WEBLOG BASED MAPPING WITH TRACK BACKS ON SPATIO-TEMPORAL RELATIONS

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This paper proposes a new framework of creating maps by the collaboration of personal users’ posting of articles which include spatial information using a weblog’s communication method, such as track back ping and RSS retrieval. In our daily life, each person differs in how he or she utilizes the real space. Therefore, maps which are visualization of spatial descriptions should be essentially created and customized for each person. To realize the concept of map, we adopt new methods, in which each article of the weblog has a map of a certain place where a user knows in detail. The methods enable users to create a variety of personal maps with articles written firstly and then to generate automatically links connecting articles over personal maps through common places of multiple maps to interchange information of their interests using track back ping and RSS retrieval. The advantages of the methods are that users can choose both scale and place for maps freely and that the users’ scope for describing spatial information is expanded. We call our proposed framework, for managing both the weblog and mapping services, weblog based egocentric mapping or blog ego map. Also, we discuss the process and configuration of our prototype system that develop a wide area map by collecting multiple egocentric local maps, departing from the traditional map-making process.

1. INTRODUCTION

With the spread of Internet, the enormous information space has been realized these days. Many documents such as news, company information and public organization information are being circulated on the Web. Now, there is a movement that everyone is going to publish his or her personal writing the Web. Its representative software to realize the movement is the weblog which is extended from a bulletin board system and mainly used for writing diary. Accordingly, as the content personalization further proceeds on the Web, a large amount of writings about personal experiences and ideas will be available on the Web.

Considering the present situation in the weblog, almost all articles end up only posted without being read and received track back by other users. Even though an article is not so valuable as one unit, it may become worthy by linking relevant articles using track back or RSS. We can say the structure of weblog is immature. In the near future, information from each person will increase on the Web, and therefore it is firstly important that a weblog reader can efficiently look for information from masses of information. Secondly, to make weblog more useful for both publishers and viewers, there will be more demands for improving merits of weblog by connecting relevant articles written by different users. As the methods to archive them, the simplest way is that all articles are collected and sorted by time when an article is posted. By listing articles sorted by the time, weblog increases the likelihood that users can easily catch other related articles. In this paper, we focus on location of weblog to collect and connect articles using several methods. It is true that all articles do not necessarily have associations with location, but introducing an idea of location to weblog enhances usability of weblog about location-based articles. The advantages of the framework that articles are attached to maps on Internet are to produce wide area map intended for article viewers, and to enrich personal spatial descriptions for article writers.
2. BASIC CONCEPT OF WEBLOG AND ITS EXTENSIONS

We introduce definitions of main components in weblog as follows.

\[ wbg_i : \text{a weblog group where all articles posted by users can communicate with messages of track back ping.} \]

The track back is one of the most characteristic mechanisms in the weblog, and makes users to know all articles linking to their article. We can track back articles related to our articles. A track back ping is a communication message that enables an article to know the fact that a new article including a link to the article has been created. The result of an article’s receiving a track back ping from another new article is to add a new inverse-link to a list of track back in the article. The mechanism allows both a writer and readers of the article to know and appreciate new articles related to it through the list of track back. It strongly activates communication among people and community development.

\[ wbg_i.member : \text{a set of all members belonging to a group } wbg_i. \]

A member \( \text{mem}_j (= wbg_i.member) \) of a weblog group \( wbg_i \) has the following attributes:

- article : a set of all articles written by the member. It is often called a log or a diary.
- nickname : the nickname of the member.
- personalInfo : a set of personal information of the member such as name, email address, age, occupation and so on.

An article \( a_k (= wbg_i.member_j.article) \) has the following attributes:

- content: the content of \( a_k \). The content is generally written in a subset of HTML or only a text.
- summary: the summary of \( a_k \). The summary is a meta data for the content of \( a_k \), and is generally written in the RSS XML form. The summary is simple enough to find articles by queries with keywords and to match similar articles with elements in RSS XML.
- comment: a set of comments against \( a_k \).
- trackBack: a set of track back information, so-called a track back list, each of which is composed of a URL \( url_{m} \), a nickname and so on. The URL \( url_{m} \) addresses on an article \( a_m \) which includes a hyperlink to the current article \( a_k \) in its content by a URL \( url_{k} \). The URL \( url_{k} \) is so-called a track back URL. On the other hand, a URL \( url_{m} \) is called a citation URL of the article \( a_k \) in this paper. Figure 1 shows relations among articles, track back URLs and citation URLs. A track backed article \( a_m \) is denoted by \( wbg_i.member_j.article_k.trackBack_m \).
A content $c_n$ has the following attributes:

- **citation**: a set of track back URLs in $c_n$. A citation or track back URL $url_p$ in the content is denoted by $wbg\_\text{member}._\text{article}_k._\text{content}._\text{citation}_p$ (Fig. 2).

