

INTERACTIVE MAPS FOR (LOCAL OR WEB BASED) PRESENTATION OF GEO-DATA

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ABSTRACT:

Maps have become common on the Internet. One year ago the number of maps, displayed or consulted through the web estimated was 200.000.000 per day (Peterson, 2001)! Google's Search images engine delivered a harvest of 548.000 (static) maps! (van den Worm, 2002). Most web maps have not been displayed on special request of the web user but just appear on the screen as an integrated part of a specific site (van Elzakker, 2001). When trying to classify web map-designers, there may be four main groups distinguishable: hobbyists, professional graphic and website designers, GIS users and Cartographers (with or without web map design experience). Web graphics, such as maps, are distributed through the web in raster or vector format. Referring to the applied file-format it is an interesting question whether there is a relationship between the designers of web maps and the applied file format. Despite their numerous advantages, vector-based maps (such as those stored in SVG or Flash format) are still scarce on the web and mostly designed nor by GIS-users nor by cartographers. This paper concentrates on some of the most obvious advantages of vector-based web maps for the presentation of geo-data.

1.1 INTRODUCTION

Maps have become common on the Internet. Peterson (2001) estimated one year ago the number of maps, displayed or consulted through the web at 200.000.000 per day! In April 2002, I used Google's Search images engine to search for static map images available on the web and came to a harvest of 548.000 maps!

To put this number in a perspective, the subject "Cars" came up to a number of 205,000! An amazingly low number compared to the relative high popularity of this subject on the web. We may assume that most web maps are not displayed on special request of the web user but just appear on the screen as an integrated part of a site. The number of web users who is seriously in maps interested, and who want to use the maps for exploratory purposes might be limited compared to those who just accidentally find maps on the sites they are visiting. For instance typing in the name of a small lodge somewhere even in still rather under-developed regions such as in Nepal, may be sufficient to encounter a small-scale (hand-drawn) map fragment, scanned by the lodge owner's good-willing neighbour or friend, indicating the location of the lodge. (Figure 1)

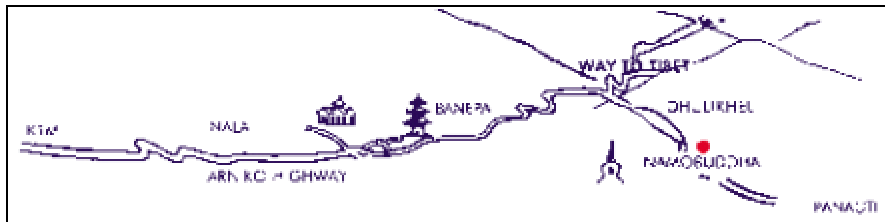


Figure 1: Location map Dulikhel Lodge Resort (URL 1)

Trying to find well-designed, appealing and functional maps on the web will soon reveal to you that there are more good-willing neighbours and friends as talented web map designers!

1.2 Web map designers:

Designers-designers can be categorized into 4 classes: hobbyists, professional graphic and web site designers, GIS users and cartographers with or without web map design experience. Hobbyists are the ones designing and constructing at home their own homepage as a personal, free-time leisure activity. Enthusiastically they use their just purchased low-cost scanner to include photo's and maps into their page not bothered by the idea that by doing so, they are in fact violating international copyright laws! Hobbyists are by the way, not only working at home. Also, in the offices of many organizations and commercial companies, they are trying to reduce their director's investments in the Internet business. Therefore, you will find multiple samples of such scanned maps even on many official governmental or company sites! Driven by enthusiasm, many hours are spent in the family room with a wide variety of low-cost or free and shareware software and as a result we can sometimes find wonderful web maps on the sites produced by this group! The next group of web maps are placed on the web by professional website builders or graphic designers working as free-lancers or at advertising and web design studios. These maps are based upon a thorough knowledge of web media and software tools. This combined with a graphic arts education and creative talent leads to maps, which often are very attractive to look at. However, the maps are not always as functional as should be because the designers lack the necessary knowledge of (cartographic) visualization principles. One other characteristic of these types of maps is that most of these maps are not GIS-based, with other words: the maps are stand-alone products not linked to a GIS database. Despite these shortcomings, many of these studios do work for governmental and semi-governmental organizations. More and more these organizations receive requests either from higher authorities or from the public to make their GIS data available through the web. High web graphics quality, inter-action, dynamics and intuitive user-interfaces are keywords as they are supposed to reflect the quality of the data sets and the customer-oriented engagement of the involved organization. (Figure 2 and 3).



