GOOGLE MAPS AND MOBILE DEVICES: CAN JUST ONE GENERIC DESIGN WORK?

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ABSTRACT

The phenomena that is Google Map® has both made mapping more visible and made access to base maps more immediate. The proliferation of mash-ups and other Web-delivered map products that are based on Google maps illustrates this 'use-it-for-everything mapping phenomena. But, can Google's maps be used for everything, including mobile and small-format map delivery platforms? Can we just 'Google it?
This paper discusses how user/producers have exploited the availability and accessibility of base maps from Google. It explores the numerous small format / mobile applications that have been developed and the content that they deliver. Then it considers whether it is appropriate and 'good' design practice to accept Google maps as an 'underlay' for developing this genre of map products.

Keywords: At Location maps, Google maps

1. INTRODUCTION

With the arrival of the Internet, cartography was able to publish maps on-line, quickly and with no distribution or printing costs. However, the way maps are constructed for Web delivery differs little from computer graphics and discrete multimedia products. Now, accelerated by relatively inexpensive access to the Internet, the availability of small, inexpensive, mobile computers and the availability of social software have changed the way in which users access information via the Internet. This has been called Web 2.0 (O'Reilly, 2004). Web 2.0 treats information production, dissemination and access differently from the 'standard' producer to client model. Users are part of a data collection / map production / map publishing consortium and cartographers lose 'control' of what has been traditionally a cartographic publishing domain. Social software and Web 2.0 has forced a paradigm shift in the way map and atlas publishing is facilitated.

'Partnerships' between producer and consumer allow products to be realised and distributed without any cartographers at all being involved in the process. In many cases, useful and timely products result. However, there exists the possibility that inferior products, or products that misinform result from Web 2.0 publishing, where user/producers develop and make available mapping products from their naïve geographic and cartographic knowledge. Poor quality maps might result without professional cartographic input.

This paper addresses some of the issues related to how might cartography use Web 2.0-provided maps on small screen and mobile devices? It begins by providing an overview of Web 2.0 and then looks at geospatial products delivered via Web 2.0. Then it considers some of the problems associated with the reliance upon base maps and imagery provided through Web applications. Finally it develops how Web 2.0 and mobile devices could be used to produce more affective products.

This paper does not criticise map design in products like Google. On the contrary, the author finds them attractive and most usable – in the context of desktop-delivered Web Cartography. The question being addressed here is whether Google maps can be used in all applications, including mobile applications. It is essential that the impact of this user/producer approach of just 'taking' whatever exists and "hoping for the best" be monitored and the impact of dis-informing be considered.

2. WEB 2.0

Over the last decade by far the most widely-used method for the dissemination of geographical information recently has been the World Wide Web. Mapping products delivered by the Web are by-and-large the products of cartographers and, particularly products that are provided as 'packaged' products, whereby users are unable to sometimes make their own maps from supplied databases, but otherwise cannot make personal contributions.

Web 2.0 is the use of the World Wide Web by individuals and groups of individuals to provide and share information by utilising the Web in a different

manner. The way that users of Web 2.0 communicate differently is that they do not require materials packaged by publishers – they do this themselves, and, they are computer literate, equipped with versatile computers and appropriate software and, perhaps most importantly, ready to use the Web in different ways.

The Web 2.0 has been described by Roush (2005, p. 49) as:

"… the transformation of the original Web of static documents into a collection of pages that still look like documents but are interfaces to full-fledged computing platforms. These Web-based services are proliferating so fast because they can be built using shared, standardized programming tools and languages developed, for the most part, by open-source software community".

And, Roush (op cit.) notes that this has been made possible by three broad technology trends:

- Inexpensive Internet access;
- Inexpensive wireless computing devices; and
- The Web as a platform for personal publishing and social software.

About Web 2.0, O'Reilly (2004) coined a term "architecture of participation" to describe the nature of systems that are designed to encourage user contribution. Therefore, with Web 2.0 users make their own contributions, they share documents and they are attuned and skilled at composing their own compilations of rich media to facilitate 'self-help' information provision.

