ETHICAL CONCERNS OF ONLINE GEOINFORMATION SERVICES

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Abstract:

With the new technologies that allow individual internet users the maximum freedom and flexibility to attach their own information to web maps, the developer-centered web map services have evolved into user-centered interactive map services. Thanks to the spatial data-sharing standard of Open Geospatial Consortium (OGC), some companies such as Google and Yahoo Map have developed easy-to-use mapping platforms for users to add and update information or publish their new map services. In this sense, mapping services have stepped into the everyday life of internet users. However such services can be intentionally or unintentionally misused. Currently, the interactive map services are not yet capable of tracing and controlling the input and behavior of internet users. Ethical problems may occur to the uploaded photos or comments as long as they contain privacy information about the third party. This paper focuses on the interactive map services and the associated ethical problems. Based on cases studies in Munich area, the paper analyzes the contents provided by anonymous internet users. The ethical problems embedded in online spatial information services are categorized and their (potential) seriousness is indicated. Finally, the authors give some suggestions to alleviate the negative influences of ethical problems on users.

Keywords: Ethical issue, Privacy information, Interactive map service, Data quality, Visualization.

1 Introduction

The new epoch of spatial information service arrives in our daily life confidentially whether you like it or not. Google has been offering Street View since 2007, with this platform users can navigate around buildings or scenic spots in different views. Information about the past or present state of a visited site is also available. Furthermore, users are allowed to add new information on the web map or publish their own web services. These new web-based services bring us convenience and trouble as

well, especially when the published spatial information includes some private information about the third. The trend towards the interactive map services will become more predominant. Along with the easier access to the services, searching expenses for useful information will inevitably increase. Fig.1 shows two screen shots with geo-tagged photos on Google Maps in Munich, the overlay with cluttered symbols and photos of various sizes has substantially reduced the legibility of the underlying map. Users may have to spend large workload for finding something meaningful at all.
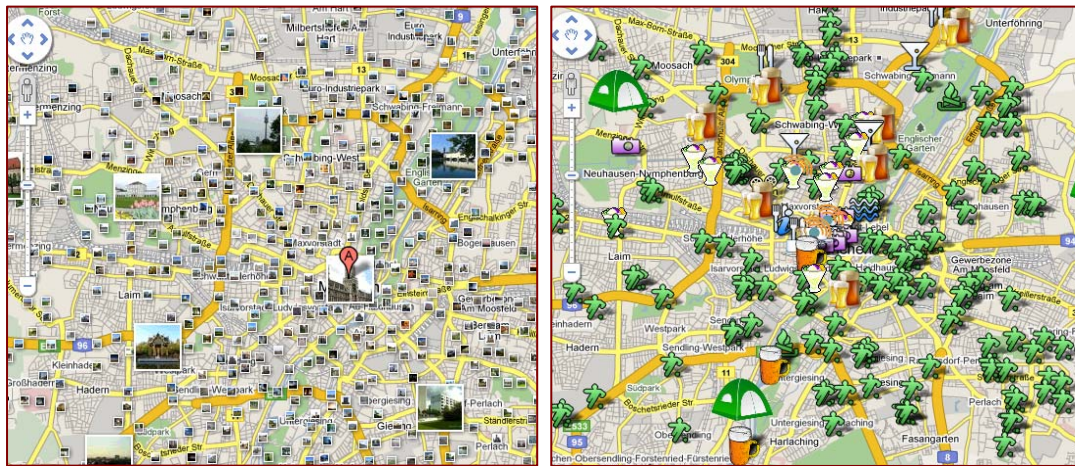

Figure1. Two screenshots with geo-tagged photos on Google Maps (left: photo features on Google map, right: user-created symbols on Google map)

A more critical issue is that there is not yet a good control to the uploaded image or information. The debate about privacy and ethics has come to national level and some countries have already enacted new laws to deal with such kind of problems (Sayer, 2008; Meller, 2008; Rosencrance, 2008). As data protection officials report throughout Germany have received more than 300 complaints over the collection of images for Street View (Kirk, 2009)

This paper focuses on the ethical problems for online spatial information services. More specifically, we discuss the ethical problems related to interactive map services ranging from data acquisition, map generation to service rendering. In section 2, we introduce the related research in GIS domain and point out two kinds of ethical issues. The third section is dedicated to case studies, exploring in Google maps around Munich the amount of information subjected to ethical problems. Based on the content analysis, we discuss in section 4 how to circumvent the detected ethical problems and conclude our findings in section 5.

