WEB-BASED SYSTEM FOR AUTOMATICALLY COLLECTING INFORMATION ABOUT LOCATIONS OF VOLUNTEER ACTIVITIES OF CITIZEN GROUPS

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Abstract: A large number of citizen groups, many of which work in a community setting, publish information about their missions and activities on their Websites. However, it is difficult to understand where and what types of activities they do because such information is distributed throughout the Web. We show how citizen groups are currently using maps on their Websites and propose a system for automatically collecting information from their Websites about locations of their volunteer activities. Our system selects numerous URLs of citizen group Websites and extracts information about locations of volunteer activities from each group based on the content and structure of each page on the site. We developed and evaluated a prototype system and found that our proposed system has great potential for understanding volunteer activities of citizen groups in a local community.

1 INTRODUCTION

Recently, citizen groups have been playing an important role in providing solutions to various needs of citizens and challenges facing societies worldwide (Salamon et al., 2003). To conduct their volunteer activities more effectively and to strengthen their foundations, it is important for citizen groups to gain the trust and support of their potential supporters, who are individuals, governments, and businesses. They are also working in an era of greater demands, fewer resources, and increased competition. Information and Communication Technology holds the promise of addressing these challenges, and many groups publish information about their missions, activities, and their results on the Web (Hackler and Saxton, 2007). On the other hand, many people who want to participate in or support volunteer activities of citizen groups search for such information using the Web. This has led to the Web being an important tool for citizen groups and their potential supporters to publish and collect information.

However, because each group publishes information on its own Website, general information about volunteer activities is distributed throughout the Web. This causes difficulties in understanding where and what types of activities are done by certain citizen groups. These difficulties can be overcome by aggregating such information published by these groups on their Websites. In addition, maps are useful for them to publish information (Craig and Elwood, 1998). However, to our knowledge, little is known about how citizen groups are using maps on their Websites.

Therefore, we show how citizen groups in Japan currently use maps on their Websites, and propose a system for automatically collecting information about locations of volunteer activities from their Websites by taking such map usage into consideration. With our system, potential supporters who want to participate in or support volunteer activities can understand where and what types of activities are performed by such groups in an easy-to-understand map. This will lead to increased citizen involvement and cooperation.

The rest of this paper is structured as follows. In Section 2, we briefly discuss related work. In Section 3, we show how citizen groups currently use maps on their Websites. In Section 4, we describe our proposed system, followed by its evaluation and discussion. Finally, we give our conclusion in Section 6.

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2 RELATED WORK

2.1 Citizen Group Websites and Online Databases

Over the past ten years numerous attempts have been made to assess how citizen groups use their Websites using content analysis. Some studies involved evaluating such Websites from the viewpoint of communication and fundraising practices (Kent and White, 2001) (Waters, 2007). There have also been several studies on how Web 2.0 technologies, such as Weblog and social networking sites, were being used by citizen groups to advance their missions and programs (Waters et al., 2009) (Greenberg and MacAulay, 2009). However, as far as we know, how citizen groups use maps on their Websites has never been examined. We show such usage based on citizen group Websites research. A large number of citizen groups work in a local community setting, and Web mapping services, such as Google Maps and Yahoo! Maps, are freely available (Hudson-Smith et al., 2007). Such mapping services hold the promise of providing an opportunity for using maps on Websites for citizen groups, especially, small ones, which generally have limited financial and human resources. Many groups are small in Japan. Therefore, it is important to explore how these citizen groups use maps on their Websites.

A variety of online databases of citizen groups have been developed by various organizations on the Web, for example, GuidStar (http://www2.guidestar.org/), The Chronicle of Philanthropy (http://www.philanthropy.com/), and Imagine Canada (http://www.imaginecanada.ca/). These databases store basic information such as names, locations of main offices, and missions and programs, and make it available to the public. Some databases allow registered groups to update their information. However, the information stored in such databases is basic and are typically textual documents. Therefore, they do not provide an easy environment to understand where and what types of activities are performed by citizen groups. In contrast, our proposed system aggregates location information of their volunteer activities distributed on their Websites and puts it onto a map.

