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The Web and Collaborative Geospatial Mapping: A Position Paper

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The Web and Collaborative Geospatial Mapping*
— A Position Paper —

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ABSTRACT

The initiative of our research is to build a geo-writable web, using open source technologies for people's participation online. This paper is the key underpinning for the new emerging trend "*online community mapping*" as a conceptualized model combined with information/computer science, geography, and sociology, which we have proposed recently. In particular, we argue that public access to geospatial datasets and tools, as well as mechanism design of collaborative and social software, are crucial factors. We envisage the web as a medium of *places, people, and participation* (3P), and we outline in this paper an implementation strategy for this vision. A prototype called *Web3P* is being built to experiment with various design elements and implementation techniques to further facilitate an "online community mapping" process.

Note: As of September 12, 2006, the Web3P prototype mentioned in this paper now resides at the following URL: <http://pomelo.iis.sinica.edu.tw/project/maps/>.

Categories and Subject Descriptors
A.1 **[Introductory and Survey],** H.4.3 **[Information Systems Applications]:** Communications Applications**,** J.4 **[Social and Behavioral Sciences],** K.4.0 **[Computers and Society]:** General

General Terms
Design, Experimentation, Human Factors

Keywords
Collaborative Software, Community Mapping, Online Community, Online Mapping, Open Access, Geospatial Data.

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1. INTRODUCTION

After 15 years of the WWW, New York Times (Oct.20, 2005) has a comment on Google Map's release resulting in a proliferation of online map websites. "This is like the 1990's, when everyone was creating everything on the Web."

Of course, the online mapping scene is not new. But the implication for the role of the Web is tremendous. Geospatial information becomes a huge segment of everyday life. Statistics of online mapping phenomena such as online map usage has increased 60 percent world wide during last two years; map searching become top activity online in US last year[1]; online street-level map services like Google Map/Earth, Yahoo Map, and Microsoft Virtual Earth which are being combined with social software technologies (blog, Wiki, social tagging, etc.) to encourage and facilitate online community participation. Efforts of World Wide Web Consortium (W3C), Internet Engineering Task Force (IETF) and The Open Geospatial Consortium, Inc. (OGC) are coming within reach of consensus on geospatial related data standards like Geographic Markup Language (GML), Scalable Vector Graphics (SVG), Web Feature Servers (WFS), Web Map Servers (WMS format), as well as W3C's Resource Description Framework Interest Group (RDFIG) Geo vocabulary.

The Web becomes a symbiosis of old and new. It is a challenge for the traditional expert-oriented Geographical Information Systems (GIS) to ask the question, "GIS, elite as ever?" In fact, a symbol for a new wave of online distributed geospatial information integrated for people's daily use is emerging as statistics shown above. The problem relates to geospatial information field is that researchers have focused very little effort on systematic analysis in exploring dimensions of relation and potential development between geospatial data, web technology and online community. However, increased attentions outside academics in appreciating geospatial information and rapid

[1] Web news reported these statistics, mostly quoted from Nielsen NetRatings, October 2004, and Pew Internet & American Life Project survey, Dec.2004

development of web technologies have resulted in collective efforts, both by offline and online communities, to develop various online mapping services over the web.

The initiative of our research is to build a geo-writable web, using open source technologies for people's participation online. This paper is the key underpinning for the new emerging trend "*online community mapping*" as a conceptualized model combined with information/computer science, geography, and sociology, which we have proposed recently[2]. We envisage the web as a medium of *places, people, and participation* (3P), and we outline in this paper an implementation strategy for this vision. A preliminary prototype called *Web3P* is being built to experiment with various design elements and implementation techniques to further facilitate an online community mapping process.

2. THE WEB AND COLLABORATIVE DOMAIN MAPPING

Online, open, and collaborative exploration of domain spaces is one of the most successful web paradigms. Examples include collaborative compilation of fact and knowledge [1], collaborative mapping of web resources [2], and collaborative open source software development [3]. Online collaborations nevertheless predate the Web era. Probably the best example is the "Jargon File", a public domain comprehensive compendium of hacker slang that has been freely used, shared, and modified since the very beginning of the Internet [4]. Another example is the Internet Movie Database (IMDb), which started out in the Usenet newsgroup rec.arts.movies as FAQs on bibliographic and biographical information about movies and their makers. The IMDb endeavor was later incorporated and purchased by Amazon [5].

There are several reasons for the Web to success as a medium for open collaboration. The Web provides access to a rich collection of online resources, and as such acts as a common basis of collaboration. Simple yet flexible in its design, the Web as a technology further encourages the development of online tools to facilitate group participation. Examples of web-based collaborative and social tools include those for document creation (wiki), personal publishing and syndication (blog), and peer-to-peer resource sharing (e.g., BitTorrent).