2 Ethical issues and challenges of online spatial information services

2.1 Ethics in GIS

Ethics are the rules of right and wrong behavior, Baase (2003) deem that ethics is the

study of "doing the right thing". Ethics are associated with morals and laws. However morals are the value judgments that are applied to behavior; Ethics are a set of principles or standards, they produce moral beliefs and actions, perhaps they can be thought of as the 'theory' that informs the 'moral practice'. Laws have penalties ability. Those who do not obey the law will be punished. Ethics, however, are based on principles and values. In reality, there is no global punishment for ethics violation.

Ethics of GIS remain uncertain (Crampton 2007), even though many researchers have already reported their ethical concerns of tradition maps. Haque (2003) summarized the sources of ethical misconduct in three categories: technical incompetence, misinterpretation of the real world phenomenon and the data quality, Boulos (2004) discussed that associated with internet GIS and Web Maps progresses, there are ethical issues of GIS and data confidentiality/individual privacy, and even national security starts to surface and call for further examination of and research into them. Cramton (2007) also argue that besides for "professional ethics," such as using timely data, acknowledging copyrights and creating good metadata, fairness is also an important ethical issue. In other side because Geographic information systems are so new that they lack common standards of practice ,technical standards such as building codes to simplified the ethical of technical decisions, about GIS code, Blakemore and Longhorn (2004) gave ten commandments of GIS ethics.

2.2 Ethical issues challenge for spatial information services

New technologies provide users with more capabilities to deal with the spatial information via internet. With tools such as map mashups, the traditional map can be connected with other information such as image, video, text and so on, most important, users can update the information or overlay their own information on the map using Web Map Service (WMS) developed by the OGC in 1999.

This means, maps have evolved to interactive map services which offer more than just spatial information. Users can access the past or present special information and give their personal opinions. Interactive map services have lots of internet users and more users will choose this new technique in near future because of the following three advantages:

(1) Interactive map services are easy to access for the individual internet users. Usually, large companies or research institutes such as Google and NOAA's National Geophysical Data Center provide the basic map information. Users can easily publish his new information on the base map or get linked with other interesting websites. In this sense, interactive map services are an open-ended portal for all the internet users.
(2) Interactive map services have extended the functions of traditional maps. To the same point of interest, lots of users can add their information from different views or different times. This kind of information is often most interesting for internet users.

(3) Interactive map services help to distribute the opinions of the providers. Since users can provide their own spatial information and allow other users to share it by simply clicking the underlying object, they feel triumphant when their information can attract more traffic to their links.

Nevertheless, concerns of ethical issues about the added information come along with the widespread of interactive map services. Debates and discussions about the privacy of street view features of Google map is a typical example (Mills, 2007; James, 2007; Waters, 2008). How to control the ethical issues for internet users is a challenge for providers of spatial services. Here are some key terms that cartographers and GIS professionals need to know: (a) Privacy: it is the ability of individuals to control personal information that is not knowable from their public presentations of themselves; (b) Confidentiality: It involves an agreement to share personal information for a limited purpose; (c) Identity: It is description about a unique individual in a database; (d) Harm: It is a negative consequence resulting from a breach of confidentiality. Obermeyer(2009) suggests that crash courses, self-teaching using manuals and tutorials will change the status. For spatial services the users are anonymous and optional, therefore, it is a challenge for cartographers to develop a concept which should reach its target groups and tell them what is right.

Another challenge is about misrepresentations or biases of online spatial services. According to Friedman and Nissenbaum (1996), biases seem to be inherent in every information system and they have classified biases into three types: preexisting, technical, and emergent. A bias can arise before data are added to a computer system and can also after an information system is in use, a bias could be intentional or unintentional. For example, a small computer screen has limited space to display information in a proper style; this can be regarded as a technical bias.

3 Case studies on ethical issues of interactive maps services

In order to find what kinds of ethical issues there are and how they are related to users' life, we designed three tests for Munich area on Google Maps, which is one of the most widespread map platforms that allow internet users to add their information and provide users with tools to integrate local data and publish it as map services officially or privately. One test aims to find the typical map-related ethical issues from the geo-tagged photos, and other two explore the comments displayed on Google map from Wikipedia.org and from users themselves.

(1) Geo-tagged photos
Table 1 summarizes the result of 1105 geo-tagged photos of Munich in the corresponding Google map. These photos are categorized in 10 groups.