3. WEB 2.0 AND MAPPING PRODUCTS

Relatively recently, maps have been published on the Web by user/producers using a process called 'mash-ups' with Web 2.0 and Social Software. Web 2.0 is the use of the Web by individuals and groups of individuals to provide and share information, including geographical information. It provides a new model for collaborating and publishing.

Mapping packages delivered using Social Software and Web 2.0 include free maps and images for re-use from OpenStreetMap (http://www.openstreetmap.org/), GPS Traces – a public collection of road centrelines – also from OpenStreetMap, a library providing a common API for Google, Yahoo! and Microsoft's javascript mapping APIs from MapStraction (http://www.mapstraction.com/) and Tile Engine v0.5, a Web mapping engine for insertion into individual sites that present maps with clickable thumbtacks from CivicMaps (http://maps.civicactions.net/). The availability of this free software has allows individual users to create 'Mash-ups' – collections of maps using the resources provided via the Web.

Web hybrid publishing using Application Programmatic Interface (API), Web feeds or JavaScript has added to the genre of Web-delivered maps. Mash-ups allow maps to be produced by mixing services delivered through a third party using a publicly-accessible and usable interface or an API. Perhaps the most widely-used mapping application is that provided by Google Maps. It provides base maps of almost anywhere that can be used as an 'underlay' for individual annotation with default symbols or specially-created symbology. Map views are available as topographic or street maps (perhaps the most widely used maps are street maps), imagery (satellite or aerial), hybrid (maps plus imagery) and street (360 degree views of some locations). Google-based applications are also available, for example Quikmaps and PlaceOpedia. They allow user-producers to generate information overlays and map annotations that could be described as 'geo-notes'. As well as user-producer maps, 'mainstream' publishers are also using mash-ups for Web publishing. For example the New York Times newspaper uses mash-ups to illustrate its travel sections.

User/producers rely on geospatial products (maps and imagery) as 'foundations' for their mapping. However, their products can only work in the 'corridor' provided by these foundations. Other graphic interpretations of the underpinning geography are not used and thus only one interpretation of geography is made.

It has been argued by geographer/cartographers like Castner (1981) that users have to appreciate the 'grammar' of cartography in order to fully understand the 'language' of maps and how maps depicts geography (including the associated 'lies' that maps use to illustrate the 'truth' about what the map reader needs to see on the map in order to have the best 'view' of reality). Using the defined geographical 'picture' that is used in the corridor provided by this 'slim' volume of base maps only one, or few views of reality can be provided. Therefore a true appreciation of what constitutes the 'real world', and where the user 'fits' into that world, cannot be had. Certain lies, as per Castner, have been told when the Applications Programming Interface (API)-delivered base maps were produced. However, to tell the real picture, perhaps other, more appropriate lies need to be told, different 'design lies' than the freely-available base map design lies. The concept of "one shoe fits all" cannot work in all geo-depiction cases.

4. WEB 2.0 AND MOBILE DEVICES

This problem is increased when mobile devices are used. Their small-screen information displays demand innovative, customised designs so as to best communicate geospatial information via maps. If 'just' Web-delivered base maps are employed, perhaps by naive producer/consumers then inappropriate depictions of geography will result.

Take for example the mapping product delivered via the Blackberry J2ME in figure 1. Here, a

Google map has been used as the base map for more information. It cannot be assumed that maps that work on desktop screens can be just imported into mobile formats and work immediately.