When compared to web-based collaborative mappings of other domains, group exploration of people's physical surrounding and human geographical space, however, is less prominent on the web. However, geo-referenced information rich in its variety includes at least: cultural, environmental, facilities (transportation, telecommunications availability, etc.), historical, political information / local public services, safety information (health, accidents, crime, etc.), social-economic information, as well as specialized enterprise/industry data. Also, it is often quoted that the estimation of 60~80% information has geospatial characteristics[3]. Two major problems are often pointed out. First, Geographic Information Systems (GIS) have long been criticized as elitist, because their utilization requires that users possess certain computer literacy ability, have access to the necessary geospatial data, and are knowledgeable about the specific domain with which a GIS is employed for visualization and analysis. Second, it is pointed out that geographical data sources currently used on the web are mainly provided by authorities. They are less accessible and more difficult to amend to serve community needs. The tools for inter-operating and aggregating official geospatial data sources with user-generated data and feedback, as we will show in this paper, are on hand and can be readily used to further advance the art of online community mapping.

3. FROM PARTICIPATORY GIS TO ONLINE COMMUNITY MAPPING

Even in this Internet era, basic literacy and equal access continue to be unresolved issues in a divided digital world. In addition, the underpinning geospatial data sources in most GISs are provided by authorities (such as government agencies or commercial entities); thus, they may not be relevant, or they may be difficult to amend. Potentials for further development of geospatial mapping have been implemented by some efforts such as proponents of neighborhood-created GIS and Participatory GIS (PGIS). Similar terms about the use of GIS for household or local community level planning in combination with participatory approaches such as Public Participation GIS (PPGIS), and Community-Integrated GIS (CiGIS) /Community GIS.

The Participatory GIS groups believe that using maps, geographic information, and information technology can lead to more informed decision-making, improved planning processes, as well as local project opportunities. In theory, participatory research is an approach to social geography that offers a model for community development and involvement. Such research not only indicates that mapping is one of the best participatory techniques but also recognized participatory approach as (a) helping to train local people and build community capacity, (b) offering a collaborative and non-hierarchical approach to investigating interrelationships, (c) integrating different ideas and contributing to community projects, and (d) providing participants with a means for self-representation [6].

We distinguish Community Mapping from Participatory GIS by the volume and significance of user-generated geospatial data in the mapping process. In participatory GIS, a geographic information system is mainly used as a tool to assist community development; whereas in community mapping, producing geographic information and the necessary application system, are the focus of group participation. From this understanding, we define online community mapping as the process of collaborative mapping of geospatial domains where people participate online. [7]

However, explorations are undertaken to categorize existing community mapping web sites in order to make discoveries of learning models from case study. We categorized some

[2] We have traced the emergence of specific features and classify a diverse collection of web phenomena, and proposed a preliminary conceptual model as "Online Community Mapping". See [7] for details.

[3] The estimated numbers differ from many web sites. 80% is the most frequently cited, but we cannot find original survey for these estimation.

identical examples by the process (offline or online) and the volume (small or large) of user contributions of geospatial data to the generated maps. There are four categories.

Offline process and small volume: This is Web cartography of authoritative geospatial datasets, and allows online visual exploration and some user interaction; however, many sites in the category may not involve community efforts. UpMyStreet [8], Window to My Environment [9], Topologically Integrated and Geographic Encoding and Reference System (TIGER) [10], and Taiwan Social Map [11] are examples of such datasets.

Offline process and large volume: This is Web cartography of the results of offline/local/physical community mapping. It is made available online to encourage further community involvement, as showcased by Community Mapping Network [12] and Community Atlas [13].

Online process and small volume: These are web sites of community demographics. The demographic data is collected either by voluntary user self-registration (via physical location, zip code, etc.) or by analyzing geo-identifiable traces of users' online activity (via IP address, domain name, etc.). Living Independently in Los Angeles [14], Blogmapper [15], the GeoURL ICBM address server [16], and the ISC Internet Domain Survey [17] are examples of such web sites.

Online process and large volume: This is Web cartography of specific geospatial domains with data provided by online/global/virtual communities. The sites are often more complex in their designs compared to sites in the above three categories, as they need to support online and collaborative collection, processing, and visualization of geospatial data. Examples include Google Maps [18], the Community Habitat Re-sources Project (CHiRP) [19], and Project OneMap [20].

Online community mapping as a concept captures the essence of the exemplary process of web cartography, as illustrated in the fourth category above. As online community mappings are emerging phenomena, they are necessarily diverse and emphasize different aspects, namely, online community, community mapping, or online mapping. Of the three examples in the last category above (online process and large volume), Google Map emphasizes online community (as presented by the aggregation of available web pages), CHiRP emphasizes community mapping (of habitable resources), and Project OneMap emphasizes online mapping (methods and tools).