2.2 Detection of Geographic Location Information on the Web

It has long been recognized that there is a large amount of geographic location information on the Web. Many Web pages have one or more types of geographic location information. However, current search engines often produce results of geographically unrelated pages for queries containing some kind of geographic term. Considerable attention has been on geographic-oriented keyword searches. Many approaches have been proposed for detecting geographic location information on the Web (McCurley, 2001), (Amitay et al., 2004), (Clough, 2005), and (Wang et al., 2005). They identify and extract information from Websites from around the world. Junyan et al. (Junyan et al., 2000) discuss how to automatically estimate the geographical scope of Web resources. Ahlers and Boll (Ahlers and Boll, 2007) and Gao et al. (Gao et al., 2006) proposed several geographically focused crawling strategies for collecting Web pages related to the specified geographic regions. There are also systems for automatically creating a detailed gazetter (Goldberg et al., 2009) and (Martins et al., 2009), which is a unified repository of geographic information, from geographic location information on the Web. The system developed by Chen et al. (Chen et al., 2007) visualizes RSS feeds containing geographic location information on a map.

Current systems, including those mentioned above, collect geographic location information from Websites from around the world or specific information sources such as the RSS feeds specified by a user. However, to our knowledge there is no comprehensive collection of links to citizen group Websites. Therefore, it is necessary to find such links from numerous Websites and to extract information about locations of volunteer activities from each group, and current systems are inadequate for doing this. Our system is characterized by selecting a Website for each citizen group and extracting information about locations of volunteer activities from the site based on the group's basic information, content, and structure of each page on the site.

3 HOW CITIZEN GROUPS CURRENTLY USE MAPS ON THEIR WEBSITES

3.1 Methodology

Maps are useful for citizen groups working in a community setting to publish information. To understand how citizen groups currently use maps on their Websites, we examined two questions before designing our system: (1) What types of maps are used by these groups? and (2) What kind of information do they

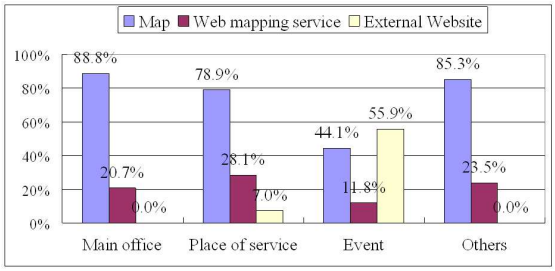

Figure 1: Map types for each type of map content.

publish using these maps? We refer to questions (1) and (2) as ”map type” and ”map content”, respectively.

Citizen groups were drawn from ”npo hiroba”, which is one of the largest online databases in Japan and is available at http://www.npo-hiroba.or.jp/. We selected groups that have main offices in Kanagawa and have Websites. We analyzed the Websites of 297 groups from June 6 to 23, 2010.

3.2 Results

The map content of citizen group Websites are divided into three purposes: for showing the locations of their main offices, locations of their programs and services they regularly provide, and sites of special events they hold. Figure 1 illustrates what types of maps are used for each type of the map content. Most of the maps for showing the main offices are hand drawn using word processing programs and map creation tools. About 15% of the groups we examined use Web mapping services, and many of them do this to show the locations of their main offices and their programs and services. About one-tenth of the groups use maps to show their special events, and about half of them are links to external Web pages containing maps.

3.3 Discussion

About half the groups we examined use maps to show the locations of their main offices and the places where they provide their programs and services. One of the purposes of using a map on a Website is to show locations to visitors. For this purpose, many groups are likely to use hand drawn maps containing only landmark buildings and large intersections rather than detailed maps. However, because each group manages its own Website, information about their volunteer activities are distributed over many sites throughout the Web. This causes difficulties in understanding where and what types of activities are performed by citizen groups. It is effective for those who want to search for citizen groups on the Web to aggregate these two types of geographic location information about their volunteer activities distributed throughout the Web into a map. A street or postal address is the most common way to refer to a location (Himmelstein, 2005). In addition, addresses are found on many of the groups’ Web pages containing maps showing the locations of their main offices and programs and services. Thus, our proposed system automatically collects addresses as information about locations of volunteer activities done by citizen groups from their Websites and puts this information onto a map.