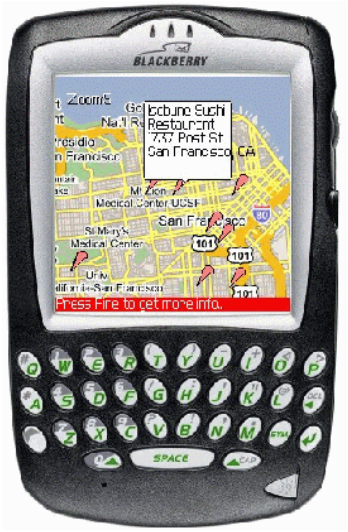

Fig. 1 - Google Maps and the Blackberry J2ME. Source: http://research.techkwondo.com/project_idiom/cartography/collaborative_cartography

Does the way of 'seeing' influence the way of knowing? What is the most appropriate pedagogy for using generic base maps for providing 'overprinted' visualizations to assist users to understand geography or to wayfind? How do humans learn about geographical information, and how does this learning vary as a function of the medium through which it occurs (direct experience, maps, descriptions, virtual systems, etc.)? Products like Google Maps, Google Earth et al. (here I have bundled both maps and imagery together as usable foundation data sources) only provide one viewpoint of geography – through their map.

5. PROBLEMS BEYOND THE MAP BASE

The Web provided cartography with a new method for disseminating maps. Early Web mapping packages were delivered as either .GIF or .JPG images - a low-resolution counterpart to printed maps. As the focus on early Web mapping was on speed, some of these early Web-delivered maps mirrored the graphics produced by early computer systems. Alternatively, the maps provided were only scanned paper map collections. Later, maps were made available via large databases and on-demand images were composed server-side and then delivered to the map user. Using the Web for map publishing meant that the cartographic industry could publish world-wide without the mass replication costs of paper. Quality was adjudged by speed of delivery, circulation figures and screen resolution. Quality was gauged by how the 'rules' of computers and communications systems were applied. Users were still seen as consumers, and not collaborators in geographical knowledge acquisition.

The use of Web2.0 as a means for providing geographical information presents different problems for assuring quality. Problems might arise with a conglomerate product related to 'self-constructed' Web 2.0 products. To guarantee quality and assured, concise information a number of questions arise:

- Who takes 'ownership / custodianship of the product?
- Who guarantees the quality /integrity of the product?
- Who maintains the product?

6. PROBLEMS FROM SOURCING THE MAP BASE

Crawford (2006) wrote that computers are being used differently illustrates a shift from the conventional publishing model. She writes: "But what has changed over the past 15 years is that they (the users) no longer represent the only way to produce and distribute creative work. As computing power has become more affordable and software has become more powerful, the creative potential of what can be done at home – and at relatively low cost – has soared. And there has been an explosion of creative production as a response. It has been described as "mass amateurisation": the masses now have greater access to the means of cultural production. We are witnessing a crucial shift as the gap narrows between what can be done at home and what is professionally produced; amateur productions take on professional approaches and professional productions make use of the amateur aesthetic." (Crawford, 2006, p. 23). She goes on to say: Everyone is making something, collaborating on something or distributing something. It doesn't matter if it's a zine, a new media installation, a piece of software, an album, a short film or a photo blog" (Crawford, 2006, p. 23).

But – the maps are still conventional mapping products, from a design perspective. In many cases the innovative use of social software and the Web has not produced innovative products, just conventional maps. And, in many cases these maps are naive design outputs.

A number of problems related to using desktop-focussed products on small devices arise when the larger-format maps are imported directly into small devices without any consideration about how they might NOT work on small screens. The problems are many, but the ones discussed in this paper are:

- 'New' cartographers ignoring design: map extent;
- Generic symbols being accepted, and unique symbol sets rarely designed and incorporated;

- Ignoring copyright;
- Privacy;
- Governmental influences;
- Commercial influences;
- Database graffiti;
- Ambush advertising;
- Data manipulation; and
- Custodianship of data.

The provision of additional graphical information to illustrate the actual extent of map coverage is ignored in many applications. Typical of this is the *Google* Maps application built for the Apple *i-Pod*. Only individual maps are displayed, and the user has to scroll the map set using the standard *i-Pod* method. No overview maps are provided.

Fig. 2 - Maps for the *i-Pod.* Source: http://ipastudio.com/photopost/uploads/1/maps_news-.jpg

When viewing the numerous maps produce with generic base maps, it becomes immediately apparent that the symbol sets used are usually the default symbol set. Very rarely are unique symbols used (figure 3). When unique symbols are generated they are so poorly placed that they become meaningless. Figure 4, from the New York Times travel Web page (figure 4) is an example of this. The problem is compounded when a satellite image is used in place of the map base (figure 5).