You may feel confused by the fact that the expressions “to cite” and “to track back” have the same meaning or opposite meaning. Originally, “to cite” is an inverse expression of “to track back”. It is only the difference of the viewpoints of a same link. From the starting anchor of a link, “to cite” is used for referring to the link. From the ending anchor of a link, “to track back” is used for the link.

A usual hyperlink used in the Web is a directed link and used for only citation, but a link used in the weblog is a bi-directed link which is composed of two links, that is, a link for citation and a link for tracking back. Thus, generally, a usual hyperlink for citation on the Web is called only “URL”. On the other hand, a link on the weblog which enables functions for both citation and tracking back is called “track back URL”.

![Figure 2. Concept of citation list, article, track back URL and citation URL](image)

When a weblog user has created an article $a_k$ with a track back URL $url_p$ in a weblog site $site_x$. The track back propagation management system in $site_x$ sends a message, so-called a *track back ping*, about a track back URL to all sites in the same weblog group. The message of the track back ping includes both a track back URL $url_p$ and a citation URL $url_k$. If a site $site_y$ has managed the article $a_p$ and has found it matched with the track back URL $url_p$, the citation URL $url_k$ will be added to the track back list of the article $a_p$.

RSS is considered one of the most characteristic components in the Web. RSS is an abbreviation for RDF Site Summary, Rich Site Summary and so on. Anyway, RSS is the XML encoding for representing the summary of the content of the article in the weblog. As XML provides with both tag and content of the tag, a pair of the tag and the content of the tag can be interpreted as an attribute and its value. Thus, the precision of information retrieval for XML content is much higher than one for text content, because the information in the XML is usually more structured than the one in the text.

The summary of the content of an article is itself better for a computer to analyze similarity among a large amount of articles in the weblog, because the data size of the summary of the article is smaller than the content of the article. Also, the summary includes characteristic data about the content, so-called meta data of the content of an article.

If a new article includes a common word in other articles, the new article may be related to the other articles (Fig. 3). Without describing track back URL in the article, the weblog management system inform us a list of URL of new related articles by text matching and similarity analysis. This kind of mechanism has been already supported in commercial weblog services. Users often browse related articles by some URLs in the list of related articles computed by text matching. Thus, the list of related articles computed by text matching is almost used as the same as a track back list. We call the list of URLs of related articles *indirect track back list*. Users can indirectly track back to related article through related keywords. In other words, users can firstly track back to “keywords” included in their articles, and they can secondly track back to “articles” including the keywords. This text matching is applied for not only the summary of the article, but also the content itself of the article in some advanced weblog services.
I don’t know weblog. Could you explain it?
I cannot sleep.

Figure 3. \textit{Indirect} track back list, related URL and text matching

Figure 4 shows the fact that a keyword itself can be an article in the weblog. Articles can cite a keyword by a track back URL. Articles can also be related to a keyword by text matching. Thus, because a keyword has the same structure of an article, a keyword has its track back list as well as the list of articles related to the keyword. Fig. 4 shows that both the track back list and the list of related articles including a keyword “apple” will be imported to the indirect track back list in an article $a_k$. A keyword acts as an intermediary between articles. Thus, a user can indirectly track back some articles via keyword space.

Figure 4. A keyword in keyword space as an article in the weblog, which acts as an intermediary between articles
A keyword space is one of spaces which acts as an intermediary between articles (Fig.5). Examples of other spaces are map space or space space, time space, photo space, sound space and so on. In the case of map space, information matching is based on spatial relations. It is easy to extend two or three dimensional spaces to ones with time dimension by the definition, but it may be difficult to find usefulness in the extension. Anyway, because all spaces provide the definition of distance between elements in the spaces, element matching is available in all spaces. Articles can be connected one another through track back lists in varied spaces as information ports.