4. ENABLING FACTORS IN ONLINE AND COLLABORATIVE GEOSPATIAL MAPPING

Further research revealed some interesting observations: while traditional geo-spatial data (such as points, vectors, polygons, raster and spectral data which used in GIS) which at present are mainly held on government agencies and commercial enterprises, and utilized accessible only to limited people, there is a trend and demand acknowledging the importance of non-traditional geo-spatial information such as geo-encode hypermedia (web documents, objects, media with geographical coordinates/tags) contributed by online community participation. Our aim is to establish conditions for effective adaptation of available web technologies and standards to reinforce and facilitate remote access to geo-spatial information in a more open, collaborative and participatory way that involve a variety of actors, and not through unilateral elitists and institutions that permit actions by a powerful few.

As such, we believe that access to public geospatial datasets and related software tools are essential for collaborative geospatial mapping. Furthermore, software tools designed for collaboration and social interaction play critical roles in the online mapping process. In particular, we advocate that access to the datasets and tools must be free (without charge and with very few restrictions), and that lessons learned from the design of collaborative and social software (such as blogging and open source software development tools) are extremely relevant. We view geographic information technology, social software, and open access to geospatial datasets and software tools that enable online and collaborative geospatial mapping, see Figure 1.

4.1 Open access to geospatial data and tools

In an online community mapping project, users collaborate in mapping a specific geospatial area. However, certain geospatial datasets about the area must be available to users before collaboration can start. These "start-up" datasets include, for example, topographic maps and administrative boundary maps of the area, local gazetteers, and related socio-economic records. However, such datasets are usually produced and maintained by government agencies [4] or chartered organizations and although the datasets can be released, their usage can be severely restricted.

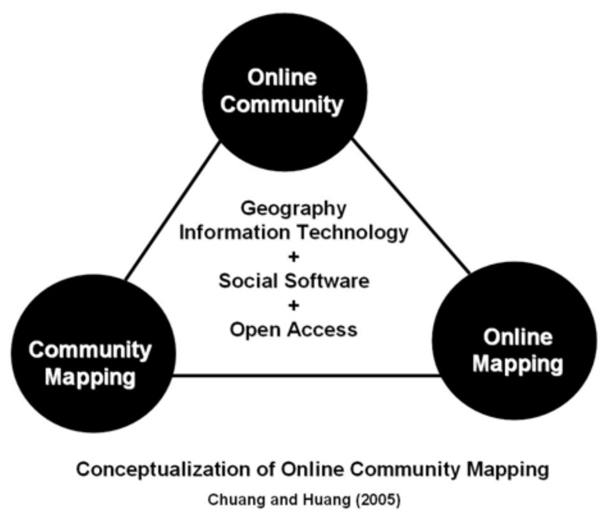

Figure 1: Enabling factors for online community mapping.

[4] Exceptions include Australia, Brazil, Canada, New Zealand and the US, which implement open and free access to the geospatial data in federal/national level. Legal issues about geospatial data are such as public right, economical reasons, data usability, and security and privacy. See [7] for discussions.

Such restrictions could be in the form of license fees and royalties, restricted derivation and distribution rights, or grossly delayed or digested releases. The restrictions may make large-scale online community mapping impractical, or render it less meaningful. We advocate that more flexible licensing models, such as those of the Creative Commons licenses [21] or those based on Science Commons approaches [22], should be used to release geospatial datasets to the public. In itself, this broadening of geo-licensing issues over last few years has been a very positive development. Examples like US National Research Council proposed "National Commons in Geographic Information" at local scales [23], UK-based Okfn.org proposed Creative Common-style License to GIS datasets [24], or Public Commons of Geographic Data [25] are such cases.

In particular, we emphasize that released geospatial datasets should be in source forms (not in digested or rendered forms) and should be accompanied by the necessary data models (i.e., schema), metadata and catalog descriptions, data format definitions, and source code of the related software tools. Rather than rely on authority-sanctioned subsets only, it would be more appropriate if users had timely access to the source datasets, and were able to extract from them a profile of geospatial layers as a basis for collaborative mapping.

4.2 Collaborative geospatial mapping technology

Among decentralized geography information technologies, alternatives have been paid particular attentions to web map service and open source technologies, which not only represent the rising grassroots trend but also offer benefits such as lower cost, simpler than commercial software, and a more open structure to both data producers and users. The implication is overwhelmingly nowadays. Other integrations of the social software paradigm shift affecting how people connect online and refer to the physical geography will be explored by this study.

Geography Markup Language (GML) [26], a data standard with a well defined and accepted geospatial data model, has been used increasingly as the data format for the exchange of geographical data. Since GML is based on XML, GML-coded geospatial data can be processed with many existing XML processing tools. At the same time, Scalable Vector Graphics (SVG) [27], an XML-based descriptive language for two-dimensional scalable graphics, is gaining ground as the language of choice for web graphics. Furthermore, many of the tools that support GML and SVG are open source software, and can be modified as required to build web mapping applications. The trend of using GML, SVG, and open source software to support novel web mapping concepts and experiments can be observed at annual developer conferences, such as GML Days [28] and SVG Open [29]. Our experience using GML and SVG to retrofit legacy geospatial data standards for new web mapping applications has also been very positive [30][31].

