SOME NEW APPLICATIONS IN THE THEORY AND PRACTICE OF CYBERCARTOGRAPHY: MAPPING WITH INDIGENOUS PEOPLE IN CANADA'S NORTH

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Abstract

There have been some fundamental changes in cartography over the last two decades and the term "cybercartography" was introduced to capture some of these. This paper describes some recent developments in the theory and practice of cybercartography. The main products of cybercartography are cybercartographic atlases. A cybercartographic atlas is a metaphor for all kinds of qualitative and quantitative information linked through their location. Location is a central organizing principle informed by new concepts of maps and mapping. Such atlases are multimedia, multisensory online products. This paper describes the key concepts informing cybercartography and discusses some new applications of cybercartography in mapping with indigenous people in Canada's north. These include the Kitikmeot Place Names Atlas, the Arctic Bay Place Names Atlas, the "Living" Cybercartographic Atlas of Indigenous Perspectives and Knowledge, and the Inuit Sea Ice Use and Occupancy Atlas. Each of these atlases has been developed in collaboration with the indigenous communities involved. The Nunaliit Cybercartographic Atlas Framework (Nunaliit means community in Inuktitut) is an open source software package, which has been designed to facilitate input to these atlases by community members who have little knowledge of geographic information processing. This helps to ensure that the atlases reflect and contain information of interest and utility to the communities concerned and that the atlases are continuously updated as the communities take a strong ownership role of these products.

Introduction

Maps and mapping have been important throughout history but in the information era they are more central than ever. Technological change is revolutionizing cartography and mapping now investigates how individuals organize, navigate and interact with

computer-based information through the use of a variety of electronic maps and how to make increasing volumes of digital data more accessible, understandable and useful.

It has been argued that cartography is in the midst of an ontological crisis (Kitchen and Dodge, 2007) and is in the midst of a radical transformation away from a focus on representation, communication and objectivity and towards a focus on performance, reflexivity and narrative (Crampton, 2001; Kitchen and Dodge, 2007; Pearce, 2008; Turnbull, 2007; Taylor and Pyne, 2009). Cybercartography is one example of a response to these challenges. The map as an artifact is changing and new forms of "maps" are emerging, some of which bear little resemblance to traditional products. New topics are being "mapped", some of which have never been considered for traditional mapping. Location is becoming a central organizing concept for all kinds of quantitative and qualitative information. Maps are much more than artifacts indicating location as Brian Harley and David Woodward pointed out many years ago. They defined maps as "…graphic representations that facilitate an understanding of things, concepts, processes or events in the human world." (Harley and Woodward, 1987: xvi) The terms maps and mapping are used as metaphors for a wide range of human activities. We "map" the future, we "map" the brain, we "map" the human genome and societies all over the world create mental maps. Maps provide matrices for a wide range of cultural and socio-economic topics and are moving increasingly beyond the graphic by using multimedia and multisensory formats. The term cybercartography captures the various revolutionary changes affecting maps and mapping (Taylor, 1997, 2003, 2005, 2009; Taylor and Caquard, 2006). Cybercartography is defined as "The organization, presentation, analysis and communication of spatially referenced information on a wide range of topics of interest and use to society in a interactive, dynamic, multimedia and multisensory format."

Cybercartography

The history of the development of the theory and practice of cybercartography over the last twenty years is given by Taylor and Pyne (2009).

Cybercartography has seven major elements:

- It is multisensory (sound, touch, smell, visions and even taste) and multimodal;
- It uses multimedia forms (eg. Web 2.0, mobile devices);
- It is interactive and "map users" can increasingly become "map creators";
- It is an information/analytical package and an organizational framework for the emerging products and processes of the Web 2.0 era of social computing;
- Cybercartographic products are compiled by teams of individuals from a variety of different disciplines, not just cartographers;

- Cybercartography is applied to a wide range of topics, responding to societal demands including topics not usually "mapped";
- The creation of cybercartographic products involves new research and development partnerships with government and industry.

The main products of cybercartography are cybercartographic atlases. A cybercartographic atlas is a metaphor for all kinds of qualitative and quantitative information linked through their location. The map is a central organizing principle but these atlases contain information in a variety of forms, not just maps.