Fig. 3 - Default symbols.

Fig.4 - Symbology from the *New York Times* travel Web page.

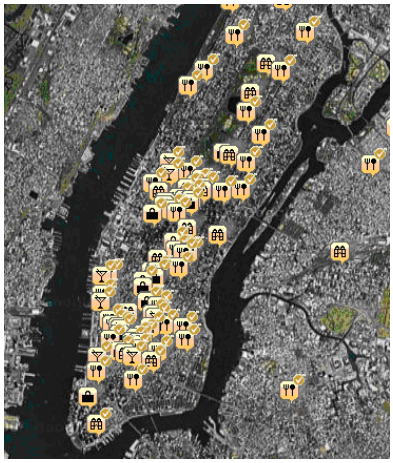

Fig. 5 - *New York Times* travel Web page with satellite image.

Copyright is an essential way in which map designers and producers can protect their rights. In some instances products delivered for small devices have ignore copyright altogether. Take for example the

Web site http://www.ipodsubwaymaps.com that provides subway maps for the I-Pod. It provide most maps for free download by accepting maps that had been scanned and tiled by interested individuals, in some cases with no copyright agreements in place at all. The examples from the London Underground maps set shown in figures 6 and 7 were the subject of litigation by London Transport. Since this litigation was resolve the maps are again available for download and the relevant copyright clearances are in place. However, this is an example about how 'new cartography' can ignore rules and regulations that guide 'mainstream' publishing.

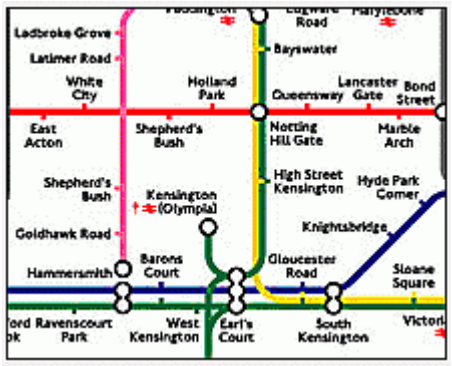

Fig. 6 - A tile from the London Underground map. Source: http://www.ipodsubwaymaps.com.

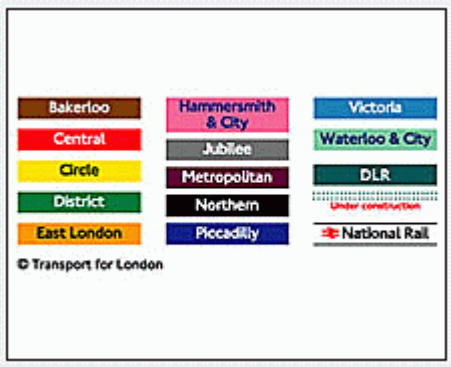

Fig. 7 - Map legend – also scanned and tiled.

Privacy is a problem when using the Web generally (Cartwright, 2004), and it is no different when Web 2.0is use. Take for example Gmail, provided by Google. Users are provided with an almost unlimited storage space via the Web, plus the use of the Google search engine. But, there are some privacy concerns with this service, as Google stores the contents of all email messages, outgoing and incoming. For two years and detailed personal data is contained in 'cookies'. Also, Microsoft and Yahoo, kept data indefinitely. Investigations into Google was undertaken by Britain's Information Commissioner, the EU and Norway's privacy enforcer, Datatilsynet (Waterfield, 2007).

Governmental influences can affect the availability of Web 2.0-delivered information. In early 2007 the Government of China blocked photo sharing on Flickr, the photo sharing Web site, after photographs of Tiananmen Square were uploaded to the site (The Age, 2007b). If mobile devices relied on the availability of Web-provisioned base maps to function, then similar 'blockages' would render them useless.