In addition to having access to geospatial data and technologies, a successful online community mapping process must include web mechanisms that enable group participation and collaboration. As observed by Rebecca Blood, such mechanisms can be designed into software. Blood identifies several mechanisms in blogging software that help shape a sense of community and encourage group participation [32]. For example, the use of a permanent link for each blog entry makes cross blog referencing and discourse easier. Trackback, which automates cross blog referencing, helps bloggers converse and keeps correspondence explicit and persistent. The usage of common distribution formats, e.g., RSS and Atom, enables easy syndication and aggregation of blog content. The main lesson from the success of blogging software has been that novel software designs eliminate technical barriers, and make the Web accessible as a medium for self expression and online participation.

Wiki is similar to blog that requires no specific IT expertise and offers two-way channels to communicate with through an easy-to-use client interface. As for content, Wki and Blog both act as a knowledge management tool. Both not only support administrators to manage content-production capacities on a user basis by separating production and presentation from content, but also offer archived entries containing text and other formats such as picture, image or sound files which allow old content remain accessible (version control). Altogether, these new combinations have a contemporary relevance all the more convincing for being expressed in recent online community mapping movement, easily intelligible cases such as the WorldKit projects [33] and applications which include theme maps, community mapping, mobile blogging, travel mapping, mapping Flicker (social photo application), mapping Del.icio.us (social bookmark mechanism), Craigslist prototype, and GeoWiki [34], etc. In a similar manner, we also find the Thingster.org as an open-source weblogging service for locative media, the Open Guide to London [35] which combines Wiki and Streetmap service [36] to make a network of community-maintained city guides available online.

As a result, Online Community Mapping could learn from the practices of collaborative open source software development, and utilize associated software tools to help manage collaborative production of community geospatial datasets. Such tools include those for version control, bug reporting, issue tracking, and shared document maintenance. However, we expect major difficulties in adapting these tools, as they are mostly text-based, while geospatial data is inherently more complex. The data types range from tables, semi-structural texts, vector graphics, to raster images. This diversity requires a sophisticated set of tools just to author, edit, and render geospatial data. As suggested earlier, an approach based on GML and SVG that utilizes existing open source resources, would be a good beginning. We believe such a developmental framework is within the reach of the online mapping community.

5. A WEB OF PLACES, PEOPLE, AND PARTICIPATION

We envisage a web of places, people, and participation in which activities of online community mapping are organized and carried out. Here, we outline our implementation strategy for this vision. We understand there is an enormous interest in web mapping, also called online cartography, of which the Web is the new medium for cartography and for which new mapping techniques have been rapidly developed. This interest is demonstrated by the many developer web sites, of which carto.net [37] and webmapper.net [38] are but two examples. We emphasize the necessary mechanisms and the novel software designs that will make the Web accessible as a medium for collaborative mapping and community participation. Although this perspective has received less attention, it will have great impact.

Our implementation strategy is simple. Instead of setting up specific online maps as community focal points with which users are expected to collaborate only in pre-defined ways, we propose to associate each individual geospatial feature with its own Web resource, i.e., the Uniform Resource Locators (URLs), which users can freely refer to in documents and applications. Geospatial features can be buildings, landmarks, streets, and forests, etc. They are places in our geographic environment. Note that we are not proposing to have locations (as represented, e.g., by their coordinates) as Web resources. This approach has already been projected in "The Proposed .geo Top-Level Domain Name," by SRI International Organization [39]. We believe locations carry less contextual information and do not suit the needs of community mapping. However, a geospatial place can of course include its location as an attribute, and it can be accessible via the place's URL.

Two-way (mutual) communication is the essence of making virtual and physical world interactions possible in a more profound and effective way. The analogy to blogging is strikingly clear. Each geospatial feature is given a permanent link with which people add annotations about the feature by providing comments on, or making trackbacks to, the link. Annotations can be aggregated to function as a basis of community opinions and actions. A collection of geospatial features, with their associated aggregated annotations, is now the outcome of a community mapping process. The collections of community mapping results — the feature sets and group annotations — can be further aggregated, processed, visualized, and can interact with others, as the results are automatically put online and accessible to all.

All of the above activities are supported by the necessary software tools to facilitate participation. Existing blogging tools can be used to add feature annotations. We are developing new tools for the aggregation and visualization of feature sets and group annotations so that the processes and results of online community mapping can be faithfully represented.

But who will issue and maintain permanent links to geospatial features? Our view is that this task can also be a collaborative effort. As stated earlier, communities would benefit greatly by having access to authority-maintained geospatial feature datasets. Some of the authorities already provide online gazetteer services, e.g., the USGS Geographic Names Information System [40] and the Taiwan Gazetteer [41]. The existing services can be converted into new ones, where permanent links used for individual geospatial features accept comments and trackbacks. We are currently building such a prototypical system based on the Taiwan Gazetteer. The prototype, called Web3P, is described in the following section.