Figure 2: Risk Management Map of the Province of Friesland, The Netherlands Netherlands
(URL 2)



Figure 3: Risk Management Map of the Province of Noord-Brabant, The Netherlands
(URL 3)

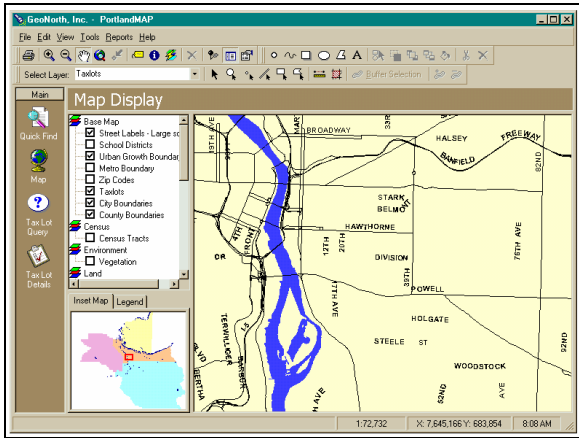


Figure 4: Population Census base map of Portland (USA)

© GeoNorth, (URL4)

Web maps, in “real time” displayed on the screen by the use of a GIS data web viewer are more often the products of GIS users. Not bothered by a overdose of cartographic knowledge they fully rely on the visualization tools and the technological options as offered by the applied data viewing and GIS software. Examples of this type of web map generation are the numerous routeplanners that can be found on the web but more and more web map oriented websites are applied to inform the public on for instance environmental issues. The communicative and functional quality of these maps varies from very poor till very good. (Figure 4 and 5)

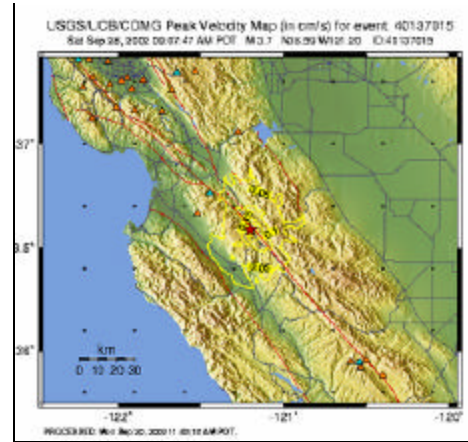


Figure 5: Earth Quake Peak Velocity map

(URL 5)

The last group of web maps are those designed by cartographers. Cartographers are professionals, engaged in the design and production of a wide variety of map products, based upon a mixture of thorough cartographic visualization knowledge and practical experience. Maps placed on to the web by this group can be stand-alone products or maps generated from a GIS database. The results are a combination of cartographic craftsmanship and aesthetic talent. However, the difference between webmaps designed by cartographers with or without webmap design experience is expressed by content, readability and download time of the displayed map.

Cartographers love detail and based upon Bertin’s rules, they love to visualize as much as possible relationships between the map theme’s. It is a pity that receivers of this love for details are sometimes punished by long download times, and often, they are often not patient enough to wait until the map is displayed. Lack of webmap design experience and knowledge is expressed by maps showing too much detail, in-appropriate colour use, longer download time and in-appropriate file format. (Figure 6)



Figure 6: Clemson University campus map
Download time (56K modem): 159 sec (URL 6)