The Conceptual Basis of Cybercartography

There are six major concepts underpinning cybercartography:

In the real world people use all of their senses in learning about their environment, not just vision. Cybercartography attempts to create multisensory representation to mirror the sensory reality of real life through cybercartographic atlases. This includes the use of sound (Brauen and Taylor, 2007; Theberge, 2005), touch (Araujo de Almeida and Tsuji, 2005) and experimental work with smell (Lauriault and Lindgaard, 2006).

People learn in different ways and prefer teaching and learning materials in different formats. Some individuals prefer information in textual format, others as tables or graphs, yet other in narratives or videos and many are visual thinkers. Cybercartographic atlases provide people with a choice of learning styles or combinations of learning styles. The same information is presented in different formats.

Substantial educational research has shown that effective teaching and learning takes place best when individuals are actively involved and engaged (Baulch et. al, 2005).
A central message of the social computing revolution is that people need the power to create their own narratives. The Nunaliit Cybercartographic Framework developed by the Geomatics and Cartographic Research Centre at Carleton University (Hayes, 2006; Pulsifer et. al., 2008) provides a mechanism for doing this. The framework provides an organizational structure for the narratives to be included in a cybercartographic atlas as well as the metadata indicating the quality and nature of the narratives that people create. Metadata is often missing from many examples of maps created by social computing initiatives which detracts from their utility and value. The framework is also open source software which is licensed to allow maximum use. It has been developed to facilitate the creation of narratives by non-specialists.

Many topics of interest to society are very complex. There is no "right" or "wrong" answer to many questions such as those about global warming and climate change. To

appreciate these complexities a number of different perspectives on the same topic are often required. Each of these has its own ontological underpinnings which result in different narratives. Cybercartographic atlases can present these different narratives without privileging one over the other. The atlases also present information in a way which is easily understood. Of particular importance in this respect is the ability of giving voices to local people. By facilitating their ability to create their own narratives they can speak for themselves rather than have others speak for them.

The "map user" has always been central to cartographic research and practice. Cybercartography takes this further and, in some instances, the "map user" becomes the "map creator" which establishes new forms of "democratized" and "participatory" cartography. The Nunaliit Cybercartographic Atlas Framework has been specifically designed to do this. The research is also being carried out by large interdisciplinary teams in the Geomatics and Cartographic Research Centre at Carleton University and the contribution of faculty members, post-doctoral fellows, graduate students and technical and administrative staff is fully recognized although space does not allow a list of all the individuals involved.