6. WEB3P: A PROTOTYPE FOR ONLINE COMMUNITY MAPPING

Our prototype is called Web3P (A Web of Places, People, and Participation) and is designed for collaborative geospatial mapping. Although currently missing some key features, the prototype already allows us to experiment with design elements and implementation techniques at the first stage that we hope will lead to better online community mapping experiences.

Let us start with several things we like to do but have not done. At the server side, the system has not yet used GML as the language to markup the geometries of places. Also at the client side, SVG is yet to be used for the visual presentation and navigation of the places. Currently, a place has no geometry and is presented as a clickable label placed upon an image-based map. Moving to GML and SVG will not cause major problems as our previous experiences in using GML and SVG to build Web-based GIS has been successfully developed [30][31].

At this stage, we use conventional open source software tools (Linux, Apache, MySQL, PHP, etc.) in building our proto-type. The background map as well as place name labels on it, are prepared in a separate stage using common commercial GIS tools. However, users do not need any client side GIS tool in order to use the service provided by the Web3P prototype. It is planned that, by using open software tools in combination with publicly available gazetteers and other geospatial datasets, the prototype can be made freely available to others so they can set up their own online community mapping servers.

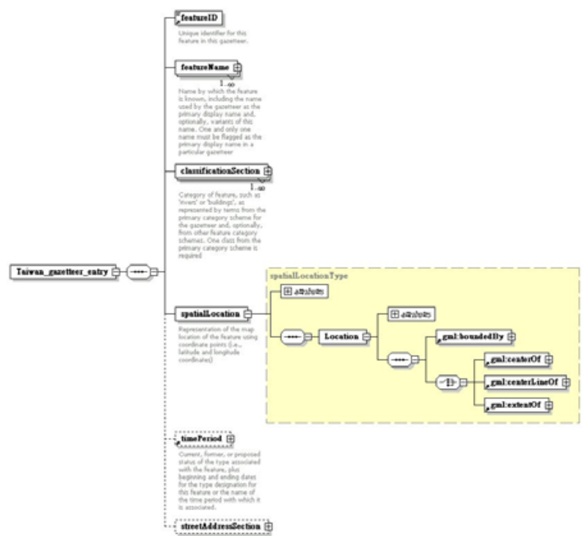

Figure 2: Taiwan Gazetteer Content Schema revised from ADL .

We adapt the Alexandria Digital Library (ADL) Gazetteer Content Standard (version 3.2) [42] as the data schema for place names. The ADL Gazetteer Content Standard is slightly modified to use the geometry language of GML [26] to describe the shape of geographic features.(see Figure 2) Therefore, e.g., an administration area can be described geometrically by its boundary and is specified by corresponding GML geometry element. The current data model for the entire Web3P prototype is still in its simple design phase.

We build up a Place DB, which is a relational database of place names that have been taken out from the Taiwan Gazetteer and marked up using ADL Gazetteer Content Standard. In particular, PlaceID, the key to a place in the Place DB, is used in combination with the URL of the Web3P server to form a permalink to the place. Basic attributes about a place, such as its name, coordinate, and feature class, can then be fetched via its permalink. Figures 3 shows that the browser accesses the Web3P server and makes a query to a place called Lanyu (Orchid Island). Note that Lanyu Island's PlaceID is 14, and the place's permalink is http://tsm.iis.sinica.edu.tw/~evirt/w3p/meta-list.php?id=14[5]

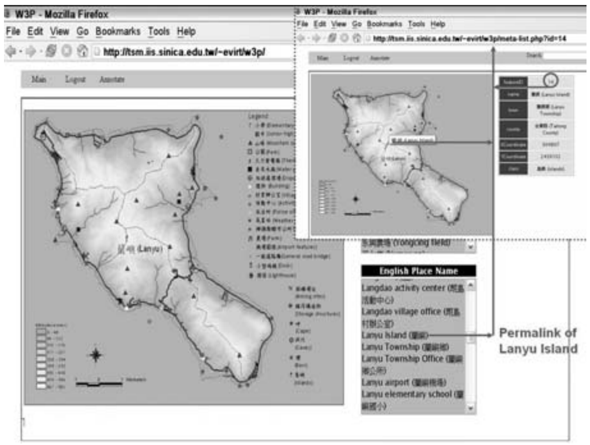

Figure 3: The PlaceID and its permalink of a place.

Additional tables are established to store community-generated geospatial data. In these tables, individual contributions are recorded, and a history of revision made to the Place DB can be produced if necessary. Each user contribution is in the form of additions or modifications to the Place DB, e.g., places added or their attributes changed, or in the form of new annotations to existing places. Each annotation is either a tag or a web resource. A tag is an identifier that is used to attach a user / community - specific meaning, e.g., OwlObserved, to a place. Likewise, a web resource, as presented by its URL, is used to associate certain information, e.g., an image of the place, to a place.

