THE FUTURE OF SCIENCE AND TECHNOLOGY

Forecast: Next-generation interfaces for maps are needed to keep pace with the world's evolving geography and data

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Description:

At their essence, maps are stylized representations of our complex world, used to reduce and refine a huge volume of information into a distilled relevancy. As a technology, they are centuries—if not millennia—old, and it shows. The world is dynamic, ever-evolving, and fractal. Maps are static, stagnant, uniscaled media. Moving the technology to digital platforms has helped to alleviate at least one of those legacies; users are now quite comfortable with zooming in and out of areal overviews, and watching map features and symbology scale appropriately as their perspective shifts. Computer cartography is just beginning to catch-up with digital trends in dynamic data-feeds and near-real-time updates. More profound limitations persist in cartography, however, that limit the suitability of the map as a next-generation interface.

First, cartography (mostly through historical inertia) inherited a model of the world rooted in absolute space: the georeferencing, positioning, and distance measurement of Newton's classical mechanics and the math of Euclid. These are obviously very useful tools for representing the Earth's surface, its features, and its geography, as they have persisted in use for a very long time. Ultimately, though, the absolute space view of the world is relevant at relatively local scales, on the order of a manifold neighborhood in mathematical terms or a large metropolitan area in geographical terms. We know that the Earth's surface and its topology are not flat. Projections that morph the Earth's 3D surface to fit a 2D plane must cede either distance, shape, or angle, with detrimental effects, in some instances (for example, around the poles and equator) [1]. Moreover, these are not standardized and many users of maps (particularly browser-based maps) are blissfully unaware of these issues.

Moving to digital globes resolves these issues, but does not rectify the second problem, which is that most maps are incapable of representing (empirically or visually) relative spaces. Much of the world conforms more naturally to relative spatial models: space-time, action-at-a-distance, entity-relationships, and so on, and this translates to things that we really do care about, such as social networks, globalization, and digital messaging.

New connections between cartography, spatial analysis, social networks, and sociometrics will be formed

The very recent popular fascination with computer and browser-based cartography is paralleled by a surging interest in social network analysis and visualization. There are logical connections to be forged (and obvious fortunes to be made) by connecting the two. Cartography, particularly Online cartography, is going to have to evolve with the times and we may be moving beyond the map as interface. Graph-based visualizations of social networks can easily incorporate absolute position in an orthogonal spatial coordinate system as data points or visual artifacts, such that users may mine interfaces for who they care about, first, and where they are, second. These two areas of research have traditionally gone their separate ways. Space is not particularly important to most sociometrics, for example, and development of user interfaces can focus on design in lieu of geography in such instances. That said, the marketplace--and a generation of Online users comfortable with managing their social networks and relationships in the real-world concurrently with those in cyberspace--are driving demand for future improvements in these areas.

Mapping will provide novel user interfaces to augmented reality

Maps are a logical interface medium for augmented reality systems. Mapping is among the oldest and most well-developed GUIs, tried and tested over millenia. Sufficient prior art has amassed in tagging space and location-relevant media to suggest that augmented reality might fuse with the map as the

dominant future user-interface, particularly on mobile devices and in-car navigation equipment. (William Gibson is already writing about it, so it must be on the horizon! [2]) AR is already being deployed in lieu and in tandem with maps as a UI for Geographic Information Systems in the field [3]. The GeoDec project at University of Southern California is also implementing prototypes of this sort of interface, folding photo streams and video feeds into 2.5D GIS models of urban areas. Wii-based paddles for surfing Microsoft's Virtual Earth have already begun to trickle out of development.

References

[1] Monmonier, M. (1996). How to Lie with Maps. Chicago: University of Chicago Press.

[2] Gibson, W. (2007). Spook Country. New York: Putnam.

[3] Department of Geography, University of California, Santa Barbara, Battuta Project

[4] National Visualization and Analytics Center (2005). Illuminating the Path: The Research and Development Agenda for Visual Analytics." Richland, WA: U.S. Department of Energy, Pacific Northwest National Laboratory

Signals:

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