4 AUTOMATICALLY COLLECTING LOCATIONS OF VOLUNTEER ACTIVITIES

4.1 Outline of Our System

As mentioned above, there is no collection of links to citizen group Websites, and postal addresses are found on many of the groups’ Web pages containing maps. Thus, our system has two main functions. One is to find the addresses (URLs) of such Websites from numerous sites throughout the Web, and the other is to extract postal addresses from these Websites.

The overall flow of our system are as follows. (1) The system collects basic information about citizen groups such as names, location of main offices, and mission and activity areas from an online database of them on the Web, attaches geographic coordinates (latitude and longitude) corresponding to the location, and stores the information in our system’s database, which is referred to as the basic information database. (2) Next, it collects URLs of citizen group Websites using a Web search engine and selects one for each group. (3) Then, it extracts information about locations of volunteer activities, which is a postal address in our system, and maps used from each Website and stores the information in two of our system’s databases, referred to as the first location information database of volunteer activities and map metadata database, respectively. The system attaches geographic coordinates corresponding to the extracted address as well. (4) Then it applies some filters to the extracted addresses based on the structure of the Web page such as the address and presence or absence of a map, and stores the resulting addresses in another database of our system, referred to as the second location information database of volunteer activities. (5) Finally, it shows geographic location information stored in the databases on a map using a Web mapping

service. The following section explains each step in detail.

4.2 System Functions

4.2.1 Collecting Basic Information

Our system uses the ”NPO portal” site as the online database of citizen groups to collect basic information such as their names and locations of main offices. The site is managed by the Cabinet Office of Japan and available at http://www.npo-homepage.go.jp/portalsite.html. The system searches for citizen groups on the site by location of their main offices, and parses the resulting HTML document to collect basic information about the citizen groups linked from the document. After that, it converts the location of the main office contained in the basic information to geographic coordinates, which are latitude and longitude, using the geocoding functionality of a Web mapping service. Finally, it stores the information in the basic information database.

4.2.2 Collecting and Selecting URLs of Citizen Group Websites

To collect URLs of citizen group Websites, our system first puts their names and ”NPO, or ’specified nonprofit corporation’”, as keywords in the query of a Web search engine, which is the Google search in our system. The system uses the top three search results as candidates for the URL of each group’s Website. Then, it applies the following filters to these candidates:

1. If more than two URLs have the same host and a path starting with the same directory of the server, they are regarded as indicating an online database of citizen groups and eliminated from the candidates. They all start with ”scheme://host/path/.”
2. If one of the path elements of a URL is an e-mail address, a postal code (three-digits hyphen four-digits in Japan) or a telephone number (three-digits hyphen three-digits hyphen four-digits, etc. in Japan), it is regarded as indicating an online database and eliminated from the candidates.
3. If one of the path elements of a URL is ”bbs”, which is short for bulletin board system, or ”ml”, which is short for mailing list, it is eliminated from the candidates. This is because many bulletin board systems and mailing lists are used to communicate among members and supporters of citizen groups.
4. If the title of the Website at a URL for a group do not contain the group’s name, the URL is eliminated from the candidates.

After applying these filters, our system selects the URL with the highest ranking for each group as its Website.

4.2.3 Extracting Addresses and Maps from Websites

First, to extract addresses and maps from citizen group Websites, our system searches within the Website of the URL selected for each group using a Web search engine. Then, the system executes the following process for each of the resulting Web pages.

As a preprocessing to extract addresses and maps from each page, our system converts the HTML document to XML with HTML Tidy and loads it as a tree of nodes, which is commonly referred to as a document object model (DOM) tree. After that, our system traverses the tree from its root.