Figure 4: User-contributed annotations from web resources.

Figure 4 shows two user-contributed web resources that serve as annotations to the Lanyu. One of them is an image file with its thumbnail displayed; the other is a web page with its link displayed. The description fields are for optional user comments. New annotations can be attached to the current place by clicking on the Annotate button at the top of map. An existing annotation can also be edited if one selects the specific annotation and clicks on the Edit button. Figure 4 also demonstrates the annotate/edit window which is used for adding a new annotation to, or editing an existing annotation of, the place.

Our earlier experiments [43] on a light-weight file management and sharing system built on top of PHP and MySQL bring us to combine the tagging framework to meet community-generated data variety (multimedia files). It also supports group access control (such as files can be managed according to community needs). As illustrated in Figure 5, on the upper right side, user can utilize searching function for tag and resource which are added by user-defined. People find their specific interest place jointly with its PlaceID by permalinking to retrieve all its annotations. One can imagine that a web resource annotation is simply a trackback from the resource's URL to the place's permalink. However, right now the annotations are more like comments to the place's permalink, and they are stored along within the Place DB. This results in a centralized repository of community-generated geospatial annotations, and makes it easier to aggregate the community's geospatial knowledge. As shown in Figure 5 people participation is revealed in building a collaborative Lanyu (Orchid Island) Gazetteer by annotations of web resources.

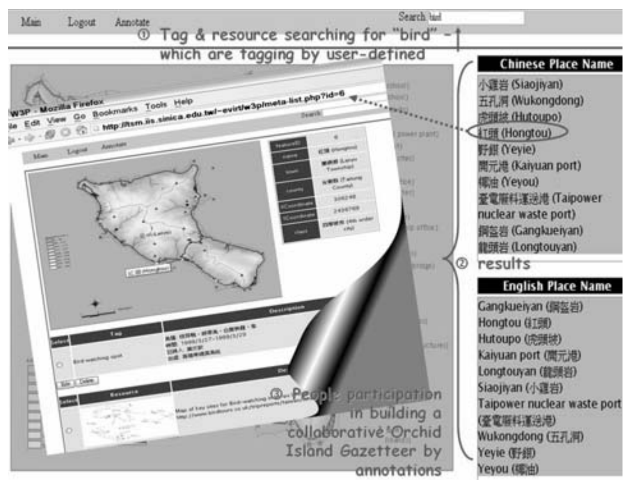

Figure 5: People participation in places by tag annotations.

Thus, these are key premises of our further work : (a) A Tagging Framework for re-constructing the Taiwan Gazetteer System to be a light-weight geo-spatial data file sharing and management system. (b) The aggregation and visualization of geo-spatial feature sets will be implemented through GML and SVG. (c) Wiki-like functions such as version control and collaborative writing will be jointly tested with blog-like functions mentioned before.

The Web3P prototype can be accessed at the following URL

http://tsm.iis.sinica.edu.tw/~evirt/w3p/

High resolution images of Figures 2, 3, 4, and 5 are placed in the Appendix.

[5] The URL does not look too permanent! But that is because we are still experimenting. The URL will have a more permanent look, e.g., http://web3p.iis.sinica.edu.tw/p14/, once we are done with the experimentation.

7. SUSTAINABILITY

The continuing relevance of the study for the Web and collaborative geospatial mapping is to ask that "Why will this or that collaborative geospatial mapping service survive but not others? "

A major set of evaluation criteria used in examination of Web-based GIS such as page appearance/information clarity, intended purpose explanation, ease of navigation and use, currency and maintenance of data, and presence of metadata concerns cost-effectiveness and sustainability for data stores over time [44] are proposed. Similarly, Project OneMap aforementioned responses to problems coupled with rapid changes in social needs and information technologies. Ten characteristics of sustainable information technology include longevity, demand, simplicity, quality, accessibility, responsiveness, adaptability, scalability, robustness, and stability are identified [45]. However, for the present, the concept of sustainable GIT remains more toward as a statement than a holistic study.

On the other hand, in the context of sustainable online community, one significant theoretical instrument, "Online Community Framework" proposed by de Souzqa and Preece [46] suggesting that: "The ease with which (online) community members interact with each other and with the technology will depend on how well designers support sociability and usability." Having seen numerous online mapping websites, they spring up and they die out. The future architecture of online community participation for the Web and collaborative geospatial mapping is indeed of calling for its sustainability in concern.

