

Geospatial Web Interfaces, Why Are They So “Complicated”?

Erick López-Ornelas, Rocío Abascal-Mena, and J. Sergio Zepeda-Hernández

Information Technology Department,
Universidad Autónoma Metropolitana – Cuajimalpa, México
{elopez, mabascal, jzepeda}@correo.cua.uam.mx

Abstract. The usability evaluation is an important element of human computer interaction. The usability which translates to ease of use is the feature that all user interfaces should have. The geospatial interfaces should then follow the basic rules of usability. In this paper, we conducted a series of usability tests for some geospatial interfaces. These interfaces were designed for local users, for example INEGI or Guía Roji in the Mexican context. The results reveal the lack of usability guidelines user testing to be performed in the cases for this type of interfaces.

Keywords: geospatial interfaces, usability evaluation, GeoWeb applications.

1 Introduction

User interfaces for geospatial information are the tools by which users interact with and explore that information. The provision of appropriate interface tools for exploiting the potential of contemporary geospatial visualization products is essential if they want to be used efficiently and effectively. This paper addresses some problems and some research challenges in geospatial interface development.

The use of geospatial information is increasing in real world applications and due to this; Geographic Information Systems (GIS) are a growing interest area for research nowadays. Today, these geographical applications are combined with the World Wide Web (WWW) to provide information to a lot of people, this is what we call GeoWeb. These applications have gained popularity. Through browsers, web-based geospatial applications can display maps with features like buildings, forests, roads and even traffic. Also, spatial data can be analyzed and large amounts of data can be viewed on small screens by zooming and panning the map. So having all the above features, effective GeoWeb applications should be designed in a way that they should be easy to use and understand for users. In addition to these interfaces, applications have to take into account geospatial development adapted to mobile devices, which currently has a wide applicability to smart phones.

Usability evaluation is becoming an important part of Interaction Design to find out the user’s needs and requirements. In this paper, different geospatial interfaces are evaluated to find out usability problems. The most important GeoWeb applications

has been studied like the digital map of INEGI (The National Institute of Statistic and Geography of Mexico, <http://www.inegi.org.mx/>), the Guía Roji (a cartography guide of Mexico, <http://www.guiaroji.com.mx/>), and the Mexico City map of tourism, (<http://www.mexicocity.gob.mx/mapas/>). These are the most important geospatial references in map generation and displaying in Mexico City. Some usability problems have been found in the different platforms (desktop, web and mobile). We will focus on usability problems on Web based geospatial applications. These problems are described in the next section.

2 GEOWEB Usability Problems

According to the well-known usability expert Jakob Nielsen, the ease of use in any web application is required to survive in the market, because if the product or application has problems with this usability, users will not get the results they want, and simply leave the website.

Usability means that people can use the product easily and can perform their task in expected time. Usability is defined in the ISO 9241 standard as “the effectiveness, efficiency, and satisfaction with which specified users achieve specified goals in particular environments” [1], [2]. So, the usability can be measured by different attributes like learnability, efficiency, effectiveness, utility, memorability, error tolerance and satisfaction [3].

In general, usability is an important issue concerning the web. If any website has problems like file downloading, no clear navigations or is not oriented towards the needs of the users, then users get frustrated and they will not use this website in future [4]. The interface of the website must be so simple that experienced and non experienced users can easily use it and fulfill their requirements with it. The users are only satisfied when they can achieve their goals in a successful and efficient way [5].

As web-based GIS (GeoWeb) applications are a combination of complex systems, its interfaces should be designed in a way that normal users can interact with it easily and can fulfill their requirements without problems [6].

Usability evaluation has methodologies that help to measure usability aspects in system interfaces and also identify the problems. During the interface design process, usability evaluation has an important role that includes interactive cycle of designing, prototyping and evaluating [6]. Usability evaluation methods play an important role in the designing of most GIS applications because usability aspects included in product design give credibility to company and customers are more satisfied with the products [7]. Map applications are nowadays used by many users who have less experience in using the geospatial data, so usability aspects give benefits to the users accessing internet based services which contain easy to use and attractive exploring functions. Usability thus has an important contribution in the development of successful web-based geographical applications. The evaluation is very important for GeoWeb application because many usability issues can be taken care of through usability testing [7], [8], [9].

In this paper, a usability study has been made with real users and some problems have been found. We grouped these problems into two categories: (1) user interfaces and (2) maps and mapping tools.