Commercial influences in the provision of geospatial information databases do dictate the actual image available for user/producers to access. However, these are commercial sites and advertising, location-based advertising, is the underpinning reason that the sites have been built in the first place. The consumers of mapping products need to detail with intrusive advertising, like the advertising for the Safeway Food & Drug store that forms part of the image from Google Earth, shown in figure 8. The PLUS version of Google Earth has the option to "Disable onscreen advertising, a feature that is not available in the free version. With the limited screen 'real estate' on small devices, the actual area available for geospatial information provision will be compromised.

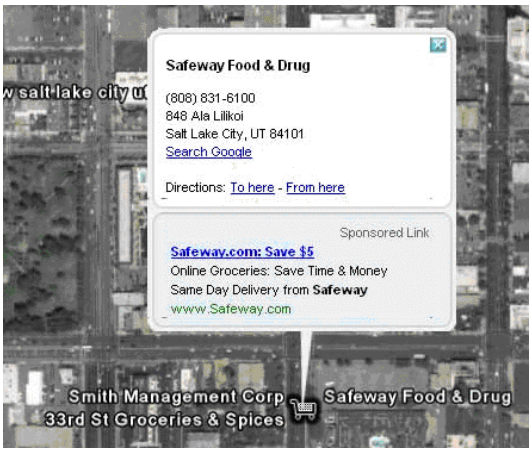

Fig. 8 - Commercial interests as advertising on the *Google Earth* site.

Database 'graffiti' is what I call imagery available from geospatial information sites that have had graffiti made by individuals and commercial enterprises to use the imagery captured by satellite systems and displayed on imagery Web sites. These images are then 'degraded' by the graffiti, like that shown in the image in figure 9. However, this graffiti does exist in reality and should be shown if a faithful representation of what exists on the Earth is to be provided. But, what happens when offensive graffiti is captured and available for use? Should this be shown as part of a mapping application?

Fig. 9 - Database graffiti on an image database.

'Ambush' advertising is the situation where advertising takes hold of the accessibility of satellite imagery on Web sites and uses it to deliver advertising content. The example shown in figure 10 is the 75-by-110-foot billboard that was spread over the ground in a desert location outside Las Vegas in the USA to promote the Maxim magazine's cover for its 100th issue. It featured swimsuit model Eva Longoria (cNetnews.com, 2007). This was a joint effort between Maxim and the City of Los Vegas. The magazine cover was printed onto a vinyl mesh windscreen and then assembled it the ground using stakes and 2 airline cable. A large reproduction of the cover was clearly visible from satellites (note the truck at the bottom of the image to appreciate the scale of the painted cover image). Again, the image exists and it needs to be included in any faithful representation. But the mapping package, if it relies on underpinning satellite imagery upon which to add additional geospatial information, will also include advertising.

Fig. 10 - Ambush advertising and Maxim magazine cover painted on the ground. Source: Google Earth.

Data 'manipulation' is something that undermines the integrity of geospatial information. But what happens when non-current information is substituted for current information. Figure 11 shows the Google Earth image of New Orleans pre Hurricane Katrina. It is provided post Katrina and thus dis-informs.

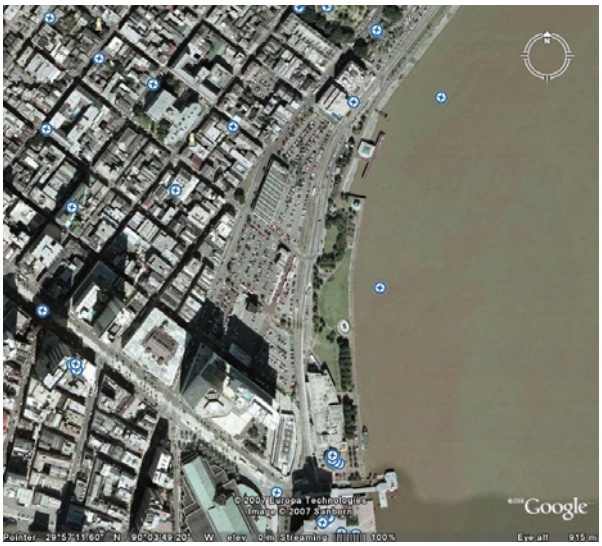

Fig. 11 - Google Earth image of New Orleans. Image is delivered post Hurricane Katrina, but is in fact a pre-Katrina image. Source: The Age, 2007[a]

