Adaptive Cartography in the Context of Neogeography and Ubiquitous Computing: Some Research Issues

Xiang Zhang, Tinghua Ai, Xiaoqiang Cheng

School of Resource and Environmental Sciences, Wuhan Univ., China

Abstract.

Web 2.0 and ubiquitous computing together provide a promising technological framework for individuals to map the world and events that are happening around them and encourage free use of these maps where network connection is available. For example, once people publish information via the new social media such as Facebook, it is technically possible for their friends to get informed of this information very quickly. As much of such information contains geographic locations or information (e.g. place names) that can be georeferenced (in forms of POIs), maps provide a better interface to facilitate the information communication process. This envisions an environment for real-time geocollaboration (Chang & Li 2012), and everyone should be able to obtain knowledge as spatial relationships of events structure themselves on maps (e.g. it becomes easy to identify the nearest friend in one's neighborhood).

On the other hand, as handheld devices become smarter and more spatially capable (with built-in internet accessibility, GPS, compass, etc.), people with no geospatial expertise now are more easily than ever engaged in the using, sharing and distribution of spatial information (in the form of framework data). A famous example is OpenStreetMap (OSM), where everyone can collect and edit spatial data of their familiar places and contribute to the map worldwide. Goodchild (2007) described this phenomenon under the umbrella of citizen science and termed it volunteered geographic information (VGI) as a special case of the wider Web 2.0 practice of user generated content. This may substantially change the way how the general public and scientists from other domains use maps.

With all the possibilities provided by this new context, however, the question is that are there problems from a cartographic perspective? Are there problems in how individuals make and use these maps? Are current carto-

graphic theories sufficient (need for neo-cartography)? And all in all, what are the unique contributions that the cartographic domain can offer? Kraak (2011) expressed similar concerns and argued that there is no need for neo-cartography. However, he added further that one should make better use of current cartographic design knowledge to enable an effective visualization.

This paper further identifies some of the basic problems of cartography in this new context. The issues concerned have a more cartographic and geo-spatial flavor. In doing so, we went through several case studies. The results are described in the following:

- Heterogeneity between informal (e.g. OSM) and formal information sources. The heterogeneity lies in terms of semantics, fidelity and scale of spatial data to be integrated. How should diverse spatial data be integrated to benefit both sides?

- Poor map design. Although there are many web services for map styling, the control over symbol design and color scheme is still limited. How can cartographic knowledge be better integrated into the tools?

- Graphic information overload. This problem is now usually ignored by neogeographers. Cartographic generalization has long been dealing with such problems. How should existing approaches be adapted for the new context?

- Adaptive visualization has always been an important area where various user groups and devices impose diverse map requirements. Apparently, it becomes even demanded in the context of ubiquitous mapping as user requirements and how people interact with maps cannot be determined statically. The question is therefore: how should we model the user and context in order to provide the right person with the right information in a timely and usable way?

Keywords: adaptive visualization, generalization, context-aware applications, customizable map content, map design, volunteered geographic information

References

Chang Z, Li S (2012) Geo-Social Model: A Conceptual Framework for Real-time Geocollaboration. Transactions in GIS (online) doi: 10.1111/j.1467-9671.2012.01352.x

Goodchild MF (2007) Citizens as sensors: the world of volunteered geography. GeoJournal 69:211–221

Kraak MJ (2011) Is There a Need for Neo-Cartography? Cartography and Geographic Information Science 38(2):73–78