ID	Category	Photo No.	Content in photos	Number of problematic photos
1	Nature or street sight	328	Nature, street, weather such as burning sky, night of Munich…	0
2	Sport	184	sport station, skate place or club, audit amusement such as Allianz-Arena	0
3	Man-made sight	174	castle, church, monument such as Nymphenburg Palace and so on	2
4	Building	123	Tower, bridge, villa, congress hall, supermarket	1
5	Garden	77	Garden, park, small river, lake, canal	1
6	Transport	60	Public transport, old car or rail, parking Garage	0
7	Residence	54	Public residence, private house	0
8	Enterprise	32	industrial architecture, university/school, construction place	0
9	Restaurant	12	Restaurant, beer house, fast food, café	0
10	Miscellaneous	17	flower, bird symbol, terrain, people in the park /shop center, people on road	1
Sum:		1105	**Sum:**	5

Table1. Geo-tagged photos on the Google Map of Munich area

2 photos include somewhat sensitive personal information, with one showing a figure of a clearly identifiable person and the other showing many people around adult amusement buildings. 5 photos are wrongly entitled. Some photos reveal low quality. So ratio of the problem photos lies about 0.45% in our test area due to the information quality.

(2) Comments from Wikipedia in Google Map

Comments, especially, the individual opinions can also lead to ethical problems. And it is more difficult to control comments in the internet. The Wikipedia contents of our test area cover about 160 items. As illustrated in Fig. 2, large buildings, museums, transport and entertaining places in downtown seem to be more interesting for the internet users than other categories. Since each Wikipedia article comes from the wikipedia by a third party, Google map simply displays the facts, not the expression of subjective opinions about the subject matter. One Wikipedia article about military affairs we think may cause concerns in the national security system.
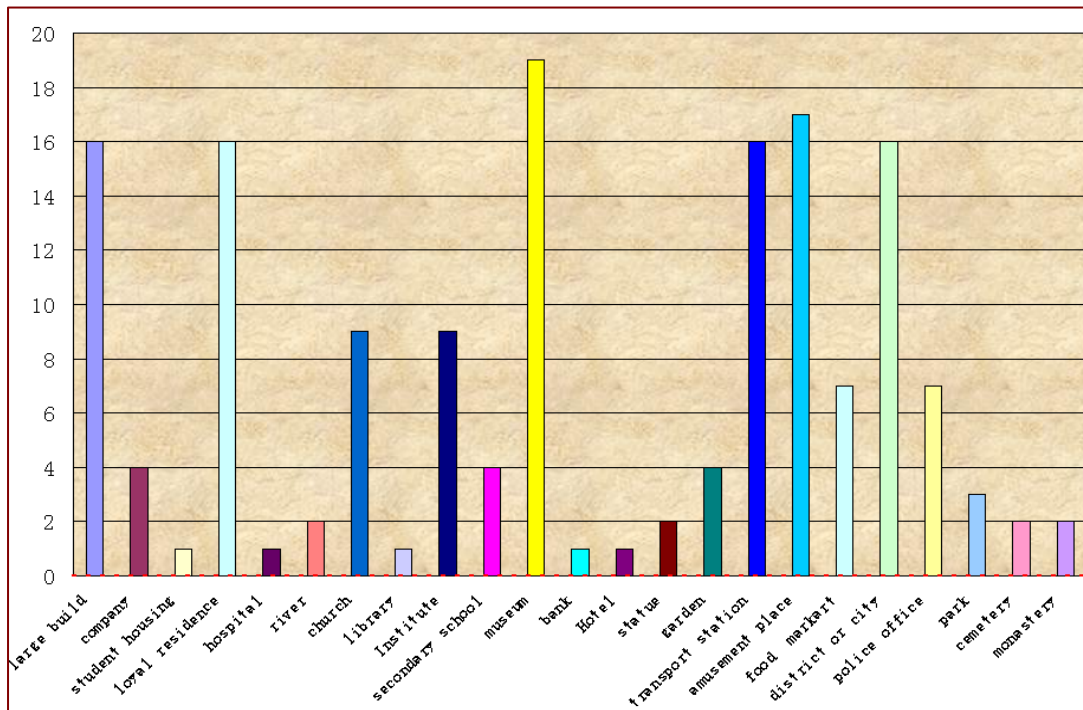
Figure 2. Comments from Google map and Wikipedia in test area

(3) User-created comments in Google Map

We have evaluated the objective and subjective comments from the analytical map created by users. 60 space-related items are registered on a Munich Couchsurfing map which has 7,598 visits. The comments are generated from the users and include information about pubs, sightseeing, cinema, sport, and restaurant and so on. We classify these comments into objective or subjective information. The subjective information amounts to 42%, while the objective information around 58%. In the subjective information, one can find comments such as "don't drink beer here", "very nice beer garden" made by the provider.