First impression is important when you visit a website. Despite this, there are a lot of problems related to the homepages as overhead information (images, advertising, and links). Also the map representation can be fundamental when you are accessing to one geospatial web page. For example the lonely planet homepage of Mexico City¹ shows a poor geospatial interface even though it has a lot of interesting information inside. (Figure 1 shows the first map shown in this page).

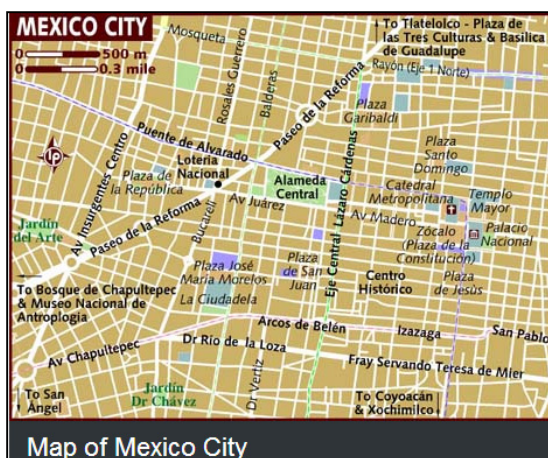


Fig. 1. The first impression of a map

Another example is the web page planetware², that is another good travel guide online that has a lot of interesting information but they doesn't exploit the mapping feature. They use photos, maps, and detailed descriptions of cities, towns, attractions, and activities, in countries around the world. But, when we want to search a map of Mexico City, what we get is a very poor representation of the map and the user normally rest frustrated when he want to interact with the map. In figure 2 we show the map interface that planetware shows.

A key element is to show your geospatial product straight away. Some geospatial Web applications don't exploit this feature. For example, the Mexican web page Guía Roji³, which shows a collection of maps of the country, normally has a good street detail and some and some places of interest. When the user open the web page he find a lot of publicity and normally he get disappointed about what he found on the page.

¹ <http://www.lonelyplanet.com/maps/north-america/mexico/mexico-city/>

² http://www.planetware.com/map/mexico-city-map-mex-mx298_e.htm

³ <http://www.guiaroji.com.mx/>

Also, the quality of maps is not well adapted. There is a lot of textual information (name of streets) that cannot be removed or manipulated by the user. This is a big problem because the map converts it unreadable. Figure 3 shows the map representation used in the Guía Roji.



Fig. 2. A bad representation of a map (planetware)

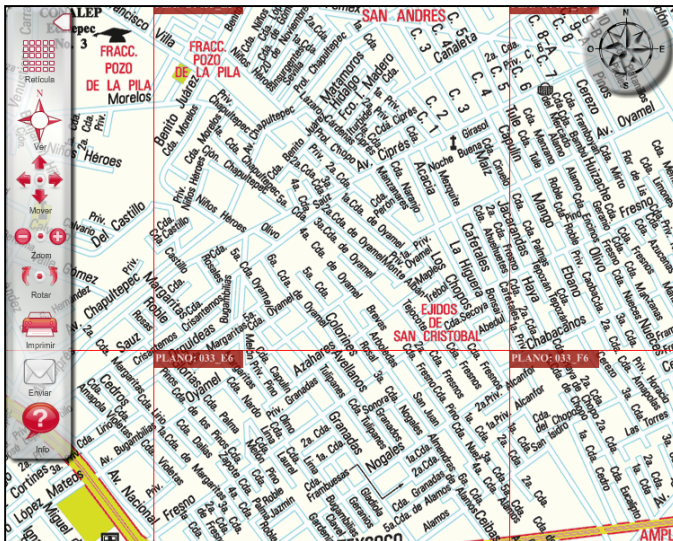


Fig. 3. Map representation of “Guía Roji”

Although the map should be the fundamental part on websites, some of them have a poor quality representation. Another major problem on websites is the information that a map can manage and display. While functionality is important and we always display large amounts of information, GeoWeb applications should always take care not to show more information than the user can process and analyze. This is the example of the Interactive map of INEGI⁴, which shows a lot of information but not understandable (fig. 4). This problem causes a lot of cognitive problems because the user cannot identify what he wants to analyze.