Fairly recently the custodianship of much data accessed by the user/producers has moved from the government sector to the private sector. This choice of data provider by user/producers has, in many cases, been influenced by the fact that the data is free. However, maps produce by user/producers using free Web-provisioned databases generally comes with a proviso that maps produced can only be stored and then provisioned via the data provider's Web site. The user/producer may be unable to build stand-alone individual sites. This may compromise the quality of visualizations if advertising becomes part of the map visualization or the database provider invokes a later 'pay-per-view' policy.

For conventional cartographic products assurances of database integrity and availability are provided by 'mainstream' cartography. A major issue if self-composed products are to be accepted with confidence might well be quality assurance. Therefore, methods would need to be developed for assuring quality with conglomerate products, assuring quality with user-produced products and a means for informing users about the source of conglomerate information resources.

7. ENHANCING LOCATIONAL INFORMATION: WEB 2.0, LBS AND BEING THERE

What Web 2.0 offers is the ability to make maps more affective (Cartwright et al., 2007). Additional 'at location' information can be provided that allows users to obtain additional information and

thus better understand what it would be like to 'be there'. That is, what it would be like to be in a place before one actually arrived at a particular location. This has been previously addressed under the 'umbrella' of "Emotional Landmarks" by Oakley and Gartner (2005).

Being there is the basic premise of using maps and other (geo)visualization artefacts is to build mental models of reality. This evokes the image of 'Being There', without (actually) being there (a concept developed in the late Peter Sellers's film Being There). Historically, maps have been used to provide information to users about places recently discovered or voyages completed to unknown worlds or hitherto seemingly impossible journeys. Maps were believed by Ptolemy, to be the means to "exhibit to human understanding … the earth through a portrait" (Crane, 2003, p. 33).

"Where am I? Where am I really?"

Information and access to information is now an important commodity and an every-day need. As information is now stored digitally, we have a love/hate relationship with the systems that store our information, but control us with the same information. Our very existence, and the proof that we do exist rely on the integrity of digital data repositories that store information about us. To illustrate the importance of digitally stored data to achieving our daily goals the movie The Net (starring Sandra Bullock) illustrated how we rely on this information to prove who we are and to determine what we are allowed to do and the things that we can access. In the movie her (digital) identity is stolen by removing her personal digital data. It proved to be impossible to establish who she was and what she owned or had access to. So, if we now rely solely on digital data and digital information, what is the proof of reality and, if we view these realities from different viewpoints, or via certain restricted access methods, are there different views of reality? Perhaps the way that we choose, or are allowed to view/access information and data changes the reality?

What is real? In many cases when popular, generic geo-media are used as information resources a 'warped' reality may be presented. Here, the inappropriate choice of a particular product by a naive user/producer can provide almost immediate results, and results directly usable by the user/producer. But, can these, perhaps imprecise, depictions of geography be used by all? Problems of interpreting reality when imprecise or wrong data displays may not be confronted at all if no experienced cartographer is involved in the map production and delivery process.

8. CONCLUSION

The production of maps and their related usage developed from the need to record the location of geo-spatial phenomena as icons on some permanent material. Using maps, and map related objects, delivered using contemporary communication systems is one matter. With the popular use of Web 2.0 and Social Software users become producers and producers become users.

A number of issues that need to be addressed if proper generation of user/producer provided maps are to be made on mobile devices when foundation mapping depends upon the free provision by popular providers. Research is needed to ensure that the use of such base mapping delivers appropriate and usable mapping tools. These tools must be built on base mapping that has integrity, currency and is usable on small-format mobile devices.

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