1.3 Relationship web maps file format and web designers:

It is an interesting question whether there is a relationship between applied graphics format of web maps and their designers. Web images can be stored in raster or in vector based graphic format. Raster based web maps are relative easy to generate by means of GIS software, by scanning existing paper maps or by drawing them in one the many graphic software packages such as Adobe Photoshop, PaintShop Pro, CorelPaint or Macromedia Fireworks. Raster based web maps can also be generated by means of graphic design packages such as Macromedia FreeHand, CorelDraw and Adobe Illustrator. In contradiction to this comfort, some major disadvantages can be mentioned. The most important one to be mentioned is the file-size of the most frequently applied graphic formats gif and jpg. Another limitation that can be mentioned is the monitor screen-resolution between 72 and 96 dpi. Zooming-in results in visible pixels, zooming-out results in disturbance of the raster-image. In most web maps no anti-aliasing techniques are applied or to much, resulting in a blurred, unsharp map-image. Only by offering the user a trickbox, he will get the impression that un-limited zooming is possible. By activating a specific map-area or object a hyperlink is created to another file containing a mapfragment at larger scale; this file is then downloaded to the user and displayed. This method, also referred to as 'static zooming' (Worm, van den 2001) is frequently applied by GIS based routeplanners and digital city plans. After the client has sent a request to the server, on the server-side a rasterbased map fragment is generated from a (often vector-based) dataset. This rasterfile is then sent to the client and displayed on the screen.

Is it because it is relative easy to generate raster-based web maps that this format is frequently applied by the hobbyists, the GIS users and the cartographers without webmap design experience?

Despite their numerous advantages, vector-based maps (such as those stored in Scalable Vector Graphics or Flash format) are more scarce on the web. Among the most obvious advantages can be mentioned: un-limited zooming without loss of image quality, the possibility to include in the same file as well vector as raster based map objects and extreme small file-sizes compared to raster-based maps with a similar content. However, the biggest advantage that can be mentioned is the extensive capacity to include inter-activity and dynamics (Figure 7 and 8).



Figure 7: Inter-active Hotel location map, Enschede The Netherlands, (URL 7)

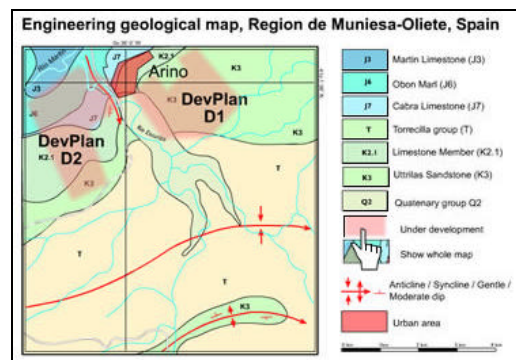


Figure 8: Inter-active Engineering Geological map, Muniesa-Oliete, Spain. (URL 8)

Of course there also disadvantages to be mentioned. Internet user using an older browser version must first download the necessary plugins, while also the users of newer browser version are sometimes confronted with the necessity to update the available plug-in. (Macromedia, developer of Flash, claims that 97.8% of the Internet users does have the necessary Flash viewer plug-in installed, availability of SVG-viewer plug-ins not known). The map designer must not only be aware of typical cartographic and webdesign related issues, but to be able to fully exploit the available tools and options in vector based web graphics design software (such as Macromedia Flash and Adobe Live-Motion), he must also have knowledge of Flash Action Scripting or XML programming language.

Flash and Live-Motion are widely applied by graphic and website designers, and as such it is not surprising that many of the vector-based maps on the web are produced by this group. Sniffing around the web will result in a collection of some remarkable, aesthetically appealing maps loaded with interactive, animated and dynamic elements. Despite those elements however, they are not all as functional as they should, as the designers lack knowledge of cartographic visualization principles. The de-facto software applied to produce vector-based webmaps is Macromedia Flash. This software is often combined with Adobe Photoshop or Macromedia Fireworks, to prepare raster-based objects to be included in the map. A disadvantage of both software packages is that although a database link can be realized to create dynamic sites, a direct link with a GIS database to update map content on demand is still a cumbersome job to accomplish, although for instance many GIS based routeplanners are applying this technology. Also the direct import of GIS based maps whilst maintaining their geographical coordinates and attribute data is not possible (yet). However, many vector based webmaps are perfectly performing well without such link. The portrayed theme might be subject of such minor changes or the database contains so little information that it is not feasible from an economical point of view to establish and maintain such a link. (Figures 9 and 10). What distinguishes SVG from Flash, is that it is a W3 recommendation (i.e. a standard for all intents and purposes) and that it is XML-based as opposed to a closed binary format. Because of its open source character, this format is interesting for GIS users; it enables developers and (web site) designers to create dynamically generated and queriable high-quality maps using real-time GIS data while maintaining structural and visual control. Its only disadvantage that can be mentioned at this moment is the relative long download time of SVG maps compared to similar maps created in Flash.