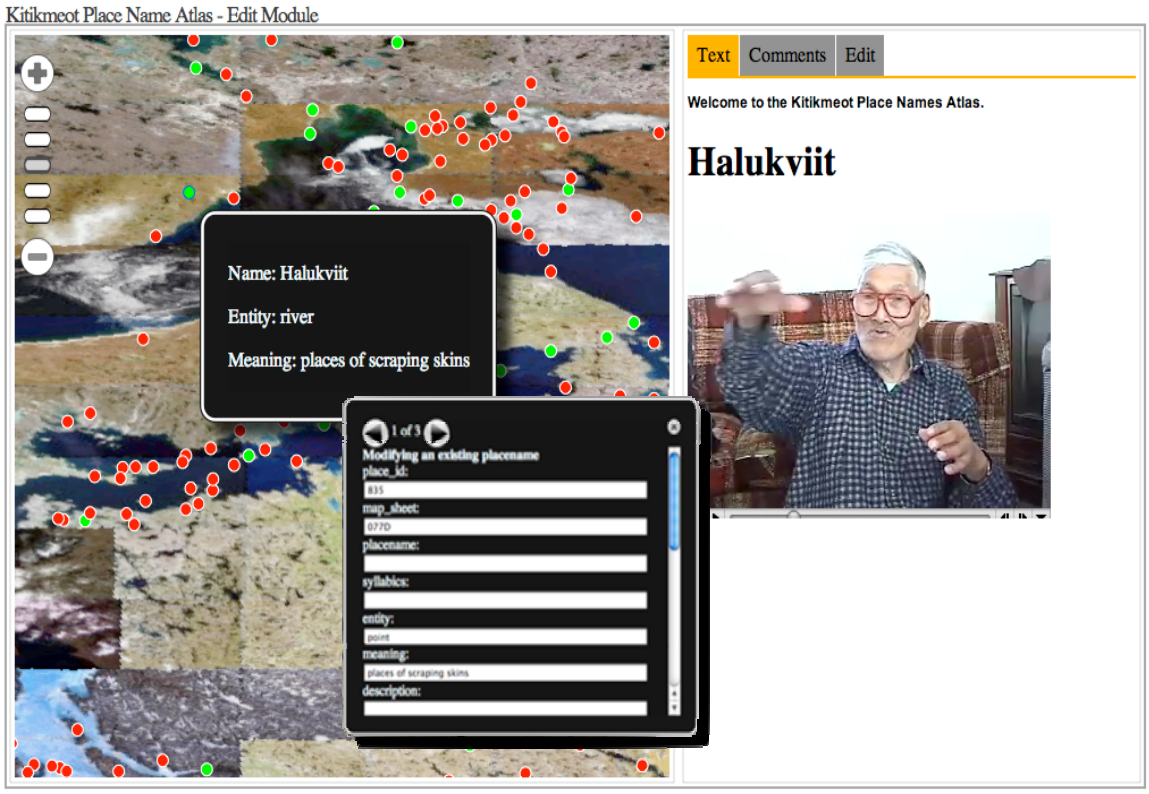
The Age of Location

The importance of location-based information to almost all aspects of societal activities is growing. It has been estimated that over 80 percent of digital information has a locational component and this percentage is growing. There are many examples of the growing importance and utility of location-based information such as Google Earth, Virtual Earth, etc. as well as applications such as GEOSS (the Global Earth Observation System of Systems - http://www.epa.gov/geoss/), Global Map (http://www.ISCGM.org), OneGeology (http://www.onegeology.org/) and others. Cybercartography has been used at the global scale in the form of the Cybercartographic Atlas of Antarctica (Pulsifer et. al.,2005) and the Cybercartographic Atlas of Canada's Trade with the World (Eddy et. al., 2005) but it is at the local scale, especially in the small communities of Canada's north where more recent research and applications have taken place. The research is being supported by funding from a number of Canadian organizations including the Social Sciences and Humanities Research Council of Canada, the Natural Sciences and Engineering Research Council of Canada, the International Polar Year Secretariat, Heritage Canada, the Inuit Heritage Trust, Nunavut Arctic College and the Kitikmeot Heritage Society.

Cybercartography is proving to be popular and useful to a number of communities in Canada's north. A brief description of some of these initiatives is given here, as space does not allow a fuller description. Much of this research is ongoing.

The Kitikmeot Place Names Atlas

Inuit culture is predominately an oral culture. Inuktitut has only been rendered as a written language relatively recently. The Kitikmeot Heritage Society was interested in preserving aspects of this oral culture through the creation of an atlas of place names and features around the community of Cambridge Bay. Written names on a map are of very limited value because a name conveys a story, a legend, and both the traditional and modern use of a place or feature. Most places of interest to the local community do not appear on official topographical maps because the English or French names on these maps reflect the ontologies of the trainers, missionaries and, more recently, government agencies which created them. Working with the Kitkitmeot Heritage Society a sound-based Place Names Atlas has been created using the Nunaliit Cybercartographic Atlas Framework. This is shown in Figure 1 (http://www.kitikmeotheritage.ca/atlas.htm). This is, of course, an interactive atlas and when the mouse is moved over each of the places indicated on the map a voice pronounces the name of the place in Inuktitut and this is often linked to a video of an elder telling the story of that place in his own language. The atlas will continue to evolve as the Kitikmeot Heritage Society can use the Framework to add to, or edit, existing names in the database. It is interesting to note that the same name can appear in more than one location on the map, but the narrative for each of these places will be different. This is not a problem for Inuit ontology but poses problems for a computer database which prefers discrete and unique points!

