-focused researchers and community members learn about the possibilities provided by the technology from interchange and discussion through iterative development cycles within and across atlas projects.
- Removal of license fees as a topic from our discussions with stakeholders in communities and funding organizations allowing the discussions to focus on the project goals and objectives of all stakeholders.
- Future-proofing of atlas projects, to as great an extent possible, by basing our projects on open standards and open, available implementations that may or may not be still in use at a specific time in the future, but by being open allow us more control in deciding courses of action if format conversions are required. Research data tends to be developed and stored using open formats.
- In a research setting, FOSS is also a valuable teaching aid.

This summary has not fully addressed how FOSS factors in to add a level of iterative processes within our atlas developments. For that, please see the full paper referenced at the beginning of this summary.

CONCLUSION AND FUTURE PLANS

This paper has discussed the development of cybercartographic atlases, emphasizing the importance of iterative processes at varying scales that underpin these projects. To illustrate these processes, the paper focused in particular on two project iterations during which a geonarrative concerning a set of reserve surveys conducted for the Robinson Huron Treaty expanded from a section of one atlas into a standalone atlas with more ambitious goals for the temporal scope of that narrative and for enabling additional community outreach concerning the multiple dimensions of the relationships that have developed around this and related treaties. These processes are not only necessary but we would argue desirable in serving interrelated but distinct functions within the numerous relationships that the atlases processes help to establish and maintain. Atlas implementation, like the software implementation efforts that contribute to it, must be conducted incrementally with close attention to testing and feedback as a regular occurrence

within the process to ensure that desired outcomes are being achieved. Similarly, community outreach activities which can, at least on a small scale, be in conjunction with some of the ongoing testing, help to maintain relationships between community and research centre members and are crucial for the development of new ideas and considerations concerning research areas that could be investigated, expanded, or discontinued. Finally, our participation as a FOSS project in a network of FOSS projects means that we are sometimes dependent on the release schedules of other projects and must adapt our priorities, delivery schedules, and design decisions accordingly but, because we also sometimes contribute to FOSS projects we are dependent on, our interactions with those projects also work best when relatively short project iterations occur.

Software technologies as currently designed and used are often difficult and time consuming to work with when attempting to achieve a specific outcome. Cybercartographic atlases are certainly prone to this complexity and everyone involved in their design must be aware, to as great an extent possible, of the audiences that are intended to use a specific atlas and must attempt to create the atlas using strategies that are as broadly inclusive of that audience as possible. Although this paper has presented the discussion concerning the encouragement of participation as one in which technological solutions can play a role, there remains an important role for the geonarrative mediator who continues to contact contributors directly to discuss and exchange ideas concerning the content and shape of the geonarratives, ultimately finding ways to incorporate their ideas into the atlas in conjunction with other project team members. Many miles have been logged in the creation of the atlases discussed here, including time spent in boats retracing portions of Dennis's survey journeys. As the mediator interacts with various contributors and sources, the stories to be told often change, transformed and extended as a result of new perspectives being introduced. The challenge for the project team, discussed in this paper, is to negotiate the complexities of emerging narratives and to communicate them in as clear a manner as possible using the best representational tools available during the current project iteration. The objective is to continue the ongoing iterative processes and the relationships that are created out of them through the sharing of information and negotiation of complex geospatial narratives. The processes are transdisciplinary and iterative at multiple scales. A tangible atlas is an important outcome from these processes but is by no means intended to be the only outcome.

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A complete list of FOSS components included in our cybercartograhic atlas software would be long but certain projects on which we rely heavily deserve to be mentioned. We use OpenLayers for map display and cursor event handling with coordinate transformations implemented using Proj4js. We use PostgreSQL and PostGIS, which combine as a geographically-enabled database. We use GeoServer to provide OGC-compliant WMS and WFS services. We use JQuery for programming portions of the client-side atlas user interface.

REFERENCES

Caquard, S., S. Pyne, H. Igloliorte, K. Mierins, A. Hayes, and D. R. F. Taylor. 2009. A 'living' atlas for geospatial storytelling: The cybercartographic atlas of indigenous perspectives and knowledge of the Great Lakes region. Cartographica 44(2): 83–100.

GCRC. 2006. Nunaliit: Cybercartographic atlas framework [software]. Published by Geomatics and Cartographic Research Centre, Carleton University. Available at http://nunaliit.org. Accessed October 2010.

Marlatt, M. 2004. The calamity of the initial surveys under the Robinson Treaties. In Papers of the thirty-fifth Algonquian conference, ed. H. C. Wolfart, 281–335. Winnipeg: University of Manitoba Press.

MNR. 1851. Ontario Crown survey records field note book (FNB) 832, Report, diary and field notes, Survey of the Indian Reserves on Lake Huron, Vol. 1, J. S. Dennis. Ministry of Natural Resources, Toronto.

———. 1853. Ontario Crown survey records field note book (FNB) 828, Report, diary and field notes and Survey of the Indian Reserves on Lake Huron, Vol. 2, J. S. Dennis. Ministry of Natural Resources, Toronto.

Peterson, M. P., ed. 2003. Maps and the Internet. Oxford: Elsevier Science.

Taylor, D. R. F. 2003. The concept of cybercartography. In Peterson (2003), chap. 26, 405–420.

Taylor, D. R. F., ed. 2005. Cybercartography: Theory and practice. Amsterdam: Elsevier Science.

Taylor, D. R. F. and S. Pyne. 2010. The history and development of the theory and practice of cybercartography. International Journal of Digital Earth 3(1): 2–15.