When our system moves to the text node, it extracts a set of addresses from the node’s value based on regular expression matching of an address and converts each extracted address to geographic coordinates using the geocoding functionality of Web mapping services. If an address is converted to geographic coordinates, it is stored in the first location information database of volunteer activities together with the coordinates. The first database also stores the path expression to traverse the tree from its root down to the processing text node. Moreover, it stores the values of all text nodes contained in a sentence block. As shown in Figure 2, we defined a sentence block as a node corresponding to an HTML block element, such as <DIV>, <TABLE>, <P>, <BODY>, which is first encountered in moving up the tree from the text node towards its root. If the value of a text node is a sentence, our system does not extract any addresses. To determine whether a value is a sentence or not, the system uses punctuation marks.

On the other hand, for extracting maps, our system checks if a node satisfies either of the following conditions based on the characteristics of the maps used on citizen group Websites.

1. When the name of the processing node is ”img”, which is an <IMG> tag, and the value of the src attribute contains a word like ”map” or ”tizu” in the file name of the image. ”Tizu” means ”map” in Japanese.
2. When it is ”a” or ”iframe”, which are <A> and <IFRAME> tags, respectively, the value of the href or the src attribute references a Web mapping service with a specific location.

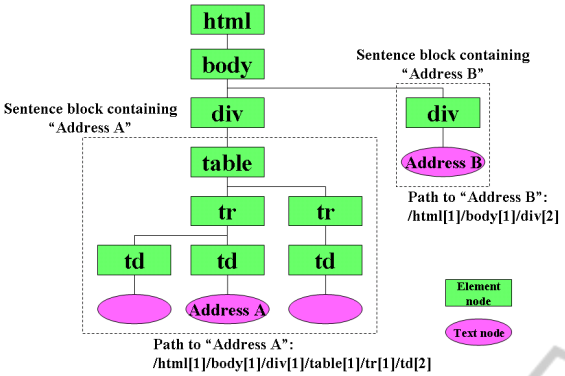

Figure 2: Example of sentence block.

When a map is found, our system stores the map's metadata in the map metadata database. The metadata consists of the value of an href or a src attribute and the path expression to traverse the tree from its root to the node containing the map.

4.3 Address Filtering

Our system applies filters to addresses stored in the first location information database of volunteer activities, and stores the resulting ones in the second one. The filters are as follows.

1. When none of addresses extracted from a Website of a citizen group correspond with the location of its main office stored in the basic information database, it is assumed that the selected URL is not the one for the group, namely, the correct URL is not selected. In this case, our system does not store all the addresses extracted from the Website in the second database.
2. When there are different addresses at the same position in each tree structure for many pages on a citizen group Website, it is assumed that its URL selected using our system is an online database. In our system, the same position means that the path expression to a text node containing an address in a Web page on a Website is the same as that in another page containing the address of the Website. In this case, our system does not store all the addresses extracted from the Website in the second database.

If a page containing an address also has a map after applying these filters, our system stores the address in the second database. The rationale is based on the fact that addresses are found on many pages with maps on the citezen group Websites we examined, as shown in Section 3.

There are also groups that do not use maps on their Websites. Therefore, when the text values within the sentence block corresponding to an address contains date expressions such as "every week" or "every month" and words indicating the day of the week, our system stores the address in the second database as well. We emphasize regular activities before irregular ones, such as a seminar, and set such words and expressions as a condition for storing addresses in the second database.

However, when the same address appears at the same position in each tree structure for many pages on a citizen group Website, it is assumed that the address is contained in the common menu, header, or footer of pages on the Website. If a page contains two or more addresses, our system does not store those appearing at such positions in the second database.

4.4 Prototype System

We developed a prototype system to collect information about locations of volunteer activities for 2658 citizen groups in Kanagawa Prefecture, Japan. The prototype displays the locations of the main offices stored in the basic information database and the extracted addresses from citizen group Websites stored in the second location information database of volunteer activities on a map using Google Maps. Users can search for citizen groups by their names, activity areas, and missions. To help users do this, the prototype performs morphological analysis of citizen group missions in the basic information database and displays a weighted list of the words in the missions in accordance with the frequency of their appearance. Each word in the list is a hyperlink that leads to a search by missions. Figure 3 illustrates a search for "Sound nurturing of youth" in the activity area and "child-raising" in the mission. In this figure, extracted addresses from the Websites of the resulting citizen groups are shown on the map.