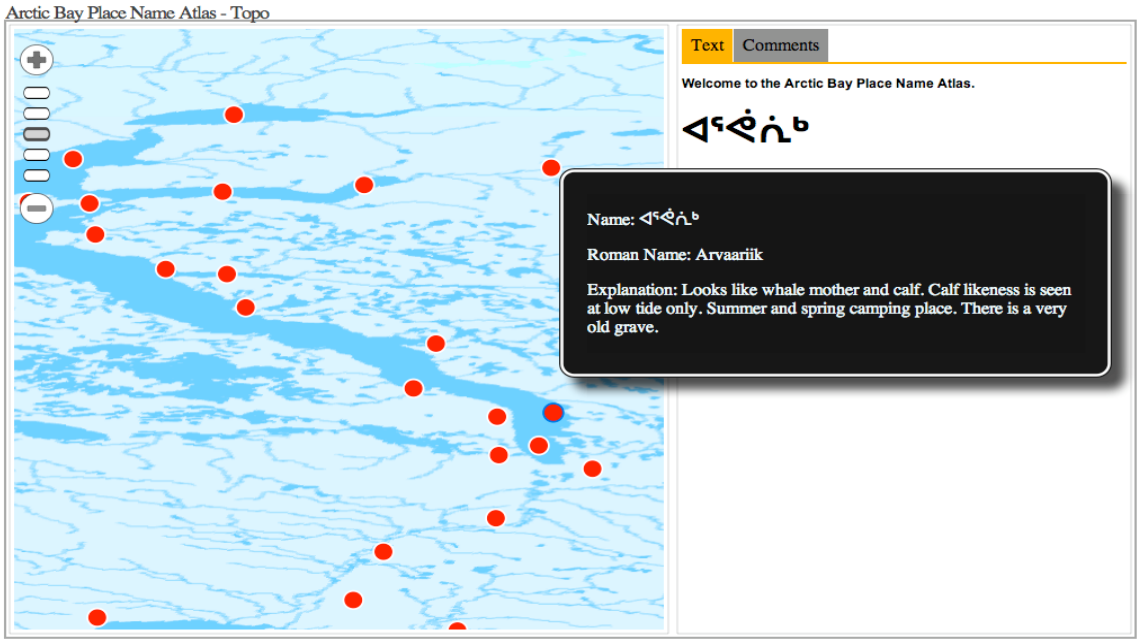


- Inuktitut is an Oral language, challenge to create a spoken map
- Name conveys the story, legend, traditional use, or modern use of the place
- Most places of interest not on official maps, need to create a wiki map for community participation in map making

Figure 1. Kitikmeot Place Name Atlas

The Arctic Bay Place Names Atlas

A similar approach is being used to create a place names atlas for the community of Arctic Bay as shown in Figure 2. This atlas is being expanded in cooperation with the local people to document locations, trails, archaeological findings and the uses of both land and sea using audio, video, text and maps, linking these with the other databases on both the past and present of Arctic Bay. The local community is collecting the information they consider to be of value and again, the elders are playing an important role. A major concern is that the younger generation is losing sight of its heritage and the Atlas will both preserve this and create an educational tool which can be used both in the formal educational institutions such as schools and colleges as well as in more informal community education. The resulting Cybercartographic Atlas of Arctic Bay, which is under construction, will cover many more topics than just the place names although these have been used to form the first module of the Atlas.