Moreover, in search of theoretical supports for our new proposing concept, Naïve Geography [47] captures the way people think and reason about geospatial environment. It offers us a next-generation GIS theory base by distinguishing the common-sense geographic world from elitist GIS stereotype. It allows errors and inconsistent, and accepts incomplete geospatial information which may open up current methods to derive restricted geospatial data, as well as presents an open manner to see community-generated data which are generated by people, made sense to people, and reasoned "that needs little explanation" in the words of Egenhofer and Mark. Here, we see the light for collaborative geospatial mapping, and the symbiosis of old and new for the Web.

8. CONCLUSION

Last but not least, let us consider a hypothetical situation: You are seized with a panic for the submission deadline of the WWW conference paper somewhere in one small corner of the world. Your friend rushes into your lab and shouts out a fire just happening at the site hosting the WWW server. You would seem to breathe a sigh of relief for a submission extension. But, what's the problem, you might reasonably ask?

Concerns about communicating your own online community friends might limit your willingness to extract as much gain from the specific place information as you can, at this moment. But, these factors won't prevent you from getting a great deal information from a geo-writable web in the future which is cross-overlaid with layers of information and cross-overlaid communities by your own choice. The Web is connecting everyone, everything and everywhere at anytime. In our vision, it can aggregate everything via the unique PlaceID even for a building, a lab (like the WWW hosting server), or the chair you are seating on. Everything which is a geo-feature will have its geospatial data accessible at a web address, and at the address it can be further enriched with data/information both from authority provided and from online/offline/local community participation.

The Web, with its rich resources and flexible mechanisms, has reached the point where it is the medium of choice for self expression and group participation. Online community mapping, as an emerging concept from the convergence of online community, community mapping, and online mapping, will necessarily depend on the Web both as the medium for expression and as a source of inspiration. Geospatial technology and social software are recognized as a new challenge for building multidisciplinary application and research.

We have given a perspective of the current landscape of online community mapping, have identified some enabling factors for its further development, and have highlighted an implementation strategy by showing a prototype we are currently building. A high-performance geo-writable web operates on a similar but more flexible vision. We recognize them when we see people, place and participation, and our position in this paper is that the web is on the edge to reach a more public and persistent architecture of collaborative geospatial mapping.

9. REFERENCE

[1] Visit, e.g., <http://www.wikipedia.org/>.
[2] Visit, e.g., <http://www.dmoz.org/>.
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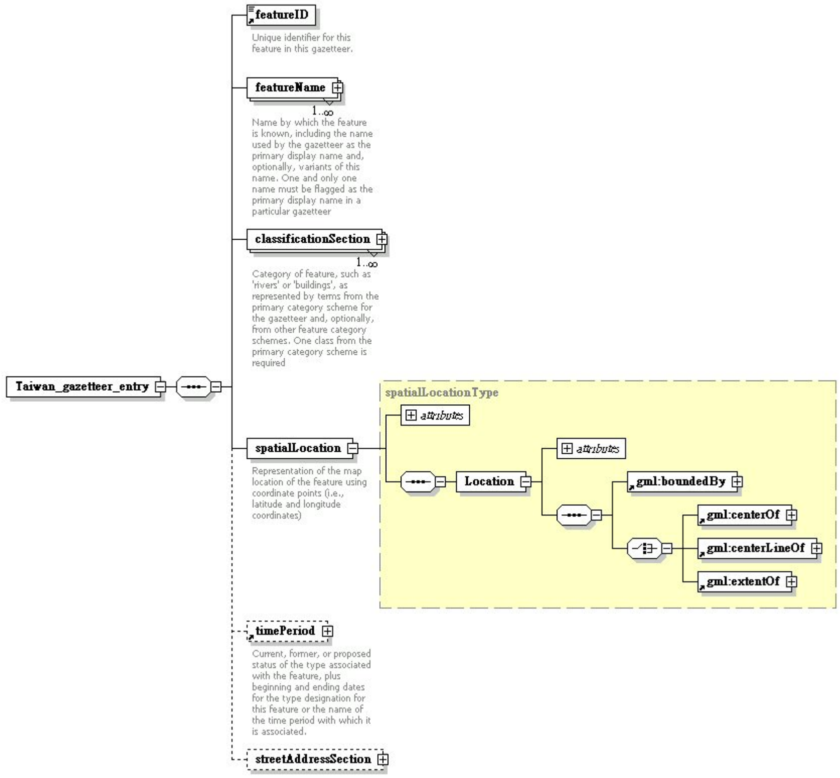

Figure 2: Taiwan Gazetteer Content Schema revised from ADL .