5 EVALUATION AND DISCUSSION

5.1 Accuracy of Selecting URLs of Citizen Group Websites

We first evaluated the accuracy of selecting URLs of citizen group Websites. We compared URLs selected with our proposed system with those of the Websites we examined to understand how citizen groups currently use maps. Because 5 of the examined 297 groups had not been stored in the "NPO portal" site, we compared the URLs of 292 group Websites. As

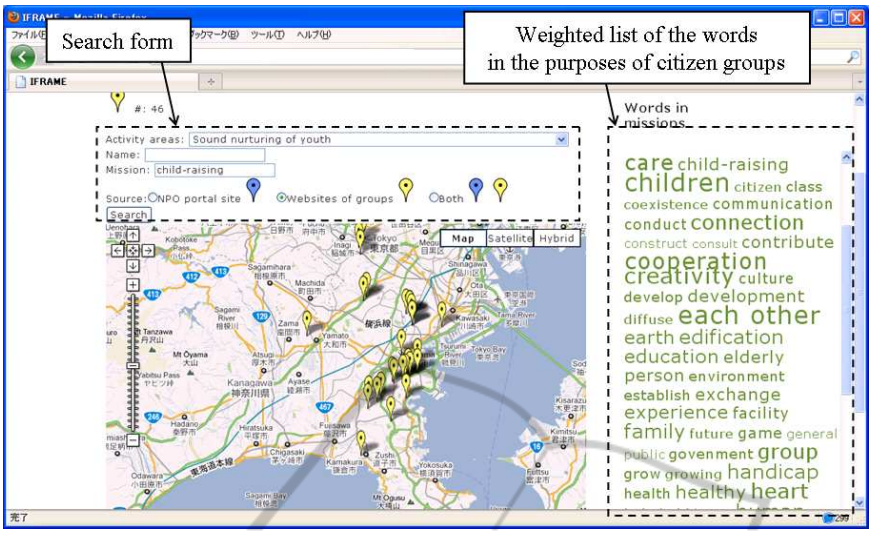

Figure 3: Map displaying search results.

Table 1: Result of selecting URLs of citezen group Websites.

Correct or incorrect	#
Number of URLs our system correctly selected	168
Number of URLs not correctly selected	61
Number of citizen groups that selected no URL	63

listed in Table 1, the URLs of Websites for 168 out of the 292 groups were correctly selected. The recall ratio was 57.5% and the precision ratio was 73.4%. The reasons why our system could not select the correct URL are as follows.

- There were groups with the same or almost the same name.
- A Website was moved to another server.
- A Weblog, not a Website, of a citizen group was selected.

We need to solve these problems to improve the recall ratio.

For all 2658 citizen groups, our system selected URLs of Websites for 1271 groups. Taking the precision ratio, which is 73.4%, into consideration, the URLs of Websites for about 930 groups could be correctly selected. According to the research conducted by the Cabinet Office of Japan, 59.0% of citizen groups, all of which are specified as nonprofit corporations in Japan, have their own Websites. Consequently, in Kanagawa Prefecture, about 1570 of the 2658 groups have their own Websites, and it can be assumed that the 930 groups will show a precision ratio of 59.5%. This is a promising result because there is no collection of links to citizen group Websites.

5.2 Evaluation of Address Extraction

We evaluated address extraction performance of our proposed system. We used the 292 citizen groups discussed in the previous section. Our system correctly selected URLs of Websites for 168 groups as discussed in the preceding section, and the system stored addresses from 148 of the 168 group Websites in the first database. Locations of main offices were extracted from 106 of the 148 Websites and other locations were from 117 Websites. On the other hand, the system could not select the correct URLs of Websites for 61 groups and stored addresses from 37 out of the 61 Websites in the first database. Locations of main offices were extracted from 14 of the 37 Websites and other locations were from 31 Websites.

In addition, the system extracted maps from 111 of the 168 group Websites. On the other hand, it extracted maps from 17 of the 61 group Websites.