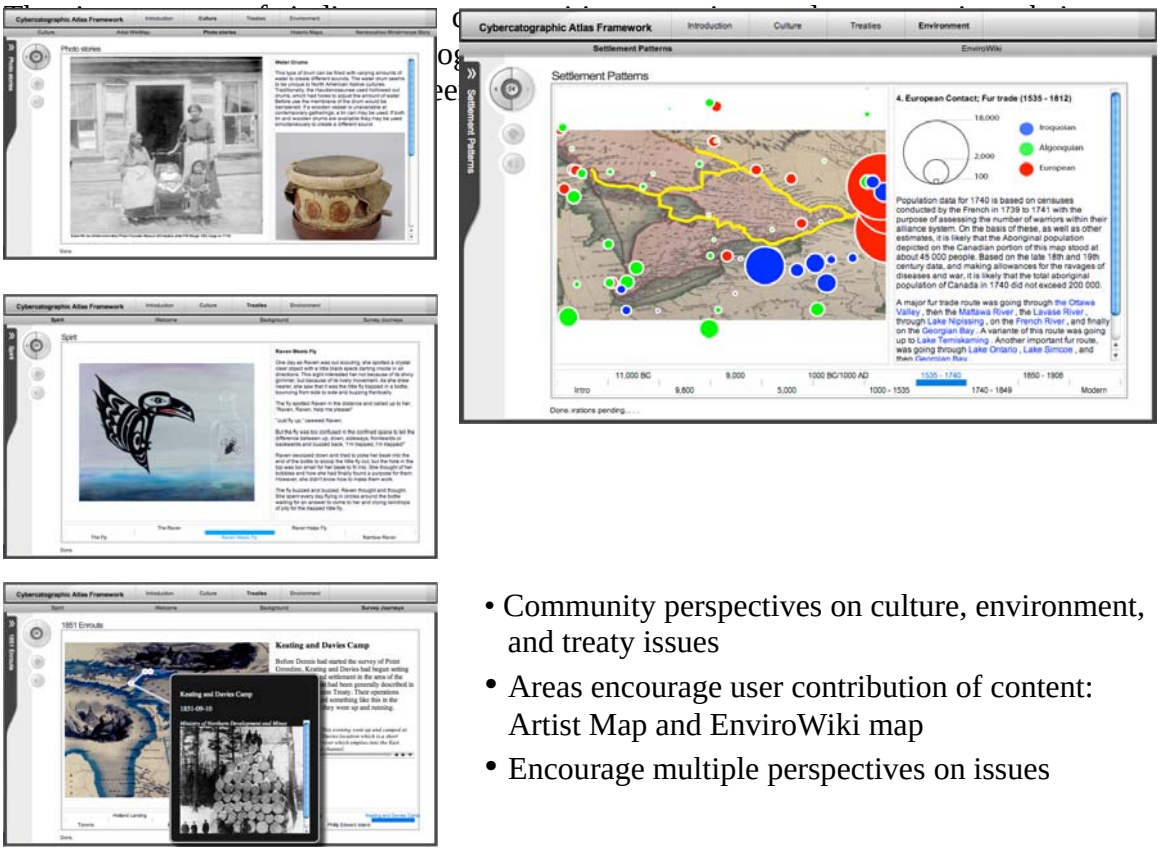


- Ongoing project to document locations, trails, archeological findings, sightings and uses of the land and ice with audio, video, text and links to other relevant content from other organizations.

Figure 2. Arctic Bay Place Name Atlas

The "Living Cybercartographic Atlas of Indigenous Perspectives and Knowledge

This Atlas was developed with the Ashinaabe peoples of Great Lakes/St. Lawrence Region of Canada (Caquard et. al., 2008). A screen capture from the Atlas is shown in Figure 3.
(https://gcrc.carleton.ca/confluence/display/GCRCWEB/Living+Cybercartographic+Atlas+of+Indigenous+Perspectives+and+Knowledge)