![Diagram](https://via.placeholder.com/150)

**Figure 5.** Varied spaces connecting between articles, and track back lists as information ports among different spaces

### 3. WEBLOG BASED EGOCENTRIC MAPPNG

#### 3.1 Personal Maps and Collaboration on Them

As a weblog is based on a concept of personalization on the Web, flickr [1] has a similar mechanism to weblog. The major different point is that primal elements are different for a weblog and flickr. The primal element of flickr is a photograph as a substitute for an article in weblogs. In flickr, a user can also utilize a track back and RSS function between photographs like articles of weblog. Futhermore, flickr adopts a communicative method that puts an emphasis on direct links between users. Users can have their own album servers and use inter-links over distributed album servers of flickr.

Livedoor Map [2] has been providing a map service for using location information in articles of the weblog. It may be the best weblog based map service in Japan so far. The map server of Livedoor Map is centralized and helps users link between an article and a position on a map (Fig. 6). Articles are indirectly connected via a central map server. It must be an ideal framework of introducing a map server into every article in the weblog. It makes weblog based mapping more personalized approach. We call the ideal framework of integrating the weblog and map services a weblog based egocentric mapping service or a blog ego mapping in this paper.
Our proposed blog ego map introduces maps into all weblog, consequently the weblog supports map making as if a user manages specific local places he or she want to describe something to as an article. At first, users set a map where they are familiar with or where they want to post an article. Then, the users post articles with map symbols which are labeled on a map. By articles’ corresponding one-to-one with map symbols, articles of a specific local area are gathered with a self-made map of the place. Therefore, besides all articles are collected on a local map, several maps of the same place could be created and divided in different weblog by themes of articles on itself according to users’ predilection. Therefore, even if maps are designed for the same place, they show different contents from totally different views. Furthermore, we compare with a former weblog mapping, especially Livedoor Map Weblog. When one map in a center server is adopted like Livedoor Map weblog, it lacks a chance of describing rich spatial information because users have no choice and available maps may have too disrelated information and uniform descriptions. Another significant different point between a former weblog mapping and a blog egocentric mapping is an approach to a scale which is used as values of longitude and latitude in the former weblog mapping. In a blog ego mapping, a target place of map is based on a user’s favorite arbitrary scale. As observed earlier, one shared map in the former weblog mapping service limits the potentiality for spatial description although weblog originally specialize in collecting personal information. From the above, we present characteristics of weblog models in Fig 7.

<table>
<thead>
<tr>
<th>name of weblog</th>
<th>organization</th>
<th>content type</th>
</tr>
</thead>
<tbody>
<tr>
<td>flickr</td>
<td>decentralized</td>
<td>photograph</td>
</tr>
<tr>
<td>Livedoor Map</td>
<td>unitary</td>
<td>map</td>
</tr>
<tr>
<td>our proposed blog ego mapping</td>
<td>decentralized</td>
<td>map</td>
</tr>
</tbody>
</table>

Figure 7: Organization and content type of photo and map based weblog services

### 3.2 Rich Capability in Representing Locations by Extending Point Identifiers to Object Identifiers

Considering an existent map, a map could be drawn by simplest symbols like point, line and surface. Therefore, drawing function consists of four symbols such as a point, line, surface and direction. Point is a symbol for indicating a small area or existence which is for example a tree and fountain. Line is a symbol for indicating a line-style existence or event which is for example a street or travel path on a map. Surface is for indicating a spacious area or event which is for example a building or rain area. Direction is for example pointing a direction of a mountain far from a place or travel direction. The symbols and its features in drawing function in our blog ego mapping are listed in Fig 8. By the four symbols, user can design a rough map which clearly intends to whatever a user wants to describe.
<table>
<thead>
<tr>
<th>symbol type</th>
<th>shape</th>
<th>sample feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>point</td>
<td>■</td>
<td>restaurant, tree, fountain</td>
</tr>
<tr>
<td>line</td>
<td>/\</td>
<td>street, travel path</td>
</tr>
<tr>
<td>surface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>direction</td>
<td>\</td>
<td>travel direction, direction far from a place</td>
</tr>
</tbody>
</table>