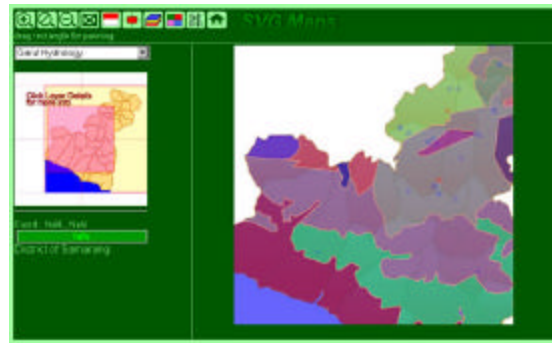


Figure 9: (Flash based) Evolutionary Infrastructure Hydrology web map, Great Bay map, Boston, USA, University of Virginia, USA (URL 9)
 Figure 10: (SVG based, queriable) Garut web map, Indonesia (URL 10)

2.1 Reflection of these developments in the Geo Information Production division (ITC) course program.

Based upon what is said before you may conclude that the ideal webmap designer should be a hybrid of a programmer, a webdesigner, a multi-media specialist, a GUI designer, GIS expert and cartographer. Living among and living of all GIS and web-design developments it is impossible for a training institute such as ITC, to keep away from these developments and we try our best during our training programs, to create such hybrids!!

In the GIP course programs students are trained to produce webmaps by two main production streams: 1) by a combination of ArcInfo, ArcMap and ArcIMS software and 2) by a combination of ArcView, Macromedia Freehand/Avenza Mapublisher and Macromedia Flash software. This second combination can also be selected by students from other disciplines in the form of an Elective of three weeks duration. Both combinations are supported by practical exercises in cartographic visualization principles and graphic user interfaces. Exercises are based upon a set of what is called: "Webmap Flash Goodies". This includes the creation of options such as: switching on-off map layers, zooming, legend options (inter-active, pop-up, pulldown) and toggle buttons, (map) animations, layer and object transparency, fading options applicable to map objects or themes, hyperlinks, inclusion of sound and movies, database linking, system independent map output and map and web site dissemination. This set of

goodies enables the design and production of almost any type of webmap. More recent the first activities have been started up to include also SVG and XML training into the course program. SVG is recognized as an important format, accepted by the World Wide Web Consortium and the International Open GIS Consortium and therefore cannot be omitted.

3.0 Conclusion:

Maps on the web have become common in a very short time. Web maps can be static or dynamic. They can be further divided into view only or inter-active (Kraak, Brown, 2001). Web maps can be published onto the web in raster or vector based format. The two most important file standards of today are Flash and SVG. Flash has become the world-wide standard of vector based web (map) images. SVG, selected by the World Wide Web Consortium can turn XML into data-rich vector/raster images or interfaces. Also recognized by the International GIS Consortium as web standard, it has a promising future!

References from books:

Kraak, M.J. and Brown, A. Web Cartography: Developments and Prospects, pp. 3 – 6, pp. 87 – 95. Taylor & Francis, London, UK, 2001.

Brown, A. and Feringa, W. Colour basics for GIS users, pp 103-104

Other references:

Neumann, A. and Winter, A.M. Time for SVG¹ Towards high quality inter-active web maps, URL http://www.carto.net/papers/svg/articles/paper_icc_congress_china_200.pdf

URL's:

URL 1: <http://www.dulikhellodgeresort.com>

URL 2: <http://www.friesland.nl>

URL 3: <http://risicokaart.limburg.nl>

URL 4: <http://www.geonorth.com/products/citymap/>

URL 5: <http://quake.wr.usgs.gov/recent/shaking.html>

URL 6: <http://www.clemson.edu/welcome/campmap/campmaps/map.jpg>

URL 7: http://www.kartografie.nl/nvk/studiedagen/verblijf_hotel.htm

URL 8: http://www.itc.nl/personal/worm/soc_2002/geomap

URL 9: <http://www.iath.virginia.edu/backbay/fenssite/html/maps/>

URL 10: <http://www.mycgiserver.com.mapbrow.html>