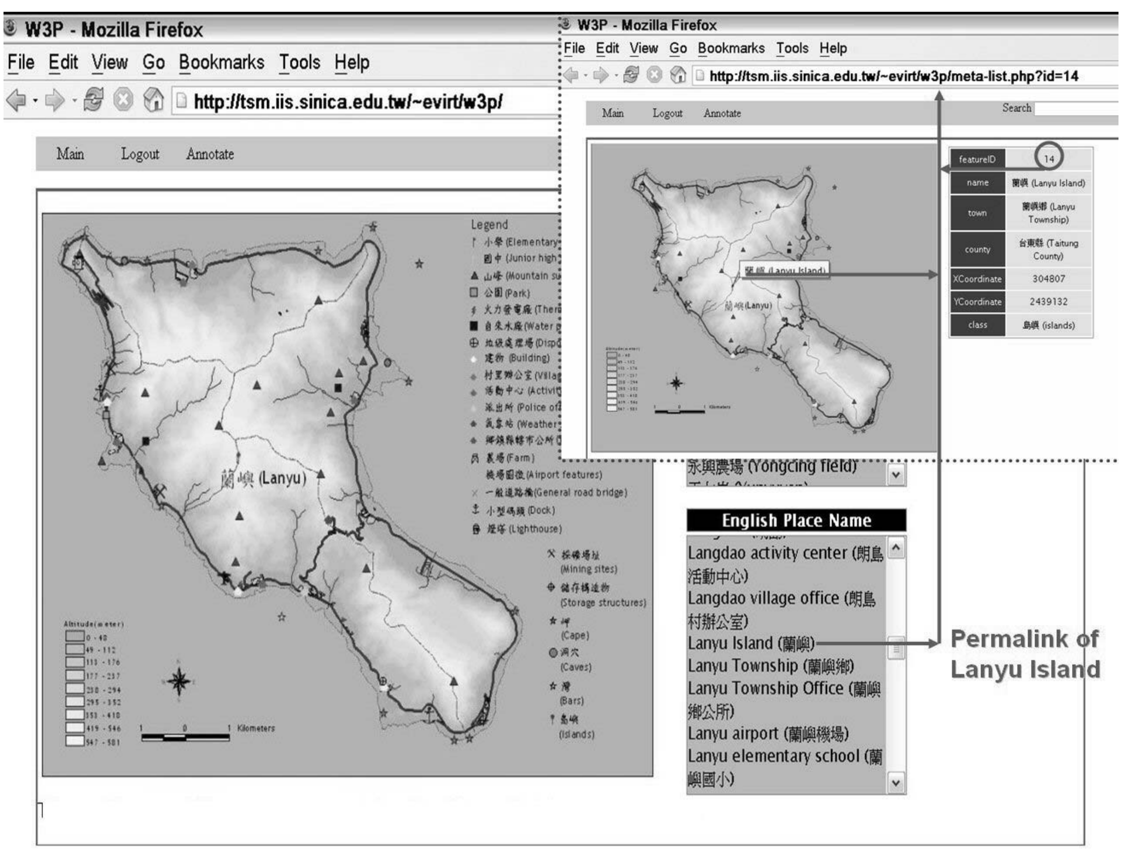

Figure 3: The PlaceID and its permalink of a place.

Figure 4: User-contributed annotations from web resources.

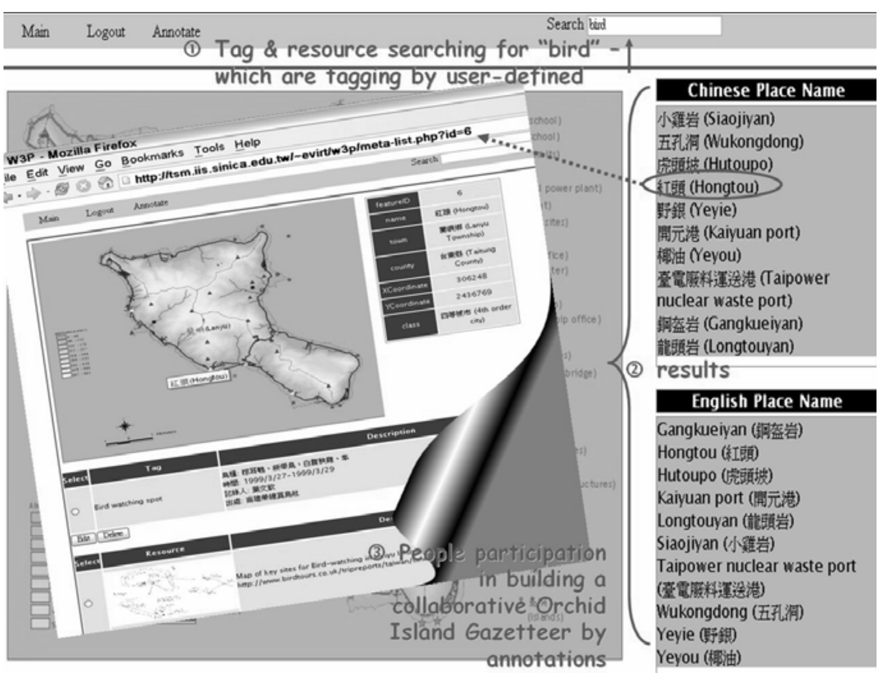

Figure 5: People participation in places by tag annotations.