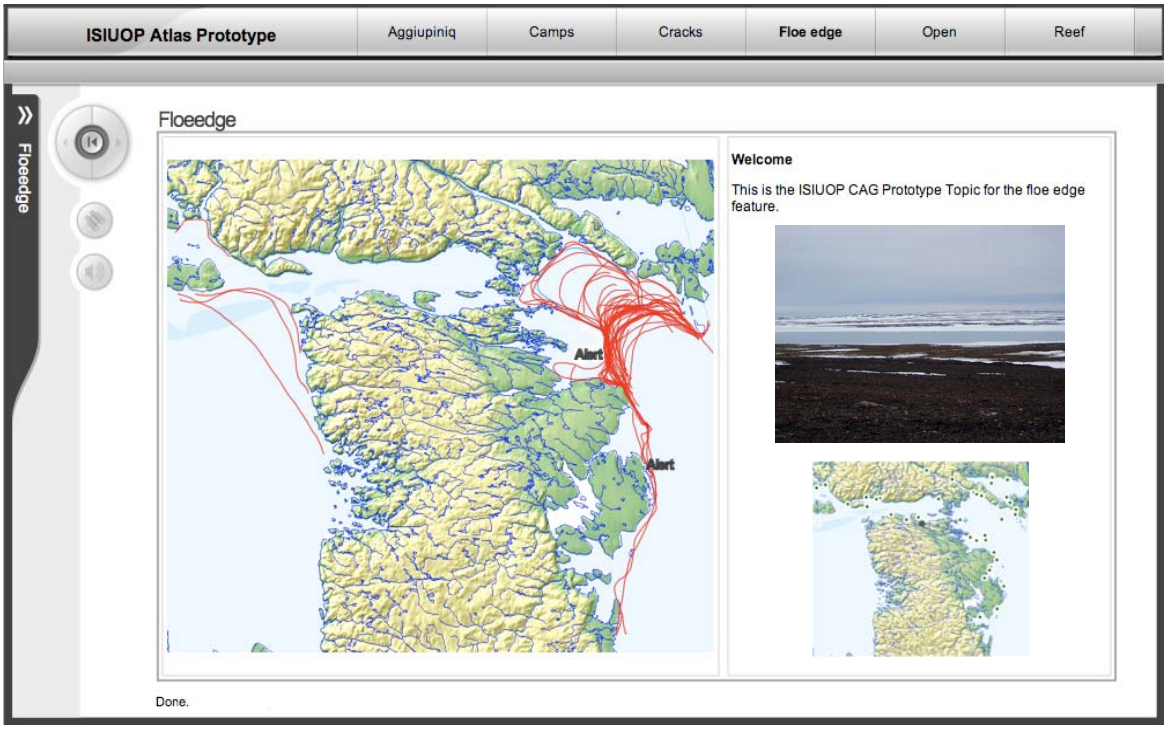


- Community perspectives on culture, environment, and treaty issues
- Areas encourage user contribution of content: Artist Map and EnviroWiki map
- Encourage multiple perspectives on issues

Figure 3. Living Cybercartographic Atlas of Indigenous Perspectives and **Knowledge**

technologies which do not easily allow for the presentation of the complex view of space, environment and culture of many indigenous communities. GIS technologies also rarely effectively capture the performance aspect of oral storytelling, art and dance. The use of cybercartography is more appropriate in this respect and this Atlas captures the artistic concepts of these communities through the creation of a native arts module where indigenous artists display and explain their art online. The narratives and stories behind each work of art are interesting and informative and several were created by the community artists specifically for this Atlas. The Atlas also has a module dealing with the complex and contested issue of treaty relationships where the views of the indigenous people and those of other actors diverge considerably. Cybercartography allows a much more nuanced treatment of this important relationship which is best understood by examining the changing historical and geographical context over time. The artistic module is a good example of community created content and the Atlas as a whole shows the ability of cybercartography to present multiple perspectives on important issues.

The Inuit Sea Ice Use and Occupancy Project Atlas



- Document local sea ice knowledge - features, uses, routes, camps, hazards
- Highlight changes to sea ice features, such as floe edge, over time
- View weather, ice measurement, and other scientific climate data in tandem with

local Inuit observations

Figure 4. Inuit Sea Ice Use and Occupancy Project Atlas

A screen capture of this Atlas is shown on Figure 4.
(https://gcrc.carleton.ca/confluence/display/ISIUOP/Inuit+Sea+Ice+Use+and+Occupancy+Project+(ISIUOP)

This large International Polar Year involves many aspects of Inuit life and the project has a cybercartographic component which attempts to document local knowledge of sea ice including features on the ice, uses of the ice, routes, camps and hazards on the sea ice. To the Inuit the sea ice is an enabling environment. To people from the south and other outsiders the sea ice is usually viewed as a barrier to movement and resource exploitation. Standard official topographical maps often portray the seas as an empty blue space with occasional delimitation of the edge of the ice in summer and winter. The Inuit narratives of the sea ice and their use of it and travel through it show a very different picture. The ice is far from a featureless desert and the Atlas attempts to capture Inuit narratives and link these to "scientific" databases documenting the sea ice and the changes which are taking place to the environment as a result of global warming.

Conclusion

Cybercartographic atlases transform cultural, socio-economic and environmental data into interactive and multisensory narratives. This allows the innovative display and exploration of spatial relationships. These atlases present several narratives of the same "reality". People can become active "creators" of map narratives, not just passive ones. This is certainly the case with the indigenous communities involved in the creation of the atlases described in this paper. The active involvement of these communities and their ability to help create their own map narratives means that these atlases will be constantly updated and respond to new situations.

Just as the map was a key navigational tool in the Age of Exploration, so the cybermap can provide an aid to navigation in the information era. Cybermaps can act as an integrating framework for a wide variety of quantitative and qualitative information and facilitate a process by which different narratives can be organized, presented and used. Cybercartography allows many voices to be heard both literally and figuratively.

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