4 Discussions of online ethical issues

4.1 Categories of ethical problems

The aforementioned information categories provided by internet users have very well confirmed the convenience of interactive map services for data sharing. For example, users can browse more than 100 photos in Allianz-Arena stadium, a famous scenic spot in Munich. These photos provide different views inside and outside the stadium. Some photos were taken 10 years ago. The information could extend our view for a special object in different directions and time series. This sort of services can truly attract more internet visitors.

Along with the advantages, however, this new map service also brings us a technical challenge. Apart from the difficulty to control the quality of the user-provided information, it is hard to tell whether and how far the information may include privacy information either intentionally or unintentionally. Different from cases where the information providers are not anonymous and can be sued for their violation of ethical rules, rule violation by anonymous users is difficult, if not impossible, to trace. This is the first kind of ethical problem related to data quality issue.

On the other hand, the increasing information amount in the web increases the complexity of visualization technique. Users will get frustrated upon seeing the maps shown in Fig.1, let alone looking for useful information. Cluttered symbols may likely lead to some misinterpretations. Since most internet users do not have sufficient cartographic knowledge, we can hardly expect a high quality of their non-professionally published maps. Amateur users tend to arbitrarily design colors, symbols and fonts, thus may unintentionally introduce some ethically sensitive contents to their maps. Graeff and Loui (2008) have reported similar cases. This is the second kind of ethical problem.

Although the number of comments in user-created maps we collected is not very large, we can already detect various ethical problems associated with the subjective descriptions. Often, the providers are unaware of these problems and they do try to describe the facts authentically and objectively. However, users may not interpret the information in the way the providers expect. Therefore, some biases and misinterpretations may remain inevitable and invoke ethical concerns.

The photos or comments with ethical problems in our tests represent a very low ratio and have not yet caused debates in the neither public media nor negative social impacts. However, this does not mean that we can ignore the problem. Being alert to what may come up; cartographers have the responsibility to develop countermeasures to avoid serious problems.

4.2 Suggestions for the treatment of ethical problems

The ethical issues between traditional GIS and online spatial information services are different. In traditional GIS, we can find specific data providers with help of metadata, but users who provide online spatial information services are often anonymous, thus difficult to locate. Where the internet providers enjoy the success of spreading their information farther and faster, there exists a larger potential for those who can maliciously spread wrong information to more innocent users.

Before serious problems occur, we need to forecast them and pay more attention to the education and research. The education has the main task to rise among internet users their awareness of ethical problems associated to geo-tagged contents. Meanwhile, we need to develop controlling mechanisms to curb the ethical problems. Generating a code

system of various ethical issues for internet users would be also an important measure. Further, we need to manage the data in a more professional and structured way. For instance, structured taxonomies describing Points of Interest (POI) can be very useful which will consider the spatio-temporal characteristics of the objects on the one hand and allow some subjective descriptions based on the preferences of individual internet users on the other hand.

Finally, there is a need to improve and popularize the cartographic visualization methods. By providing intelligent cartographic tools, users will less blindly and more efficiently design their own maps which have a more professional look.

5. Conclusions

There is no doubt that new techniques will bring about more interactive map services in the future in spite of the lack of common standards for practice. While other researchers have characterized the ethical issues in GIS, in this paper, we focus on the ethical issues for online spatial information services, especially for interactive map services. Interactive map services allow individual users to update and create their own map services, this means, some ethical problems deem to occur as byproducts of this freedom and flexibility. This paper tackles two ethical issues during the process of information dissemination: 1) Data quality issue related with privacy data collection and publishing; 2) Visualization issue when users have to explore huge amount of information.

In order to gain an overview of the potential ethical problems in interactive map service, the authors have tested geo-tagged photos and comments of Wikipedia and users' own comments on a Google map platform. 5 out of 1105 photos are in wrongly entitled or have sensitive contents, which indicates a rather low ratio but sufficient enough to cause alertness to ethical problems. The authors make a number of suggestions for professional cartographers to cope with the potential ethical problems.

Acknowledgment

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