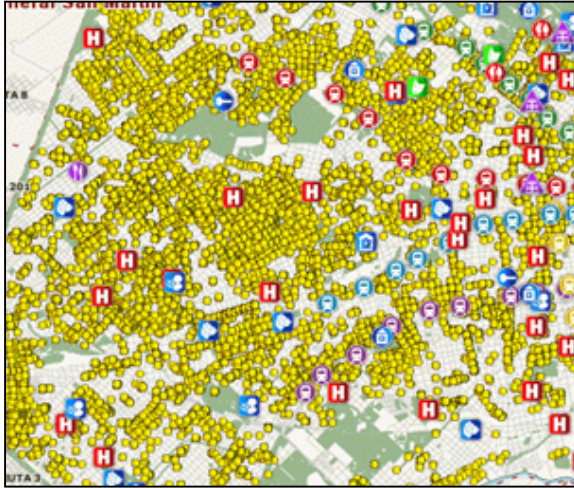


Fig. 4. Cognitive problems due to the large amount of information

Some other problems associated with the maps and mapping tools are the bad use of color, the bad categorization of the elements, the wrong location of the text to be used, the wrong use of symbols or even some movement problems (zoom). All these problems, associated to the map, should be taken into account to avoid major usability problems. One of the main problems in GeoWeb applications is that there is not a unification of the functionalities used. Besides the tools that the GeoWeb applications use, vary from one application to another. That’s the reason that the handling tools for the maps are so different. The tools used in the GeoWeb applications are hard to understand (many of them) and doesn’t have a basic study on usability and user interaction. This is a big problem because each application uses their own icons and does not allow a real standardization of tools, which could help the user significantly. For example in the interactive map of INEGI, tools used are very different and they are not intuitive for people who access to maps on first time (Fig 5).

⁴<http://gaia.inegi.org.mx/mdm5/viewer.html>

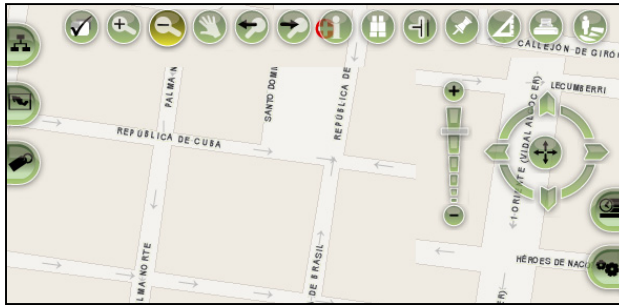


Fig. 5. A not well adapted geospatial interface

3 Conclusion

There exist a lot of usability problems on geospatial interfaces that were studied in this article. The problems found were classified into different categories according to the part of the site they belonged to. The purpose of the article is to explain the main reason of the difficulty that may have some users (especially non-experts) to manipulate and integrate these geospatial applications in their real life. Cartographic design is the key issue in the development of map sites, but the design should be reconsidered to guarantee the usability of interactive and dynamic map applications. So, the question: Why the geospatial web interfaces are they so complicated? can be answered by the lack of standards and lack of usability studies that geospatial interfaces should have. Also, some GeoWeb application can be more difficult to some users, especially the non-experts. This issue needs to be fixed by the ease of use conducted by some usability studies. Finally the context of users has to be analyzed. In these interfaces studied, the Mexican users needs to be studied in order to know their experiences, their abilities and their needs. Further work has to be focused on give some suggestions to these GeoWeb pages in order to improve usability issues.

References

1. Dragicevic, S.: The potential of Web-based GIS, vol. 6(2), pp. 79–81. Springer, Heidelberg (2004)
2. Haklay, M., Zafiri, A.: Usability engineering for GIS: Learning from a screenshot. *Cartographic Journal* 45(2), 87–97 (2008)
3. Ivory, M.Y., Hearst, M.A.: The state of the art in automating usability evaluation of user interfaces. *ACM Comput. Surv.* 33(4), 470–516 (2001)
4. Koua, E.L., Maceachren, A., Kraak, M.: Evaluating the usability of visualization methods in an exploratory geovisualization environment. *International Journal of Geographical Information Science* 20(4), 425 (2006)
5. Nivala, A., Tiina Sarjakoski, L., Sarjakoski, T.: Usability methods' familiarity among map application developers. *International Journal of Human Computer Studies* 65(9), 784–795 (2007)

6. Schimiguel, J.: Inspecting User Interface Quality in Web GIS Applications. In: GEOINFO 2004 Symposium on Geoinformatics, vol. 1, pp. 201–219 (2008)
7. You, M.: A usability evaluation of web map zoom and pan functions. *International Journal of Design* 1(1), 15 (2007)
8. Barnum, C.M.: *Usability testing and research*. Longman, New York (2002)
9. Haklay, M., Zafiri, A.: Usability engineering for GIS: Learning from a screenshot. *Cartographic Journal* 45(2), 87–97 (2008)