One of the simplest filters for storing addresses in the second database is one in which at least one of the addresses extracted from a Website of a citizen group corresponds with the location of the group's main office stored in the basic information database. Thus, to evaluate our proposed system of storing addresses in the second database, we compared our system in which a filter of a Web page containing an address has maps or date expressions with one in which a filter was not applied. We refer to these two filters as proposed and simple, respectively. The results are listed in Table 2.

With the simple filter, our system stored addresses

Table 2: Number of citizen groups stored in first and second databases.

		Location of main office (a)		Other locations (b)		Address (a or b)	
Correct, or incorrect		Correct (%, N=168)	incorrect (%, N=61)	Correct (%, N=168)	incorrect (%, N=61)	Correct (%, N=168)	incorrect (%, N=61)
First database		106(63.1%)	14(23.0%)	117(69.6%)	31(50.8%)	148(88.1%)	37(60.7%)
Second database	Proposed	49(29.2%)	3(4.9%)	38(22.6%)	2(3.3%)	63(37.7%)	4(7.5%)
	Simple	101(60.1%)	14(23.0%)	70(41.7%)	8(13.1%)	101(60.1%)	14(23.0%)

extracted from Websites for 101 out of 148 groups, of which Website URLs were correctly selected, in the second database, which was 60.1%. On the other hand, with the proposed filter, the system stored addresses from 63 Websites, which was 37.7%. For the 37 groups in which the Website URLs were not correctly selected, our system stored addresses from 14 Websites in the second database with the simple filter, which was 60.7%. With the proposed filter, however, our system stored addresses from 4 Websites, which was 7.5%. URLs of 3 out of the 4 Websites were prefixed with ”www” to each of the corresponding correct URLs or vice versa, and their IP addresses were the same. Thus, with the proposed filter, very few addresses were stored from Websites that were not correctly selected in the second database.

5.3 Potential of Our System

We received the following positive comments from five citizen group members who participated in a preliminary evaluation.

- This system is practical because a map is intuitively understandable and makes it possible to organize information into each location.
- This system is useful when we are asked for advice, for example, to send direct mail to groups working to improve the welfare of citizens.
- We can use the system when we want to do something for the local community but we do not have enough resources such as people and skills.
- I have never seen such a system before. This system can be used as an information source since we can see how many groups are in an area.
- Plotting locations of volunteer activities on a map is easy-to-understand because they are seen.

We also received the following suggestions.

- It is necessary for activities, such as for the environment and urban development, to be in different colors on the map.
- I am interested in a map showing locations of citizen groups; however, it is more important to show their activities.
- In Japan, sometimes a location of a main office is one’s home. Therefore, it will be necessary to provide a map with that in mind.
- The system can be improved when local information, such as shopping and sightseeing, is combined with information about volunteer activities on the map.
- I’m afraid that the system might cause information overload, and it may be difficult to keep the information updated.
- When a location changes through time, for example event information, it may be difficult to understand the change on the map.

These positive comments indicate that our system with a function for collecting locations of volunteer activities done by citizen groups from their Websites has great potential for understanding their volunteer activities in a local community. Although requiring a combination of an address and map decreases the recall ratio of address extraction, it is effective for the condition that in Japan, sometimes a location of a main office is one’s home. This is because one of the purposes of using a map on a Website is to show a location to visitors. On the other hand, it was pointed out that information about volunteer activities themselves was not adequately shown. Thus, we need to develop methods for collecting more information from citizen group Websites and to display and enable one to search for such information on a map.

6 CONCLUSIONS

We showed how citizen groups in Japan currently use maps on their Websites, and proposed a system for automatically collecting locations of their volunteer activities from their Websites. We also developed and evaluated a prototype system and found that collecting such locations and displaying them on a map has great potential for understanding volunteer activities of citizen groups in a local community.

Future work includes enhancing functionality of our system based on the results from evaluating the

prototype system. We also need to evaluate our system based on a broader implementation test. Furthermore, it is important to see how the system will have an effect on citizen group Websites and their activities.

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