Figure 8: Symbols and their meanings in map space

In the former weblog mapping, the position of an article on a map is identified by the values of latitude and longitude. In consequence, an article has to be replaced as a point on a map. In addition, when there are articles which have near relation in their content each other, the related articles exist separately as points around the point on a map in the former system. The place where articles gather closely collects many points on a map, therefore other viewers may suffer from browsing all the related articles. To solve these problems, we improved a method of managing a relationship between map and article in blog ego mapping. Departing from uniting an article with a map by the values of longitude and latitude, the symbols that become a part of the map like line, surface, as observed earlier, have its own object identifier or o-id which combines an article with a map. An o-id is equivalent to an article-id consisting of an attribute of symbol type, a map-id and a map position (Fig 6). Introducing o-id into the weblog, managing of spatial articles by o-id method is better suited for spatial recognition of human than latitude and longitude because symbols on a map directly mean features or events in the real world. By adopting the o-id method, related articles which should be grouped together meet in one symbol on a map in the weblog system. For example, when a user wants additional information about the article which is already posted before, the user posts to the object on map, not the latitude and longitude, then information about the article gathers under the object.

In practical use, the symbols could have a variety of meanings in the real world. As an example, one symbol on a map means an existing feature like a building, and another symbol means an event or a situation in the real world like a precipitation area or a thickly-peopled district. If these different symbols are described on the same map, the map could be difficult for viewers to understand. Then, publishers of articles are asked to distinguish a symbol character by color of symbols.

<table>
<thead>
<tr>
<th>name of map service</th>
<th>id of elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livedoor Map</td>
<td>global position = latitude and longitude</td>
</tr>
<tr>
<td>our proposed</td>
<td>map id + local position = object id = article id</td>
</tr>
<tr>
<td>blog ego mapping</td>
<td></td>
</tr>
</tbody>
</table>

Figure 9: Identifier (id) of elements for map service

### 3.4 Place and Information Sharing with Setting Ports Connecting Two Personal Maps

The blog ego mapping enables users to freely generate a link between two distributed personal maps or ego maps which have a registered common place. We call the function of connecting ego maps place and information sharing or pi-sharing. pi-sharing enables a map to catch up changes of the real world in short time and create collaborative maps by users. The content of an ego map are generated after collecting symbols in a common place by two criterions of an article’s place and interests.

As a result of defining a common place for pi-sharing between multiple ego maps, articles in the common place will be linked between ego maps one another. Then, the symbols in the common place grow up a collective entity having common articles, represented in the multiple ego maps.

In a concrete mechanism of pi-sharing as an example, we use both sending a track back ping and reading RSS of the weblog. When a user A wants to have a pi-sharing with another user B’s article of the weblog in Fig 7(a), the user A reads articles as a RSS of the user B’s weblog article specifying the position of user A’s ego map at first. Then, the user A’s ego map includes map symbols and its articles’ contents from the user B’s weblog in the user A’s ego map in Fig 7(b). Then, if the user A adds an article to the article after reading RSS, the user A’s article automatically sends a track back ping to the original user B’s article referred by the user A in Fig 7(c). By joining a common place on ego maps by many users, the entire networks of ego maps are going to be complex like an image in Fig 8.
In pi-sharing, a blog ego mapping has a mechanism that the first publisher of an article automatically gathers all related articles referring the article. That results in the weblog development by others spontaneously. Referred articles by RSS gather all referring articles’ information. If an ego map with valuable articles is referred by many other users, the ego map collects related articles of the many other users by many track back pings. Fig. 9 shows that the pi-sharing idea in map space can be applied to time space as well as all other spaces using the universal methods of the weblog, that is, track back pings and RSS.

![Diagram](image-url)

(a) Generating a port of place sharing by User A  
(b) Reading RSS from User B’s ego map  
(c) Track back by an additional article

Figure 10: Information sharing between two ego maps using RSS and track back

![Diagram](image-url)

Figure 11: Complex networks of ego maps and information ports between maps

![Diagram](image-url)

Figure 12: Information sharing between two ego time spaces using RSS and track back
4. CONCLUSIONS AND FUTURE WORK

This paper proposed a new framework for creating collaborative maps in weblog system. By the framework, we improved a map-making method which visualized and joined personal knowledge which have been so far ignored. In addition, we represent a new communication method of location-based weblog applying the weblog’s track back ping and RSS to make weblog’s articles more valuable.

As future work, we will explore location-based communication that extends our proposed weblog based egocentric mapping services to a field of mobile phone in ubiquitous computing environment. By combining the Web space with the real space, this framework could improve new functions for users to make their daily life more convenient. If a user who has a weblog based egocentric mapping can post an article with its position automatically obtained from a GPS receiver embedded in a mobile phone, then other users who share the same common place for information are automatically informed of the new article.

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